Summer 8-11-2023

Medication Management Program Among Elderly at a Residential Facility

Erica J. Kim
ejkim8@dons.usfca.edu

Caroline Mehta
cmehta3@dons.usfca.edu

Rick Nguyen
rknguyen3@dons.usfca.edu

Rosa Paniagua
rypaniagua@dons.usfca.edu

Refugio Cisneros
rycisneros@dons.usfca.edu

See next page for additional authors

Author

Erica J. Kim, Caroline Mehta, Rick Nguyen, Rosa Paniagua, Refugio Cisneros, and Veronica Williams

Medication Management Program Among Elderly at a Residential Facility

Caroline Mehta, RN, CNL, Refugio Cisneros, RN, CNL, Erica Kim, RN, Rick Nguyen, RN,

Rosa Paniagua, RN, and Veronica Williams, RN

School of Nursing and Health Professions, University of San Francisco

NURS 653: Internship

Dr. Mohamad El Najm

August 9, 2023

Table of Contents

Abstract

This quality improvement project aimed to address medication management-related issues at a residential facility. The project's population was elderly residents who self-administered their medications. A root cause analysis and SWOT analysis identified multiple factors contributing to medication management errors, including lack of resident education, resident competency, and technology limitations. An intervention plan was developed and implemented in two phases. Phase 1 involved conducting medication reconciliation, assessing resident competency, and 1:1 educational sessions with the residents. Educational retention was assessed by using a pre-test and a post-test. Phase 2, to be implemented in the future, will address technology limitations, incorporate an electronic medical records (EMR) system, and provide ongoing staff education. Results from Phase 1 include 80% recalled new information while 20% showed no change after completion of the educational session and the pre/post-test; from those residents assessed with the Medi-Cog, 55% scored above 8 out of 10 while 45% scored below the cutoff score of 8, and last 100% of the Medication Administration Records (MAR) were reviewed. Although time constraints prevented Phase 2 interventions from being implemented, implementing an EMR system and a professional development plan for staff education are expected to contribute to further improvements in medication management at the residential facility. Continued monitoring and collaboration with the residents and staff are vital for sustained success.

Introduction

A common issue within residential facilities is proper medication management among the elderly. Studies have shown that, on average, 54% of older adults reported taking four or more medications daily (Kirzinger et al., 2019). Medication management among the elderly is crucial because the aging process can cause changes to the body that increase the risk of adverse drug reactions (Lavan & Gallagher, 2015). When older adults experience adverse effects, it often leads to secondary issues requiring a higher level of care, which can be costly and negatively impact patient outcomes. Research has shown that adverse drug events in the elderly increase morbidity risk and account for 10% to 30% of hospital admissions (Parameswaran Nair et al., 2016).

Medication for the elderly is crucial and significantly impacts the overall quality of life and geriatric health, which is why medication management is essential (Brahma et al., 2013). Many issues contribute to inadequate medication management, starting with the lack of assessing an individual's ability to self-administer medications. Patient assessment is critical in determining an individual's cognitive ability and is often one of the first indicators that the patient is experiencing an issue. Before taking medications, an individual may be confused, so self-administering medications may not be safe or lead to medication non-adherence (Sumida et al., 2018).

Another common issue among the elderly involves the increased number of medications they are prescribed and over-the-counter (OTC) medications, which is described as polypharmacy. Polypharmacy refers to an individual taking five or more medications linked to causing falls, disability, and mortality in the elderly population (Varghese et al., 2022). Data has

shown that adults aged 65 and up are the most extensive buyers of over-the-counter (OTC) medications, making up 30% of misuse in the United States (Stone et al., 2017).

As previously mentioned, aging can cause changes in the body, such as a delay in the body's ability to break down drugs which can be an issue when multiple medications are being taken at one time. Along with taking many medications, many elderly individuals are unaware of the indications due to a lack of patient education. Research has shown that medication adherence depends heavily on patient education and explanation (Jin et al., 2016). If a patient is not informed of the reason for taking a medication, possible side effects, special considerations, or drug-drug interactions, this may increase their risk of adverse events. On average, 59% of the elderly make medication errors, often leading to hospital admissions (Mohamed Samir El Said et al., 2020).

These issues must be addressed because older individuals are at a higher risk of experiencing adverse medication side effects. This can often be avoided by simply reviewing whether the individual needs to be on the medication and weighing the risks vs. benefits of changing the medication to something more tolerated. Age plays a pivotal role in an individual's ability to properly self-administer medications and predisposes individuals to adverse drug reactions.

Problem

This project is intended to improve medication administration in the city of Orange at a residential facility for the elderly. The 5Ps framework will be adopted to describe the setting, which includes the purpose, patient, professionals, processes, and patterns, and will be broken down in greater detail throughout the paper. The facility's population includes elderly residents varying in acuity, and their acuity levels determine their ability to self-administer medications.

The acuity of the residents is crucial for this project since it is a determining factor in the resident's ability to manage their medication.

The facility's first floor is for residents requiring additional assistance with medications and activities of daily living who do not fulfill the cognitive abilities to administer their medications. The second floor is for independent-living residents who are self-sufficient and are considered cognitively and physically able to administer their medications. The process of carrying this plan out includes collaborating with the facility staff members, which includes management and nursing staff, to create a medication management plan. Based on the benchmark analysis, several key metrics can be utilized to measure overall performance and track progress over time. These metrics include reports of altered mental status, the number of falls, and patient reports of medication compliance and understanding. This project's goal includes increasing medication reconciliation and patient education to resolve discrepancies based on the Joint Commission's National Patient Safety Goals 2023 (The Joint Commission, 2023). The facility's core values include dignity, service, excellence, and justice, and in order to meet this goal, medication management will help provide excellent and safe care to the residents.

The target population is residents who self-administer their medications at the residential facility. This includes the facility's second floor and five residents on the first floor. Medication administration generally takes place from six to eight in the morning for residents whose medications are nurse-administered, and this is completed by two licensed vocational nurses (LVN). On the other hand, residents who self-administer can take medications independently, which is not closely monitored. Medication management among the self-administering residents within the facility has the potential to lead to adverse events. The current medication management routine issues include the lack of medication reconciliation, cognitive assessment,

and patient education. During the initial meeting, the administration mentioned that residents who were independent and responsible for preparing and taking their medications were having more adverse events. An adverse event in the older population is delirium, hypotension, and falls (Lavan & Gallagher, 2016).

Within the facility, several residents take several medications daily, which could lead to increased adverse effects and drug-drug reactions. Research has shown that one in six elderly patients is at an increased risk of significant drug reactions, especially when taking multiple medications (Błeszyńska et al., 2020). During brief discussions with the administration, it was found that medication reconciliation only happened when a medication was discontinued rather than routinely, and prescribed medications were not being compared to the Beers list during reconciliation. The Beers list lists medications proven to cause harmful effects in the older population, including individuals ages 65 and up (American Geriatrics Society, 2023). Residents also continued to take medications intended for a short period, such as medications on the Beers list, for longer than planned.

Another factor that could have contributed to the adverse events within the facility is the resident's overall understanding of medication administration and their cognitive ability. While interacting with the administration, it was learned that the resident's cognitive ability was not being assessed before allowing them to self-administer their medications. Without truly knowing the resident’s cognitive ability, it may be difficult to pinpoint the exact cause of the adverse events within the facility. Cognitive delays may happen as a normal part of aging, so any issues with their cognitive ability must be addressed sooner rather than later.

After evaluating the resident's cognitive ability, it is crucial to ensure they are given the proper resources to enhance their medication knowledge and understanding. When discussing

this issue at the facility, it was understood that the residents were not given many medication teaching materials. The residents would receive education regarding medications during doctor visits, but there was no form of follow-up teaching to ensure everything was understood. The residents are also not given written education which could be helpful if they need to remember some of the teachings following doctor's visits. Patient teaching was not tailored to each resident and was not updated whenever medication was changed or discontinued.

Available Knowledge/Literature Review

In order to gather information, a PICOT question was utilized to guide research and assist in determining key terms that enhance the search process. PICOT stands for population, intervention, comparison, outcome, and time. In this project, the main focus is on the elderly population self-administering medications residing in residential facilities, and the intervention involves configuring a medication management bundle that will lead to the desired outcome of a decrease in the number of medication management-related adverse events in the facility within three months. The PICOT established for this project asks, "Is a safe and collaborative medication management program effective in reducing medication management-related incidents among the elderly at a residential facility?"

A literature review has been conducted by utilizing CINAHL and key terms searched, including "medication reconciliation," "medication management," "polypharmacy," "older adults," "long-term care facilities," "risk factors," and "inappropriate medication use." The literature review themes are medication duplication, multiple prescribers, adverse drug events, medication reconciliation by deprescribing and reviewing medication records, and access to medication information. Twelve articles have been identified that relate to assessing the problem and potential solutions to improve medication management (Appendix G). The literature

discusses the risk of adverse drug events in older adults taking multiple medications without routine medication reconciliations. The literature demonstrates the incidence of medication management-related events within the older adult population in long-term care facilities and the methods to reduce these events by improving medication reconciliation and staff and patient education. The literature suggests that healthcare providers minimize the number of medications given by deprescribing wherever possible, reviewing patient medications as there are no duplicates or drug-drug severe interactions, checking for Beers criteria in the elderly patient population, and providing medication education to patients. Two articles identified the usefulness of a cognitive assessment to test the ability to perform activities of daily living, including self-administration of medications. These studies support using the Medi-Cog tool, which can effectively screen for cognitive impairment, suggesting the increased risk of drug adverse events when those individuals who present with cognitive impairment are self-administering their medications.

Rationale

The Johns Hopkins Evidence-Based Practice (EBP) Model was adopted to lead the project. This model has been adopted because it will allow for nurses to practice common language and the strength of the model, as it is peer-reviewed and has been modified based on criticisms to be the best version it can be. The advantage of this model is the core purpose which is to utilize the current best evidence and research to create change. A disadvantage has been identified as a long time to carry out this process and the strength of the model may depend on the numbers of good quality literature and research.

The Johns Hopkins EBP Model consists of three phases: Practice question, evidence, and translation (PET) (Johns Hopkins Medicine, 2023). In the first phase, the team of nursing

students has been developed. The problem has been identified as inappropriate medication management, which encompasses residents with polypharmacy, previous incidents of medication errors, inadequate knowledge of residents of what medications they are taking, which all of these can be associated with inappropriate medication management. The EBP question was refined with the PICOT format which helps to identify key terms for our evidence search as follows: "Is safe and collaborative medication management program effective in reducing medication management-related incidents among the elderly at a residential facility?" The stakeholders of this project include the clinical director, facility residents, and healthcare staff of the facility. Our team has scheduled weekly meetings within our group to discuss the project's next steps and progress.

Phase two is related to the evidence of the project. An internal search was conducted, and the problem identified was incidences of adverse events related to inappropriate medication management in the facility. Through comprehensive discussion with the clinical director of the residential facility and observation of medication administration on-site, an apparent problem and focus were identified for the project. Causes and effects related to the project have also been identified through analyses of the facility (Figure 1). To support this need for change, an external search of evidence was conducted through literature research outlining the risks of inappropriate medication management in long-term care facilities and the importance of medication reconciliation for elderly patients.

In the final phase of the Johns Hopkins EBP Model (translation), Lewin's change theory was utilized to guide the change process. Lewin's Change theory consists of three stages: unfreezing, change, and refreezing (Nursing Theory, n.d.) . These phases were demonstrated by identifying the current process for medication management at the residential facility which is

inappropriate medication management leading to adverse events in the facility. To address this old structure of medication management at the facility, we had to assess the current protocols (Unfreezing), identify problems, which led to us implementing this intervention (Change) to create change and aim to sustain this change (Refreezing)by changing the way medication is administered and managed. The final refreezing stage can be reflected by establishing the new medication management program as the standard procedure at the facility.

Specific Project Aim

Project Aim

Reduce medication management-related incidents among the elderly at a residential facility.

Project Objectives-Phase 1

1. All residents' medications will be reconciled and compared against the Beers Criteria List and checked for drug-drug interactions by mid-July and periodically afterward.
2. All residents who self-administer their medications will receive individualized education relating to their medications by mid-July.
3. 100% of self-administering residents should be competent cognitively using the Medi-Cog assessment tool by mid-July.

The theme for improvement in this project is patient safety and polypharmacy reduction. The project aim is to improve education among the residents at the residential facility about their medications and decrease complications from polypharmacy. The process begins with assessing the residents' ability to self-administer their medications, knowledge about their medications, and awareness of the side effects and special instructions for taking multiple medications for their chronic health conditions. The process ends with each resident better understanding their medications and efficient medication management. By working on the process, the expectations

are to learn if the residents can self-manage their medication administration, to understand the level of knowledge the residents have about what each medication does, and to aid in medication reconciliation for each sister. Furthermore, the nurses are expected to verify the residents' medications with the physician's orders and eliminate duplications or collaborate with pharmacists and physicians to adjust medications that are similar in mechanism of action. It is essential to work on this now because patient safety is a priority, and the elderly population is highly affected by certain medications which are part of the Beers List. These medications can put the elderly in a high-risk situation with adverse effects and drug-drug interactions that could result in drowsiness, dizziness, falls, and injury (Appendix B).

Methods

Context

The residential facility is a clinical microsystem composed of one registered nurse (RN) who is also a clinical director, one LVN who is a clinical coordinator, two other LVNs and med techs who are in charge of medication administration. This group of healthcare professionals who work together regularly to provide care for the residents at the residential facility is formed around a common purpose or need within the microsystem. During the initial meeting with the clinical director, clinical microsystem assessment and cultural assessment data were collected to identify quality issues within the residential facility, recognize the impact of barriers when working to improve this microsystem and identify cultural strengths and areas for improvement. The assessment tool, 5Ps, was utilized to direct the path for this quality improvement project. The first P is the purpose which aligns with the facility's mission and vision, such as providing a safe environment and caring for the elderly residents with compassion. The second P is the patients who are the residents of the facility. The third P is professionals, which includes RNs,

LVNs, and Med Techs. The fourth P is the process. One process which was identified for this quality improvement project at the facility was medication administration. The medication administration has led to an uptrend of medication administration-related incidents at the facility. This trend is the last P of the assessment tool, the pattern.

The SWOT analysis was used to assess their microsystem. SWOT stands for strengths, weaknesses, opportunities, and threats (NIH, 2022). The SWOT analysis is a framework used in this project to evaluate the residential facility's strengths and weaknesses, which are the internal factors, and opportunities and threats, which are the external factors. Table 1 shows the residential facility's strengths as having a supportive leadership, an available budget, nurse-led medication administration for residents with poor physical abilities or cognition, a strong infrastructure for training, and an existence of Evidence-Based polypharmacy models and frameworks. However, the weaknesses, such as a lack of electronic medical records (EMR), not enough RNs, and a lack of nurse educators, limit the residential facility from performing optimally. The opportunities are considered the favorable external factors that could give the residential facility an advantage of operating optimally. These opportunities include a new EMR to be launched in August, many highly educated residents, a collaborative relationship with the medications vending company, and a collaborative relationship with the physicians (Table 1). On the other hand, the threats are identified as the physicians' compliance with the reconciliation and the inability to merge paper-based medication administration records (MAR) with the new EMR. These threats are unfavorable external factors that could harm the residential facility's improvement.

Table 1

SWOT Analysis

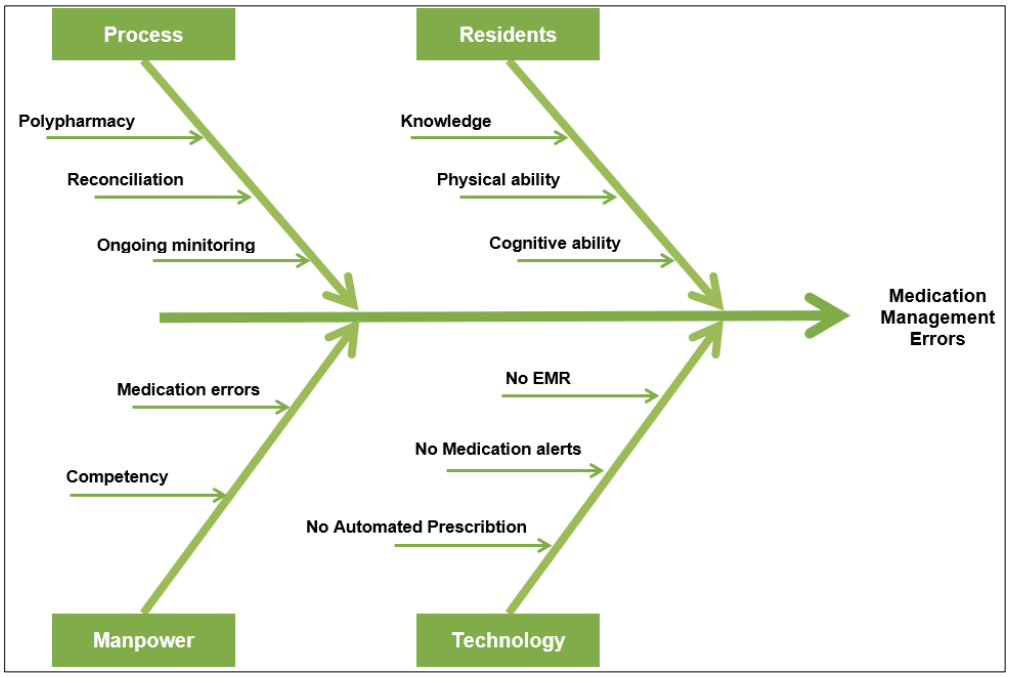
SWOT	Favorable	Unfavorable
Internal	**Strengths** ● Supportive leadership ● Budget ● Nurse-led medication administration for residents with poor physical abilities or cognition ● Strong infrastructure for training ● Existence of Evidence-Based polypharmacy models and frameworks	**Weaknesses** ● Lack of EMR ● No enough RNs (mostly LVNs & technicians) ● Lack of nurse educators
External	**Opportunities** ● New EMR to be launched in August ● Good number of highly educated residents ● Collaborative relationship with the medications' vending company ● Collaborative relationship with the physicians	**Threats** ● Physicians' compliance with the reconciliation ● Inability to merge eCDMS with the new EMR

Besides the SWOT analysis, a root cause analysis (RCA) was also completed to determine the factors that led to the existing medication management errors at the residential facility. The key factors identified in RCA were the residents, the process, the technology, and the staffing (Figure 1). The residents' limited physical ability, cognitive ability, and knowledge are part of the cause of medication management errors at the facility. Due to regular physiological changes, residents' manual dexterity and vision can become impaired, affecting

their ability to identify medications correctly, open medication containers, and prepare medications. Additionally, poor cognition among residents can result in medication adherence issues. Finally, a lack of knowledge about medications, their special instructions, and side effects can result in medication management-related incidents. In addition, processes such as polypharmacy, reconciliation, and ongoing monitoring also contributed to medication management errors. The residents at the facility are elderly and have more than five medications, including prescribed and over-the-counter (OTC). The medication reconciliation process must be clarified because different physicians treat the residents' comorbidities. There is also no straightforward process for monitoring drug-drug interactions, side effects, and adverse events from the existing medications in the MAR. Another cause identified in the RCA was the technology at the facility because the current system depends on paper-based MAR, there is no automated prescription system, and there is a lack of medication alerts for contraindicated medications or order updates, for example. Lastly, the fourth cause of medication administration errors was staffing which includes medication errors by nurses and the nurses' knowledge or competency. Several incidents have been reported regarding medication administration errors at the residential facility. Through microsystem and cultural assessments, the nurses are not knowledgeable about the medications' special instructions, mode of action, and side effects to monitor and report.

Figure 1

Root Cause Analysis



To reduce the cost of medication management-related incidences at the residential facility, this quality improvement project is designed to tackle the identified causes in the RCA. The medication management-related incidents at the residential facility have increased the cost at the facility. According to Patient Safety Network, each medical error costs roughly $10,000; data was collected in 2019. This project can reduce that cost by providing and reinforcing education to the patients, assessing the patients' competency in self-administering medications, and reconciling medications to eliminate polypharmacy. However, the facility must spend money on the quality improvement project to reduce the cost of future medication management-related incidences to achieve the benefits. According to Indeed, the hourly pay for LVN is $28 on average, and the expense for this project includes 13 hours of education for the residents by LVNs, 26 hours of reviewing the MAR by LVNs, and printed-out materials which cost approximately $364, $728, and $40 respectively (Indeed.com). The benefits include reinforcing

proper patient education, reduced medication-related incidents and adverse events among residents, and safe medication administration. However, the actual return on investment of a better quality of life for the residents cannot be measured in money.

Table 2

Budget

Expenses	Expected return
- Hourly pay for LVN = $28 - 13 hours of education for residents by LVNs = $364 - 26 hours of reviewing the MAR by LVNs = $728 - Printed out materials for education = $40	- Each medication error = $10,000 - Total number of medication errors (a) = a x $10,000
Total = $1,132	Total = (a x $10,000) - $1,132

Throughout this project, clear communication with stakeholders took place through various meetings with the nursing director, which were either in person or over the phone. During these meetings, the project team presented the project and received stakeholder feedback. This feedback was used to tailor the project to fit the facility's needs best while still meeting the project's goals.

The project is structured according to a carefully planned timeline to ensure its success. Commencing on June 1st, the project began with a brainstorming session that spanned over the course of a week, concluding on June 7th. Subsequently, on June 15th, a crucial meeting was held with the key stakeholder, the preceptor, where significant milestones were achieved, the completion of the root cause analysis, SWOT analysis, and MAR reconciliation. The reconciliation involved checking for medications in the Beers list, identifying any potential drug-drug interactions and underlying repeat medications. To further solidify the project’s foundation,

a comprehensive literature review was conducted from June 1st to June 26th. This allowed for a thorough understanding of the relevant research and best practices in the field. Moving forward, the team commenced the development of educational materials on July 1st, dedicating meticulous attention to detail and ensuring their completion by July 11th. On July 13th, we met with the residents to assess, educate and evaluate them, completing our first educational session. The second and final educational session with the residents took place on July 19th. Simultaneously, evaluations were conducted on July 13th and July 19th to measure the effectiveness of the education part of the project. A wrap-up meeting was conducted on July 31st, concluding the project. For a visual representation of the project's timeline, please refer to Table 3, which provides a detailed schedule that aids in visualizing the progression of the project and its various components.

Table 3

Gantt Chart

Deliverables		Jun					Jul				
		1	**7**	**15**	**22**	**26**	**1**	**11**	**13**	**19**	**31**
1.Residents Education											
1.1	Brainstorming meeting (setting the plan)										
1.2	Gathering all residents' MARs										
1.3	Preparing the pre-test and post-test questions										
1.4	Creating educational materials										
1.5	Conducting educational session #1										
1.6	Conduction Educational session #2										

1.7	Wrap-up meeting										
2.Medication Reconciliation											
2.1	Reconciliation										
2.2	Beer's List Check										
2.3	Checking for Drug-Drug interactions										
3.Self-administering ability assessment											
3.1	Researching cognitive assessment tools										
3.2	Conducting cognitive assessment session #1										
3.3	Conducting cognitive assessment session #2										
3.4	Wrap-up meeting										

Interventions

After conducting a root cause analysis (Figure 1) and a SWOT analysis (Table 1), a safe and collaborative medication management program was developed to decrease the number of medication management-related incidents at this facility. The root cause analysis identified various causes that may be contributing to medication management-related incidents. These causes include issues relating to technology, processes within the facility, staffing, and the residents at the facility. Because multiple factors were identified as contributing to medication management-related incidents at the facility, the developed medication management program contains interventions to address each of these factors. These interventions will be implemented

in two phases (Table 4). Phase 1 will be implemented by mid-July 2023, and Phase 2 will be implemented by September 2023.

Phase 1 of the medication management program will take place immediately and is designed to address critical medication management issues. During this phase, interventions will address the medication reconciliation process and residents' competency. The root cause analysis identified that there is no straightforward process for medication reconciliation at the facility. In response to this, an immediate review of residents' medication administration records (MAR) was conducted to identify inappropriate medications, duplicates, and inappropriate timing of medication administration. To do this, each residents' paper-based MAR was reviewed for drug-drug interactions, inappropriate medication timing, and the presence of medications listed on the Beers Criteria list. The presence of medications on the Beers Criteria list will be checked manually until the Beers Criteria list can be paired with the new EMR system that will be implemented in Phase 2. The presence of drug-drug interactions will be determined by using drug-drug interaction checker software, such as those available through WebMD or Medscape. A checklist was developed to evaluate the medication reconciliation to ensure that the physician and care coordinator had reviewed the reconciliation (Appendix C).

The root cause analysis also identified resident competency as a cause of medication management-related incidents. This includes residents' limited physical ability, cognitive ability, and knowledge due to the aging process. To address these aspects of residents' competency, residents who self-administer medications were provided with 1:1 educational sessions. These sessions included written instructions listing their medications, timing of administration, special instructions, and side effects to monitor and report. Residents were also educated about using memory cues, such as clock time, mealtime, or daily rituals, to remember when to take

medications. This was done by including this education in the 1:1 educational sessions. In the future, staff should document that education regarding memory cues was given in progress notes. To address resident competency in Phase 1 of the medication management program, residents should also be provided with memory-enhancing methods, such as pill boxes, medication calendars, blister packs, or electronic reminders. To do this, during the 1:1 educational sessions, residents were taught to use medication reminder applications, such as “MyTherapy” or the iPhone “Health” application.

Finally, to address resident competency in Phase 1 of the medication management program and to meet our objectives, the residents who self-administer medications received a baseline assessment of their cognitive abilities using the Medi-Cog instrument (Appendix A) and will receive frequent assessments with this tool by staff. The Medi-Cog instrument is a multi-part assessment that assesses an individual’s cognitive abilities.

Table 4

Project Interventions

Phase 1	
Intervention	**Process**
Medication Reconciliation	● Review all residents’ medications to identify inappropriate medications, duplicates, and inappropriate timing ● Medications compared to Beers Criteria list (Appendix B) ● Medications checked for drug-drug interactions using online software tools
1:1 Educational Sessions	● Teach residents who self-administer medications about their medications, potential side effects, special instructions, and timing using tabulated instructions for each resident ● Teach residents the use of memory cues, such as pill boxes, calendars, blister packs, or electronic reminder

	systems
Cognitive Assessment using Medi-Cog Tool	• Administer Medi-Cog to residents who self-administer medications
Phase 2	
Intervention	**Process**
EMR	• Implementation of EMR system that will be paired with the Beers Criteria list and will include automated prescription programming
Periodic Medication Reconciliations	• Medication reconciliations to occur monthly, at the start of each new medication, and after each doctor visit and major event • Physician to verify primary and secondary medical diagnosis related to medications whenever a medication reconciliation occurs
Staff Education	• Self-paced professional development plan that includes an educational program and in-service training
Protocol for Medication-Related Lab Work	• Collaboration with physicians and utilization of the Common Medication Laboratory Monitoring based on the CMS State Operations Manual (Appendix E)
Protocol for Reporting Medication-Related Incidents	• Utilization of MedWatch by physicians or voluntarily by residents (Appendix F)
Educational Instructions	• Educational materials will be provided to residents about their medications by PharMerica

Phase 2 of the medication management program will take place later and address medication management issues that require longer planning and logistical arrangements. The root cause analysis identified that technology, specifically the lack of an EMR, contributed to medication management-related incidents at the facility. During Phase 2, an EMR system is to be launched at the facility. This EMR system should include automated prescription programming paired with the Beers Criteria list to reduce medication management-related incidents.

The medication reconciliation process will be further addressed in Phase 2. During this phase, periodic medication reconciliation should occur, including monthly, when a new medication is started, after each doctor visit, and after any significant events. To do this, each resident's MAR should be printed before each doctor visit. The physician should verify and sign the MAR and provide post-visit notes to the nurses so that they can verify changes with the physicians. Additionally, physicians should identify and verify each prescribed medication's primary or secondary medical diagnosis. This should be done at the same frequency as the medication reconciliation. To facilitate this periodic medication and medical diagnosis reconciliation process and to evaluate the medication reconciliation process, a checklist was created (Appendix C). This checklist allows physicians and the care coordinator at the facility to document when medication reconciliations are completed, and that residents' MARs are being checked for the presence of drug-drug interactions and medications on the Beers Criteria list

Phase 2 of the medication management program will also address the facility's staff knowledge. To increase the knowledge of nurses and technicians at the facility, they should contribute notions, the mechanisms of action, special instructions, drug-drug interactions, side effects, adverse events, medication effectiveness, and medication adherence. To do this, a professional development plan should be created based on clearly identifying needs, instructional materials, and an evaluation plan. The professional development plan will include an educational program that is organized to have a common theme and overall purpose. The professional development plan will also include in-service training intended to assist the nurse medication administrator in acquiring, maintaining, or increasing competence in practice. Finally, the professional development plan will be self-paced. To evaluate the impact of the professional

development plan on staff knowledge, a pre-test, and post-test that aligns with the material provided in the professional development plan will be administered.

To further address the staff's knowledge of the facility, Phase 2 of the medication management program also includes adopting a protocol for lab work related to medications in collaboration with physicians. This will be achieved by utilizing the Common Medication Laboratory Monitoring based on the CMS State Operations Manual (Appendix E). Another intervention to address the staff's knowledge at the facility is to initiate and review a reporting system for drug-drug interactions, side effects, and adverse events. This will be done by utilizing MedWatch, which reports these events to the FDA. The reporting process can be done by physicians or voluntarily by residents. Listed in Appendix F is an example of a reporting form that can be used to report these events until the new EMR is adopted.

Finally, Phase 2 of the medication management program will further address residents' competency by implementing written instructions to educate residents on medications, special instructions, and side effects to monitor and report. While Phase 1 included 1:1 educational sessions with residents to educate them, Phase 2 includes the implementation of written instructions to ensure ongoing education regarding medications. PharMerica, the pharmacy that supplies the residents' medications, should provide these written instructions. To evaluate the effectiveness of these educational materials, the pre-test and post-test in Appendix D will also be used.

Results

Implementation of Phase 1, which consisted of conducting medication reconciliation, assessing the self-administering residents' competency, and preparing educational materials about the medications' special instructions and side effects to monitor, allowed us to reduce

adverse events among the residents at the facility. After conducting medication reconciliation for each resident, sixty-eight medications were on the Beers list. A total of six medications were listed double on the MAR, and 90% had drug-drug interactions. The corrective action to address these issues is routine medication reconciliation until the new EMR is implemented in Phase 2. The new EMR will have an automated Beers list and drug-drug interaction checker installed, which will help reduce medication errors. The population addressed in this project was a total of eighteen self-administering residents (Table 5). Of the eighteen residents, two were excluded because they were not taking any medications, two refused to participate, and one was unavailable on the days we attended the facility. Before this project, there were two medication administration-related incident reports in June and two in July. None of the four incident reports were for the self-administering group.

After doing the inclusion and exclusion criteria, a total of thirteen residents participated in the Medi-Cog assessment. Each of them received a 1:1 education session and was provided with written instructions regarding special considerations and the use of memory-enhancing methods. To evaluate the efficiency of the education sessions, the residents were given pre and post-assessment questions (Appendix D) about their medications. The educational sessions were effective if residents could recall more information about their medications during the post-test. Of the thirteen residents, eleven (80%) were able to recall more information during the post-test, and two of them (20%) showed no change (Table 6). The Medi-Cog instrument screen (Appendix A), is not a diagnostic, but it provides objective data to strengthen clinical judgment regarding the patient's memory and abilities to interpret prescriptions. There are a total of 10 possible points in the Medi-Cog assessment. A score of 8 out of 10 indicates adequate skills depending on the risk level of the regimen. A total of seven residents (55%) scored above 8 on

the Medi-Cog assessment, and a total of six (45%) scored less than 8 (Table 7 and Figure 2). The corrective action plan to address these results includes having the primary care physician further evaluate the six residents who scored less than 8 on the Medi-Cog assessment and move them to the non-self-administering group. This recommendation is to ensure safe medication administration and patient safety. Due to lack of time during the semester, future attempts to assess the unavailable resident should be made in Phase 2. Ongoing monitoring and education should continue to ensure effective medication administration among all the residents, but especially for those who self-administer.

There were many barriers to this project; some were due to internal factors within the facility, such as poor communication among staff and residents and lack of technology, such as using paper-based MAR. Barriers due to external factors include a change of site at the beginning of the semester that delayed the start of our project, the inability to meet with all the residents, and poor communication among physicians and staff regarding residents' medications and ongoing monitoring for any drug-drug interaction or medications on the Beers list. Since the self-administering residents can leave the facility, coordinating with them and the staff to conduct Medi-Cog assessments and educational materials was also difficult.

Due to time constraints, Phase 2 begins in September. Therefore, progress from the new EMR system implementation and professional development plan for ongoing staff education was not evaluated.

Table 5

Population

Self-administering residents	Residents that participated in the Medi-Cog assessment	Residents that refused the Medi-Cog assessment	Residents that were unable to participate in the Medi-Cog assessment	Residents excluded from Medi-Cog assessment
18	13	2	1	2

Table 6

Pre-test/Post-test results

Residents who were able to recall new information during post-test	Residents who showed no change
11 (80%)	2 (20%)

Table 7

Medi-Cog results

Residents who scored <8 out of 10	Residents who scored >8 out of 10
6 (45%)	7 (55%)

Figure 2

Medi-Cog Results

Discussion

This project at a residential facility for older adults tackled medication management issues among older adults. Proper medication management among older adults in residential facilities is a common issue, with many older adults taking multiple medications daily. Lack of proper medication management can lead to adverse drug reactions and secondary health issues, resulting in increased healthcare costs and negative patient outcomes. The residential facility experienced medication management-related adverse events. Issues identified include inadequate medication reconciliation, lack of cognitive assessments before self-administration, and insufficient medication education for residents. The project aims to improve medication education among the residents at the facility and reduce complications from polypharmacy. By addressing medication reconciliation, cognitive assessments, and providing tailored medication education, the project seeks to enhance medication management and patient safety. By conducting a root cause analysis, and SWOT analysis helped identify contributing factors to medication management issues at the facility. Phase 1 interventions will reduce medication management-related adverse events, including medication reconciliation, resident cognitive assessments, and 1:1 educational sessions. Challenges included internal factors such as poor communication, lack of technology and external factors such as poor communication with physicians. The John Hopkins EBP model and Lewin's change theory provided a structured approach to the project's planning and implementation. The team collaborated with stakeholders, including facility staff, to tailor the interventions to meet the facility's needs. Monitoring and ongoing education were emphasized to ensure sustained improvement in medication management.

In conclusion, the medication management project at the residential facility demonstrates the significant usefulness of the work undertaken to improve patient safety and reduce adverse drug events among older adults. The project effectively addresses key medication management issues by implementing evidence-based intervention and a systematic change approach. The methodologies employed, such as medication management, cognitive assessments, and tailored medication education, can be easily replicated and adapted to different contexts, ensuring broader implications for practice across the healthcare landscape. By implementing these best practices, healthcare facilities can significantly enhance medication management, reduce adverse drug events, and improve overall patient outcomes, particularly among the elderly. Based on this project, some recommendations can be made, a second cycle of individualized education should be done with the residents, residents who scored below 8 in the Medi-Cog assessment are advised to transition from self-administration group to nurse-assisted medication administration group, further cognitive function evaluation is recommended as the Medi-Cog is not a diagnostic tool, and there should be periodic MARs reviews. Is imperative that an EMR is used for the facility which is expected for Phase 2. Ongoing monitoring and education should be prioritized to ensure improvement in medication management practices.

References

American Geriatrics Society 2023 updated AGS Beers Criteria® for potentially inappropriate medication use in older adults. (2023). *Journal of the American Geriatrics Society*, *71*(7), 2052–2081. https://doi.org/10.1111/jgs.18372

Anderson, K., Jue, S. G., & Madaras-Kelly, K. J. (2008). Identifying patients at risk for medication mismanagement: Using cognitive screens to predict a patient's accuracy in filling a pillbox. *The Consultant Pharmacist*, *23*(6), 459–472. https://doi.org/10.4140/tcp.n.2008.459

Betsy Lehman Center. (2019, June 19). *The financial and human cost of medical error... and how Massachusetts can lead the way on patient safety.1*. Patient Safety Network. https://psnet.ahrq.gov/issue/financial-and-human-cost-medical-error-and-how-massachusetts-can-lead-way-patient-safety

Błeszyńska, E., Wierucki, Ł., Zdrojewski, T., & Renke, M. (2020). Pharmacological interactions in the elderly. *Medicina*, *56*(7), 320. https://doi.org/10.3390/medicina56070320

Brahma, D. K., Wahlang, J. B., Marak, M. D., & Sangma, M. Ch. (2013). Adverse drug reactions in the elderly. *Journal of Pharmacology and Pharmacotherapeutics*, *4*(2), 91–94. https://doi.org/10.4103/0976-500x.110872

Jin, H., Kim, Y., & Rhie, S. (2016). Factors affecting medication adherence in elderly people. *Patient Preference and Adherence*, *Volume 10*, 2117–2125. https://doi.org/10.2147/ppa.s118121

Johns Hopkins Medicine. (2023). *Evidence-based practice.* Johns Hopkins Nursing: Center for Nursing Inquiry. https://www.hopkinsmedicine.org/nursing/center-nursing-inquiry/nursing-inquiry/evidence-based-practice

Kirzinger , A., Neuman, T., Cubanski, J., & Brodie, M. (2019, August 9). *Data note: Prescription drugs and older adults*. KFF. https://www.kff.org/health-reform/issue-brief/data-note-prescription-drugs-and-older-adults/

Lavan, A. H., & Gallagher, P. (2016). Predicting risk of adverse drug reactions in older adults. *Therapeutic Advances in Drug Safety*, *7*(1), 11–22. https://doi.org/10.1177/2042098615615472

LVN jobs, employment in Anaheim, ca | indeed.com. Indeed. (2023, January 1). https://www.indeed.com/q-LVN-l-Anaheim,-CA-jobs.html

Mohamed Samir El Said, S., El-Din Amin, G. E., Mohamed Baumy Helal, E., Salah Amin Radwan, R., & Wahba, H. M. (2020). The effect of a tailored health education programme on medication management in the elderly. *The Scientific World Journal*, *2020*, 1–7. https://doi.org/10.1155/2020/1903191

Nursing Theory. (n.d.). *Lewin's change theory.* https://nursing-theory.org/theories-and-models/lewin-change-theory.php

Parameswaran Nair, N., Chalmers, L., M Peterson, G., Bereznicki, B., L Castelino, R., & Bereznicki, L. (2016). Hospitalization in older patients due to adverse drug reactions- the need for a prediction tool. *Clinical Interventions in Aging*, 497. https://doi.org/10.2147/cia.s99097

Stone, J. A., Lester, C. A., Aboneh, E. A., Phelan, C. H., Welch, L. L., & Chui, M. A. (2017). A preliminary examination of over-the-counter medication misuse rates in older adults.

Research in Social and Administrative Pharmacy, *13*(1), 187–192. https://doi.org/10.1016/j.sapharm.2016.01.004

Sumida, C. A., Vo, T. T., Van Etten, E. J., & Schmitter-Edgecombe, M. (2018). Medication management performance and associated cognitive correlates in healthy older adults and older adults with aMCI. *Archives of Clinical Neuropsychology*, *34*(3), 290–300. https://doi.org/10.1093/arclin/acy038

Teoli, D., Sanvictores, T., & An, J. (2022, September 15). *SWOT analysis - StatPearls - NCBI Bookshelf*. National Institutes of Health. https://www.ncbi.nlm.nih.gov/books/NBK537302/

The Joint Commission. (2023). *Hospital: 2023 national patient safety goals*. https://www.jointcommission.org/standards/national-patient-safety-goals/hospital-national-patient-safety-goals/

Varghese, D., Ishida, C., & Koya, H. (2022). *Polypharmacy - StatPearls - NCBI Bookshelf*. National Institute for Biotechnology Information . https://www.ncbi.nlm.nih.gov/books/NBK532953/

Appendix A. Medi-Cog™ instrument (Mini-Cog + Medication Transfer Screening)

Mini-Cog©

Instructions for Administration & Scoring

ID: _____ Date: _____

Step 1: Three Word Registration

Look directly at person and say, "Please listen carefully. I am going to say three words that I want you to repeat back to me now and try to remember. The words are [select a list of words from the versions below]. Please say them for me now." If the person is unable to repeat the words after three attempts, move on to Step 2 (clock drawing).

The following and other word lists have been used in one or more clinical studies.[1-3] For repeated administrations, use of an alternative word list is recommended.

Version 1	Version 2	Version 3	Version 4	Version 5	Version 6
Banana	Leader	Village	River	Captain	Daughter
Sunrise	Season	Kitchen	Nation	Garden	Heaven
Chair	Table	Baby	Finger	Picture	Mountain

Step 2: Clock Drawing

Say: "Next, I want you to draw a clock for me. First, put in all of the numbers where they go." When that is completed, say: "Now, set the hands to 10 past 11."

Use preprinted circle (see next page) for this exercise. Repeat instructions as needed as this is not a memory test. Move to Step 3 if the clock is not complete within three minutes.

Step 3: Three Word Recall

Ask the person to recall the three words you stated in Step 1. Say: "What were the three words I asked you to remember?" Record the word list version number and the person's answers below.

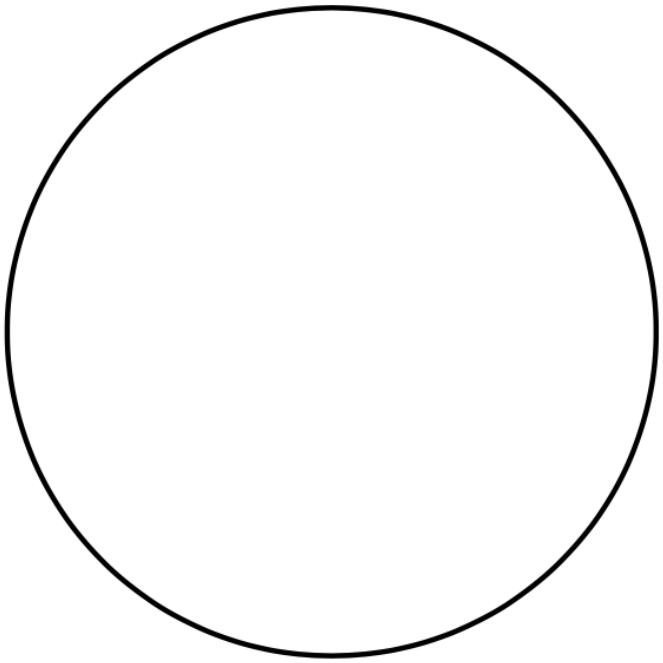
Word List Version: _____ Person's Answers: _____ _____ _____

Scoring

Word Recall: _____ (0-3 points)	1 point for each word spontaneously recalled without cueing.
Clock Draw: _____ (0 or 2 points)	Normal clock = 2 points. A normal clock has all numbers placed in the correct sequence and approximately correct position (e.g., 12, 3, 6 and 9 are in anchor positions) with no missing or duplicate numbers. Hands are pointing to the 11 and 2 (11:10). Hand length is not scored. Inability or refusal to draw a clock (abnormal) = 0 points.
Total Score: _____ (0-5 points)	Total score = Word Recall score + Clock Draw score. A cut point of <3 on the Mini-Cog™ has been validated for dementia screening, but many individuals with clinically meaningful cognitive impairment will score higher. When greater sensitivity is desired, a cut point of <4 is recommended as it may indicate a need for further evaluation of cognitive status.

Clock Drawing

ID:_____ Date:_____



References

1. Borson S, Scanlan JM, Chen PJ et al. The Mini-Cog as a screen for dementia: Validation in a population based sample. J Am Geriatr Soc 2003;51:1451–1454.
2. Borson S, Scanlan JM, Watanabe J et al. Improving identification of cognitive impairment in primary care. Int J Geriatr Psychiatry 2006;21: 349–355.
3. Lessig M, Scanlan J et al. Time that tells: Critical clock-drawing errors for dementia screening. Int Psychogeriatr. 2008 June; 20(3): 459–470.
4. Tsoi K, Chan J et al. Cognitive tests to detect dementia: A systematic review and meta-analysis. JAMA Intern Med. 2015; E1-E9.
5. McCarten J, Anderson P et al. Screening for cognitive impairment in an elderly veteran population: Acceptability and results using different versions of the Mini-Cog. J Am Geriatr Soc 2011; 59: 309-213.
6. McCarten J, Anderson P et al. Finding dementia in primary care: The results of a clinical demonstration project. J Am Geriatr Soc 2012; 60: 210-217.
7. Scanlan J & Borson S. The Mini-Cog: Receiver operating characteristics with the expert and naive raters. Int J Geriatr Psychiatry 2001; 16: 216-222.

MEDI-COG

Mini-Cog© Scoring – 5 Point System – Methods may be updated. Copyright noted.

1. Three Item Recall

2. Clock Draw Task **Mini-Cog __/5 Score** ☐

Medication Transfer Screen (MTS) – 5 Point System

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday		Award one point per instruction correctly followed.
Morn	1+1	1+1	1+1	1+1	1+1	1+1	1+1		
Noon	1	1	1	1	1	1	1		
Eve	1	1+2	1	1+2	1	1+2	1		
Bed	1	1	1	1	1	1	1+1/2		

Total number of pills on Saturday _5-1/2_ __1__

Point awarded only if entire row is correct. Saturday pill count reflects simple addition; one point if column added correctly.

Medication Transfer Screen Score __/5 Score ☐

Medi-Cog Score (Mini-Cog + Med Transfer) __/10 Score ☐

Medi-Cog Administration: On the **MTS form,** the **Mini-Cog** is performed on the top half or on the back of the sheet of paper. **The Medication Transfer Screen (MTS)** has four prescriptions and a counting skill. The grid represents a pillbox. Explain to the patient that the instructions may be new to them and offer reassurance that questions will be answered at the end. Explain the exercise is not about his/her medications. Point to each instruction (don't read it), so they know there are 5 tasks, but do not prompt them to do it if they forget task 5 – this is also an evaluation for memory. Read the Example and show how "1" is drawn to represent each pill being placed into the bedtime compartments and have them finish marking in the bedtime tablets for the entire week. Encourage completion of each prescription instruction before proceeding to the next. During screening, step away so the patient can complete the MTS independently within ~five minutes. Stop if the patient becomes frustrated and offer reassurance. The screen is not diagnostic, but provides objective data to strengthen clinical judgment regarding the patient's memory and abilities to interpret prescriptions and accurately load a pillbox.

Scoring: The Medi-Cog score consists of the Mini-Cog© score (up to 5 points) and the MTS (up to five points). Each of the five instructions is worth 1 point. Not completing an instruction or performing it incorrectly scores a zero. There are a total of 10 possible points in the Medi-Cog. An 8/10 score may indicate adequate skills depending on the risk level of the regimen. Deference to professional judgment is important in high risk regimens.

TRANSFERING MEDICATION TO A PILLBOX

On the table below write the number of pills as instructed into the correct compartments:

Example: TAKE ONE TABLET EVERY DAY AT BEDTIME

1. TAKE ONE TABLET EVERY DAY IN THE MORNING
2. TAKE ONE TABLET 3 TIMES DAILY WITH MEALS
3. TAKE TWO TABLETS M-W-F IN THE EVENING
4. TAKE ONE-HALF TABLET ON SATURDAY AT BEDTIME

	Sunday	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**
Morn							
Noon							
Eve							
Bed	**1**	**1**	**1**	**1**			

5. How many pills total are in the pill box for the entire day of Saturday? _____

Appendix B. AGS Beers Criteria®

Organ system, therapeutic category, drug(s)[a]	Rationale	Recommendation	Quality of evidence[b]	Strength of recommendation[b]
		See also criteria on rivaroxaban (Table 2) and dabigatran (Table 4) and footnote regarding choice among DOACs.		
Rivaroxaban for long-term treatment of nonvalvular atrial fibrillation or venous thromboembolism (VTE)	At doses used for long-term treatment of VTE or nonvalvular atrial fibrillation, rivaroxaban appears to have a higher risk of major bleeding and GI bleeding in older adults than other DOACs, particularly apixaban.[c] Rivaroxaban may be reasonable in special situations, for example when once-daily dosing is necessary to facilitate medication adherence. All DOACs confer a lower risk of intracranial hemorrhage than warfarin.[c]	Avoid for long-term treatment of atrial fibrillation or VTE in favor of safer anticoagulant alternatives. See also criteria on warfarin (Table 2) and dabigatran (Table 4) and footnote regarding the choice between warfarin and DOACs and among DOACs.	Moderate	Strong
Dipyridamole, oral short-acting (does not apply to extended-release combination with aspirin)	May cause orthostatic hypotension; more effective alternatives available; IV form acceptable for use in cardiac stress testing.	Avoid	Moderate	Strong
Non-selective peripheral alpha-1 blockers for the treatment of hypertension Doxazosin Prazosin Terazosin	High risk of orthostatic hypotension and associated harms, especially in older adults; not recommended as routine treatment for hypertension; alternative agents have superior risk/benefit profile.	Avoid use as an antihypertensive.	Moderate	Strong
Central alpha-agonists for the treatment of hypertension Clonidine Guanfacine	High risk of adverse CNS effects; may cause bradycardia and orthostatic hypotension; not recommended as routine treatment for hypertension.	Avoid clonidine as first-line treatment for hypertension. Avoid other central alpha-agonists for the treatment of hypertension.	Low	Strong
Nifedipine, immediate release	Potential for hypotension; risk of precipitating myocardial ischemia.	Avoid	High	Strong
Amiodarone	Effective for maintaining sinus rhythm but has greater toxicities than other antiarrhythmics used in atrial fibrillation; may be reasonable first-line therapy in patients with concomitant heart failure or substantial left ventricular hypertrophy if rhythm control is preferred over rate control.	Avoid as first-line therapy for atrial fibrillation unless the patient has heart failure or substantial left ventricular hypertrophy.	High	Strong
Dronedarone	Worse outcomes in people who have permanent atrial fibrillation or severe or recently decompensated heart failure. In some circumstances, worse outcomes have also been reported in people with HFrEF (e.g., left ventricular ejection fraction ≤35%) who have milder symptoms (NYHA class I or II).	Avoid in individuals with permanent atrial fibrillation or severe or recently decompensated heart failure. Use caution in patients with HFrEF with less severe symptoms (NYHA class I or II).	High	Strong

Organ system, therapeutic category, drug(s)[a]	Rationale	Recommendation	Quality of evidence[b]	Strength of recommendation[b]
Digoxin for first-line treatment of atrial fibrillation or heart failure	Use in atrial fibrillation: should not be used as a first-line agent because there are safer and more effective alternatives for rate control. Use in heart failure: evidence for benefits and harms of digoxin is conflicting and of lower quality; most (but not all) evidence concerns use in HFrEF. There is strong evidence for other agents as first-line therapy to reduce hospitalizations and mortality in adults with HFrEF. In heart failure, higher dosages are not associated with additional benefits and may increase the risk of toxicity. Use caution in discontinuing digoxin among current users with HFrEF, given limited evidence suggesting worse clinical outcomes after discontinuation. Decreased renal clearance of digoxin may lead to an increased risk of toxic effects; further dose reduction may be necessary for those with Stage 4 or 5 chronic kidney disease.	Avoid this rate control agent as first-line therapy for atrial fibrillation. Avoid as first-line therapy for heart failure. See rationale for caution about withdrawal in long-term users with HFrEF. If used for atrial fibrillation or heart failure, avoid dosages >0.125 mg/day.	Atrial fibrillation; heart failure: low Dosage > 0.125 mg/day: moderate	Strong
Central nervous system				
Antidepressants with strong anticholinergic activity, alone or in combination Amitriptyline Amoxapine Clomipramine Desipramine Doxepin >6 mg/day Imipramine Nortriptyline Paroxetine	Highly anticholinergic, sedating, and cause orthostatic hypotension; the safety profile of low-dose doxepin (≤6 mg/day) is comparable to that of placebo.	Avoid	High	Strong
Antiparkinsonian agents with strong anticholinergic activity Benztropine (oral) Trihexyphenidyl	Not recommended for prevention or treatment of extrapyramidal symptoms due to antipsychotics; more effective agents available for the treatment of Parkinson disease.	Avoid	Moderate	Strong
Antipsychotics, first- (typical) and second- (atypical) generation Aripiprazole Haloperidol Olanzapine Quetiapine Risperidone Others[d]	Increased risk of stroke and greater rate of cognitive decline and mortality in persons with dementia. Additional evidence suggests an association of increased risk between antipsychotic medication and mortality independent of dementia.	Avoid, except in FDA-approved indications such as schizophrenia, bipolar disorder, Parkinson disease psychosis (see Table 3), adjunctive treatment of major depressive disorder, or for short-term use as an antiemetic.	Moderate	Strong

Organ system, therapeutic category, drug(s)[a]	Rationale	Recommendation	Quality of evidence[b]	Strength of recommendation[b]
	Avoid antipsychotics for behavioral problems of dementia or delirium unless documented nonpharmacologic options (e.g., behavioral interventions) have failed and/or the patient is threatening substantial harm to self or others. If used, periodic deprescribing attempts should be considered to assess ongoing need and/or the lowest effective dose.			
Barbiturates Butalbital Phenobarbital Primidone	High rate of physical dependence, tolerance to sleep benefits, greater risk of overdose at low dosages.	Avoid	High	Strong
Benzodiazepines Alprazolam Chlordiazepoxide (alone or in combination with amitriptyline or clidinium) Clobazam Clonazepam Clorazepate Diazepam Estazolam Lorazepam Midazolam Oxazepam Temazepam Triazolam	The use of benzodiazepines exposes users to risks of abuse, misuse, and addiction. Concomitant use of opioids may result in profound sedation, respiratory depression, coma, and death. Older adults have increased sensitivity to benzodiazepines and decreased metabolism of long-acting agents; the continued use of benzodiazepines may lead to clinically significant physical dependence. In general, all benzodiazepines increase the risk of cognitive impairment, delirium, falls, fractures, and motor vehicle crashes in older adults. May be appropriate for seizure disorders, rapid eye movement sleep behavior disorder, benzodiazepine withdrawal, ethanol withdrawal, severe generalized anxiety disorder, and periprocedural anesthesia.	Avoid	Moderate	Strong
Nonbenzodiazepine benzodiazepine receptor agonist hypnotics ("Z-drugs") Eszopiclone Zaleplon Zolpidem	Nonbenzodiazepine benzodiazepine receptor agonist hypnotics ("Z-drugs") have adverse events similar to those of benzodiazepines in older adults (e.g., delirium, falls, fractures, increased emergency room visits/hospitalizations, motor vehicle crashes); minimal improvement in sleep latency and duration.	Avoid	Moderate	Strong
Meprobamate	High rate of physical dependence; very sedating.	Avoid	Moderate	Strong
Ergoloid mesylates (dehydrogenated ergot alkaloids)	Lack of efficacy.	Avoid	High	Strong

Organ system, therapeutic category, drug(s)[a]	Rationale	Recommendation	Quality of evidence[b]	Strength of recommendation[b]
Endocrine				
Androgens Methyltestosterone Testosterone	Potential for cardiac problems; potential risks in men with prostate cancer.	Avoid unless indicated for confirmed hypogonadism with clinical symptoms.	Moderate	Weak
Estrogens with or without progestins (includes natural and synthetic estrogen preparations)	Evidence of carcinogenic potential (breast and endometrium); lack of cardioprotective effect and cognitive protection in older women. For women who start HRT at age 60 and older, the risks of HRT are greater than the benefits, as HRT is linked to a higher risk of heart disease, stroke, blood clots, and dementia. Evidence indicates that vaginal estrogens for the treatment of vaginal dryness are safe and effective; women with a history of breast cancer who do not respond to nonhormonal therapies are advised to discuss the risks and benefits of low-dose vaginal estrogen (e.g., dosages of estradiol <25 mcg twice weekly) with their healthcare provider.	Do not initiate systemic estrogen (e.g., oral tablets or transdermal patches). Consider deprescribing among older women already using this medication. Vaginal cream or vaginal tablets: acceptable to use low-dose intravaginal estrogen for the management of dyspareunia, recurrent lower urinary tract infections, and other vaginal symptoms.	Oral and patch: high Vaginal cream or vaginal tablets: moderate	Oral and patch: strong Topical vaginal cream or tablets: weak
Insulin, sliding scale (insulin regimens containing only short- or rapid-acting insulin dosed according to current blood glucose levels without concurrent use of basal or long-acting insulin)	Higher risk of hypoglycemia without improvement in hyperglycemia management regardless of care setting. Avoid insulin regimens that include only short- or rapid-acting insulin dosed according to current blood glucose levels without concurrent use of basal or long-acting insulin. This recommendation does not apply to regimens that contain basal insulin or long-acting insulin.	Avoid	Moderate	Strong
Sulfonylureas (all, including short- and longer-acting) Gliclazide Glimepiride Glipizide Glyburide (Glibenclamide)	Sulfonylureas have a higher risk of cardiovascular events, all-cause mortality, and hypoglycemia than alternative agents. Sulfonylureas may increase the risk of cardiovascular death and ischemic stroke. Among sulfonylureas, long-acting agents (e.g., glyburide, glimepiride) confer a higher risk of prolonged hypoglycemia than short-acting agents (e.g., glipizide).	Avoid sulfonylureas as first- or second-line monotherapy or add-on therapy unless there are substantial barriers to the use of safer and more effective agents. If a sulfonylurea is used, choose short-acting agents (e.g., glipizide) over long-acting agents (e.g., glyburide, glimepiride).	Hypoglycemia: High CV events and all-cause mortality: Moderate CV death and ischemic stroke: Low	Strong
Desiccated thyroid	Concerns about cardiac effects; safer alternatives available.	Avoid	Low	Strong

Organ system, therapeutic category, drug(s)[a]	Rationale	Recommendation	Quality of evidence[b]	Strength of recommendation[b]
Ibuprofen Indomethacin Ketorolac Meloxicam Nabumetone Naproxen Oxaprozin Piroxicam Sulindac	risk. Upper GI ulcers, gross bleeding, or perforation caused by NSAIDs occur in ~1% of patients treated for 3–6 months and in ~2%–4% of patients treated for 1 year; these trends continue with longer duration of use. Also can increase blood pressure and induce kidney injury. Risks are dose-related.	corticosteroids, anticoagulants, or antiplatelet agents unless other alternatives are not effective and the patient can take a gastroprotective agent (proton-pump inhibitor or misoprostol).		
Indomethacin Ketorolac (oral and parenteral)	Increased risk of GI bleeding/peptic ulcer disease and acute kidney injury in older adults. Of all the NSAIDs, indomethacin has the most adverse effects, including a higher risk of adverse CNS effects.	Avoid	Moderate	Strong
Meperidine	Oral analgesic not effective in dosages commonly used; may have a higher risk of neurotoxicity, including delirium, than other opioids; safer alternatives available.	Avoid	Moderate	Strong
Skeletal muscle relaxants Carisoprodol Chlorzoxazone Cyclobenzaprine Metaxalone Methocarbamol Orphenadrine	Muscle relaxants typically used to treat musculoskeletal complaints are poorly tolerated by older adults due to anticholinergic adverse effects, sedation, and increased risk of fractures; effectiveness at dosages tolerated by older adults is questionable. This criterion does not apply to skeletal muscle relaxants typically used for the management of spasticity (i.e., baclofen and tizanidine) although these drugs can also cause substantial adverse effects.	Avoid	Moderate	Strong

Abbreviations: CNS, central nervous system; COX, cyclooxygenase; CrCl, creatinine clearance; CV, cardiovascular; DOACs, direct oral anticoagulants; GI, gastrointestinal; HFrEF, heart failure with reduced ejection fraction; HRT, hormone replacement therapy; INR, international normalized ratio; NSAIDs, nonsteroidal anti-inflammatory drugs; NYHA, New York Heart Association; SIADH, syndrome of inappropriate antidiuretic hormone secretion; VTE, venous thromboembolism.

[a]Under each drug class, drugs commonly used in the United States are listed, except in cases where doing so is infeasible due to space considerations. Unless stated otherwise, all drugs within a stated drug class are considered potentially inappropriate in the context of the criterion in which they appear, even if not listed in this table.

[b]Quality of evidence and strength of recommendation ratings apply to all drugs and recommendations within each criterion unless stated otherwise.

[c]When selecting among DOACs and choosing a dose, pay special consideration to kidney function (see Table 6), indication, and body weight.

[d]Antipsychotics used in the United States include: First-generation ("typical")—chlorpromazine, fluphenazine, haloperidol, perphenazine; Second-generation ("atypical")—aripiprazole, brexpiprazole, cariprazine, clozapine, lurasidone, olanzapine, paliperidone, pimavanserin, quetiapine, risperidone, ziprasidone. This list does not include antipsychotics rarely or never used in the U.S. among older adults.

Organ system, therapeutic category, drug(s)[a]	Rationale	Recommendation	Quality of evidence[b]	Strength of recommendation[b]
Megestrol	Minimal effect on weight; increases the risk of thrombotic events and possibly death in older adults.	Avoid	Moderate	Strong
Growth hormone	Impact on body composition is small and associated with edema, arthralgia, carpal tunnel syndrome, gynecomastia, and impaired fasting glucose.	Avoid, except for patients rigorously diagnosed by evidence-based criteria with growth hormone deficiency due to an established etiology.	High	Strong
Gastrointestinal				
Proton-pump inhibitors Dexlansoprazole Esomeprazole Lansoprazole Omeprazole Pantoprazole Rabeprazole	Risk of *C. difficile* infection, pneumonia, GI malignancies, bone loss, and fractures.	Avoid scheduled use for >8 weeks unless for high-risk patients (e.g., oral corticosteroids or chronic NSAID use), erosive esophagitis, Barrett's esophagitis, pathologic hypersecretory condition, or demonstrated need for maintenance treatment (e.g., because of failure of drug discontinuation trial or H2-receptor antagonists).	*C. difficile*, bone loss, and fractures: High Pneumonia and GI malignancies: Moderate	Strong
Metoclopramide	Can cause extrapyramidal effects, including tardive dyskinesia; the risk may be greater in frail older adults and with prolonged exposure.	Avoid, unless for gastroparesis with a duration of use not to exceed 12 weeks except in rare cases.	Moderate	Strong
GI antispasmodics with strong anticholinergic activity Atropine (excludes ophthalmic) Clidinium-chlordiazepoxide Dicyclomine Hyoscyamine Scopolamine	Highly anticholinergic, uncertain effectiveness.	Avoid	Moderate	Strong
Mineral oil, given orally	Potential for aspiration and adverse effects; safer alternatives available.	Avoid	Moderate	Strong
Genitourinary				
Desmopressin	High risk of hyponatremia; safer alternative treatments for nocturia (including non-pharmacologic).	Avoid for treatment of nocturia or nocturnal polyuria.	Moderate	Strong
Pain medications				
Non-COX-2-selective NSAIDs, oral: Aspirin >325 mg/day Diclofenac Diflunisal Etodolac Flurbiprofen	Increased risk of GI bleeding or peptic ulcer disease in high-risk groups, including those >75 years old or taking oral or parenteral corticosteroids, anticoagulants, or antiplatelet agents; use of proton-pump inhibitor or misoprostol reduces but does not eliminate	Avoid chronic use unless other alternatives are not effective and the patient can take a gastroprotective agent (proton-pump inhibitor or misoprostol). Avoid short-term scheduled use in combination with oral or parenteral	Moderate	Strong

Appendix C. Identification and Verification Form

Patient's Name:_____ D.O.B:_____ Room Number:_____

Date	M	E	V	N	Physician		Care Coordinator Verification	BEER's'sS Reconciliation
					Identification	Reconciliation		

Appendix D. Pre-test/Post-test Questions

Pre-Test

- What are the current medications you are taking?
- What are the major side effects of the medications you are taking?
- What are special considerations of the medications you are taking?

Post-Test

- What are the current medications you are taking?
- What are the major side effects of the medications you are taking?
- What are special considerations of the medications you are taking?

Appendix E. Common Medication Laboratory Monitoring Based on the CMS State Operations Manual

Remedi SeniorCare EDUCATION Rx

MONTHLY RESOURCE

Common Medication Laboratory Monitoring

Based on the CMS State Operations Manual

The Centers of Medicare and Medicaid Services (CMS) has outlined guidance for medication monitoring within section F-329 Unnecessary Medications in the State Operations Manual. Below is a summary of the recommended laboratory monitoring parameters for common medications in the geriatric population. Keep in mind this is only a general guide to monitoring; each care plan will vary depending on the condition and the needs of each individual resident. Clinically complex residents may require more frequent or additional monitoring, while a stable resident may require less.

To see the full CMS guidance, please refer to Table 1 in F-329 starting on page 371 in the CMS State Operations Manual (see references).

Medications	*Labs*	*Monitoring Interval*	*Comments*
ACE-Inhibitors and ARBs	Serum potassium	Baseline, within in first month, and every 6 months	Also, monitor serum creatinine and BUN at initiation and regularly
Acetaminophen	LFTs	Every 3 months	Only for doses >4 grams/day
Amiodarone	LFTs, CBC, TSH	Every 6 months	Also requires annual eye exam, EKG, and PFTs
Anticonvulsants: Carbamazepine Phenytoin Phenobarbital Primidone Divalproex sodium Valproic acid	Serum medication levels	Every 6 months	If used to manage behavior, stabilize mood, or treat psychiatric disorders, refer to Gradual Dose Reduction guidance (GDR)
Antidiabetics Insulin Oral hypoglycemics	Serum glucose (point of care), Hemoglobin A1c	Every 6 months (A1c); more frequently for glucose monitoring	Metformin – monitor serum creatinine
Antifungals Imidazoles (systemic)	Increased monitoring with concomitant drug use: • Warfarin (PT/INR) • Phenytoin (serum levels) • Theophylline (serum levels) • Sulfonylureas (FBG)	Based on interacting medications and clinical conditions	
Antipsychotics	FLP, Hemoglobin A1c	Every 6 months	If used to manage behavior, stabilize mood, or treat psychiatric disorders, refer to GDR guidance

Remedi SeniorCare® EDUCATION Rx

MONTHLY RESOURCE

Medications	*Labs*	*Monitoring Interval*	*Comments*
Digoxin	Serum digoxin level, BMP	Every 6 months	
Diuretics	BMP	Within the first month and every 6 months	
Fibrates	CBC, LFTs	Every 6 months	
Lithium	Serum lithium level	Every 3 months	Narrow therapeutic window; increased monitoring with drug interactions
Nitrofurantoin	Serum creatinine	Prior to initiation	Do not use for CrCL <60ml/min (SOM) or <40ml/min
Niacin	LFTs, serum glucose	Every 6 months	
Non-Steroidal Anti-Inflammatory Drugs	CBC, serum creatinine	Every 6 months	Exception: aspirin 81mg daily
Selective Serotonin Reuptake Inhibitors	Serum sodium	Baseline, dose increases, and annually	Monitor mood and refer to GDR guidance as well
Statins	LFTs	Baseline, 12 weeks post-initiation, and every 6 months	Monitor FLP for efficacy at least annually
Thyroid Medications **Levothyroxine** **Liothyronine**	TSH, T4	Baseline, at least 6-8 weeks after initiation or dose changes	T3 (instead of T4) should be monitored for liothyronine
Urinary Anti-Infective	UA and C&S	Required within 30 days of starting therapy	Prophylaxis medication is discouraged
Warfarin	PT/INR	Based on clinical circumstance; at least every 4 weeks	Checked more frequently with changes interacting medications

Key:
BMP: Basic metabolic panel
CBC: Complete blood count
C&S: Culture and sensitivity
FLP: Fasting lipid panel
LFTs: Liver function tests
PT/INR: Prothrombin time/International normalized ratio
TSH: Thyroid stimulating hormone
UA: Urinalysis

References:
1. State Operations Manual. Centers of Medicare and Medicaid Services. Available at: https://www.cms.gov/Regulations-and-Guidance/Guidance/Transmittals/downloads/R22SOMA.pdf Accessed Sept 2015.
2. Laboratory Monitoring Interval (in Months) Recommended for Chronic Medications, Table 2: Consult Pharm. 2008 May; 23(5): 387–395.

Appendix F. Adverse Drug Reaction Reporting Form

ADVERSE DRUG REACTION REPORTING FORM

REPORT ON SUSPECTED SERIOUS ADVERSE DRUG REACTION

1. PARTICULARS OF PATIENT

Name of patient. _____

Age _____ Weight (kg) _____ Patient address _____

Sex ☐ Male Race _____

☐ Female

Pregnant ☐ Yes ☐ No ☐ Not applicable

Relevant Medical History _____

_____

2. ADVERSE EVENT

Reason for reporting

☐ Requires or prolongs hospitalization ☐ Life threatening ☐ Death

☐ Permanently disabling or incapacitating ☐ Congenital anomaly ☐ Overdose

☐ Other (Please Specify) _____

_____

3. SUSPECTED DRUG

Name of suspected Drug _____ Generic Name _____

Name of manufacturer _____

Date of occurrence _____ Duration of Event _____

Starting date of Medication _____

Route of administration _____

Discontinuation of Drug because of event ☐ No ☐ Yes Dated _____

_____

4. REPORTING DOCTOR'S / PHARMACIST'S / NURSE'S

SIGNATURE _____

Institution _____

Date _____

Appendix G. Literature Review Grid

Literature Review Grid (Summary Table)

Source	Type of Literature	Methodology	Description of Study	Population/ Sampling	Data Collection	Data Analysis	Ethics	Themes	Key Findings & Recommendations	Limitations/Strengths Validity/Reliability
Cameli, D., Francis, M., Francois, V. E., Medder, N. R., Von, L., & Truglio-Londrigan, M. (2013). The effectiveness of medication reconciliation strategies to reduce medication errors in community dwelling older adults: A systematic review. *JBI Database of Systematic Reviews and Implementation Reports, 11*(7), 1–57. https://doi.org/10.11124/jbisrir-2013-463	Research article	Systemic Review	The objective of this systematic review was to identify, appraise and synthesize the best available evidence to determine the effectiveness of medication reconciliation strategies on medication errors among community dwelling older adults. All patients were community-dwelling older adults who received care in the community setting	older adults of all races and ethnicities (65 years of age and older) living in the community	The review considered randomized controlled trials, non-randomized controlled trials and quasi-experimental studies. In the absence of the above, other study designs including case control, cross-sectional cohort, and before and after studies were considered.	Data were extracted using the standardized data extraction tool from the Joanna Briggs Institute.	Researchers utilized databases such as Databases included: MEDLINE, CINAHL, The Cochrane Central Register of Controlled Trials (CENTRAL), EMBASE, Academic Search Premier, PsycINFO, Healthsource Nursing/Academic edition, and PubMed, so consent was not needed.	medication reconciliation, older adults	The review suggests that clinicians support pharmacist-led medication reconciliation. This support is integral to the health of community-dwelling older adults in terms of preventing medication errors, identifying medication errors, and in the development of appropriate recommendations to primary care providers for appropriate medication adjustments. The data presented does provide evidence relating to the potential benefits of a pharmacist-led process of medication reconciliation and the potential positive outcomes concerning identified drug-related problems/medication errors.	One limitation of this systematic review was the heterogeneity of studies included. There was variability in design, focus, implementation and intervention. Additionally, most of these studies had a small sample size.

Field, T. S., Gurwitz, J. H., Avorn, J., McCormick, D., Jain, S., Eckler, M., Benser, M., & Bates, D. W. (2001). Risk factors for adverse drug events among nursing home residents. *Archives of Internal Medicine*, *161*(13), 1629. https://doi.org/10.1001/archinte.161.13.1629	Research Article	Case Control/ Prospective Study	The study took place in Massachusetts researchers wanted to determine the risk factors associated with adverse drug events (ADE) within the elderly population. Data was abstracted from medical records, functional status exams, medical diagnoses, and medication use. During medical chart reviews, investigators paid close attention to 10 key indicators of possible adverse drug events such as changes and discontinuations of medications, abnormal laboratory values, changes in symptoms, new onset lethargy, confusion, bleeding, falls, GI problems, hospitalizations, and ER visits. Investigators found that in every 10 charts at least 9 had one of these key indicators present.	2916 Residents living in 18 long term care facilities in central and eastern Massachusetts.	Risk factor data were collected as of the first preventable adverse drug event. Data included sex, age, and the length of time the resident had been in the facility. The burden of illness was assessed using the Charlson Comorbidity Index7, Functional status was measured using the Activities of Daily Living scale and the mobility item from the Tinetti Nursing Home Life Space Diameter10,medication use at the time of the event included the number of drugs within drug classes that may cause adverse reactions in the elderly population.	Analyses began with the calculation of matched odds ratios (ORs) and *P* values for each categorical variable and paired *t* tests for the continuous variables of age and the Cumulative Illness Rating Scale score. For those residents with multiple ADEs, only the first ADE was included and all risk factor data were collected as of the date of that event. Among the 2916 subjects who were long-stay residents in participating nursing homes at some point during the study, ADEs were identified in 410. Of the initial events among these residents, 230 (56.1%) were classified as significant, 152 (37.1%) as serious, 27 (6.6%) as life-threatening, and 1 (0.2%) was	The pharmacy provider assisted in the recruitment of the study nursing homes through invitational letters, telephone calls, and visits.	Adverse drug events, nursing homes, long term care facilities, risk factors, comorbidities	Researchers found that residents taking drugs within several specific classes were at higher risk of having an adverse drug event. Researchers also found that drugs may be serving as proxies for the underlying medical or functional condition that they are prescribed to treat, or they may be acting as promoters of reactions to other medications. Researchers recommended that the number of medications given should be minimized and indications reviewed regularly. They also recommended that the initiation of drugs, such as antibiotics, should be carefully considered since prolonged use may not be necessary.	Reliability of medical chart reviews was assessed through a chart extraction by all 3 investigators on a set of 10 charts. Agreement was 90% or greater on the presence of comorbid conditions for each con- dition, on the current use of each drug category, and on sub- jects' abilities to carry out 4 of the activities of daily living. There was more frequent disagreement for 2 of the activi- ties, feeding and continence.

Mekonnen, A. B., Abebe, T. B., McLachlan, A. J., & Brien, J. A. (2016). Impact of electronic medication reconciliation interventions on medication discrepancies at hospital transitions: a	Researc h article	A systemati c review and meta-analysis was used	A systematic review to evaluate the available literature on the effectiveness of electronic medication reconciliation in reducing medication	A total of ten studies were used. Nine of the ten included studies involved a total of 21,486 patients of sample sizes	Two study authors (ABM, TBA) independently extracted data in a standardized form, including quality assessment of randomized studies.	Meta-analyses of studies were done according to the *Cochrane Handbook for Systematic Review of Interventions.* A random-effects model was employed, and the	Because this study was an investigation of the literature, no ethical approval was needed for retrieving the already	Medicati on reconcili ation	This systematic review on electronic medication reconciliation interventions did not identify a consistent impact in minimizing the occurrence of unintentional medication discrepancies during transitions in hospital	The main strength of this study was the exploration of the effectiveness of an electronic tool on unintentional medication discrepancies

systematic review and meta-analysis. *BMC medical informatics and decision making*, *16*(1), 112. https://doi.org/10.1186/s12911-016-0353-9			discrepancies during transition in hospital care.	ranging from 100 to 19,476 patients/discharges. The length of study periods ranged from 10 to 70 weeks.		results were presented in forest plots.	available public content.		care. Pooled estimates showed a 63% reduction in patients with medication discrepancies; however, this was not statistically significant, nor was the mean number of medication discrepancies per patient. The intervention had significantly reduced the percentage of medications with unintended discrepancy and drug omissions over the total number of medications reconciled. No potentially fatal error was identified, and most errors were minor in severity.	with broader inclusion criteria across a range of hospital transitions, not limited to specific transitions. The main limitation is that there were fewer published studies of sufficient scientific quality that adequately addressed the effects of electronic medication reconciliation on unintentional medication discrepancies.
Storms, H., Marquet, K., Aertgeerts, B., & Claes, N. (2017). Prevalence of inappropriate medication use in residential long-term care facilities for the elderly: A systematic review. *The European journal of general practice*, *23*(1), 69–77. https://doi.org/10.1080/13814788.2017.1288211	Systematic review	Qualitative	A systematic review to determine the exposure of residents in long-term care facilities for the elderly to inappropriate medication use expressed as the prevalence of inappropriate medication use.	The number of participants in the reviewed studies ranged from 100 to 4557 residents. Eligibility for participation mostly depended on meeting an age requirement, overall being aged 65 years or more.	Two researchers independently extracted data using a predefined extraction form. Research with incomplete data was excluded from analysis because of the risk of bias. Data of inappropriate medication use were gathered through medical records, medication charts and databases.	A quality assessment of included studies was carried out using critical appraisal skills programme (CASP) tools. The prevalence of inappropriate medication use was expressed as the percentage of residents experiencing inappropriate medication use.		Inappropriate medication use/prevalence	Despite the restrictions, findings of this review suggest an awareness of the importance to monitor inappropriate medication use. Prevalence of inappropriate medication use was most often assessed relying on the Beers criteria updated in 2003 and STOPP (Screening Tool of Older Persons's Prescriptions). Prevalence of inappropriate medication use varied from 18.5% to 82.6% when relying on the Beers criteria in general. Studies based on STOPP, reported a prevalence of 23.7% to 79.8%.	Studies included in this review generated heterogenous data because of diversity in study design; study period and how inappropriate medication use is expressed. Limitations include some studies lacking information on the loss of participants, disregarding the mentioning of exclusion because of "incomplete" data. Several studies required recalculations,

										because of non-transparent data. Lastly, heterogeneity in data hampered meta-analysis, limiting statements on the prevalence of inappropriate medication use.
Marks, T. S., Giles, G. M., Al-Heizan, M. O., & Edwards, D. F. (2020). Can Brief Cognitive or Medication Management Tasks Identify the Potential for Dependence in Instrumental Activities of Daily Living?. *Frontiers in aging neuroscience*, *12*, 33. https://doi.org/10.3389/fnagi.2020.00033	Research article	Cross-sectional observational study	A cross-sectional study of community dwelling adults age 55 and older were administered the Mini-Cog, the medication transfer screen-revised (MTS_R) and the Medi-Cog-R, the performance assessment of self-care skills and a self report daily living scale, to be able to examined if a combined cognitive and performance based medication management would be able to identify an individual's cognitive level and ability to perform instrumental activities of daily living.	Community dwelling adults age 55 and older (n=185)	A population sample was recruited via flyers and in person recruiters in Madison, Wisconsin. Participants where administered several tests and the results were noted.	A descriptive analyses for continuous data and frequency distributions for non-continuous demographic data were computed.	Was reviewed and approved by Education and Social/Behavioral Science IRB, University of Wisconsin-Madison. All participants were provided with a written informed consent.	Cognitive testing to determine ability to perform instrumental activities of daily living.	Researchers found that there is room for improvement in evaluating an individual's cognition. Researchers found that the Medi-Cog-R is an adequate cognitive screening measure.	Limitations included needing extra materials to administer Medi-Cog-R which might not be available to others. Results should be interpreted with caution because the number of participants with cognitive impairment is lower than it would be expected at an acute setting. Mini-Cog, MTS-R and Medi-cog R all show discriminant validity.
Borson, S., Scanlan, J. M., Watanabe, J., Tu, S. P., & Lessig, M. (2005). Simplifying detection of cognitive impairment: comparison of the Mini-Cog and Mini-Mental State Examination in a multiethnic sample.	Research Article	Cross Sectional	Study was conducted to compare the detection of cognitive impairment using the Mini-Cog and Mini-Mental Status Examination (MMSE) and to	Heterogeneous community sample predominantly ethnic minority elderly, enrolled in the University of Washington	Participants in the study underwent a clinical assessment that included interviews and cognitive tests. The Cognitive Abilities Screening Instrument (CASI)	The data analysis aimed to compare the two screening tests in detecting cognitive impairment, considering severity and cognitive diagnosis, while		Cognitive testing tools	Researchers found that both the MMSE and Mini-Cog can effectively screen for cognitive impairment; however, Mini-Cog was slight better with an accuracy of 83% , compared to MMSE 81%. The Mini-Cog is also easier to	Limitations include nonrandom and non-representative sampling. CASI-derived MMSE may underestimate

Journal of the American Geriatrics Society, *53*(5), 871–874. https://doi.org/10.1111/j.1532-5415.2005.53269.x			identify how socio demographic variable can influence detection of cognitive impairment.	Alzheimer Disease Research Center Satellite. (n=371)	was used as the main cognitive assessment tool, and Mini-Mental State Examination (MMSE) scores were derived from CASI scores. The Mini-Cog test was also used to compare cognitive impairment likelihood. Diagnoses were made based on established criteria for different types of dementia and mild cognitive impairment (MCI). Significant differences were observed in cognitive scores between the control group and those with MCI and dementia.	accounting for demographic factors. The McNemar statistic was used to assess differences in classification accuracy between the cognitive screens. Demographic variables such as age, sex, language, ethnicity, education, and literacy were examined as predictors using bivariate and regression analyses			administer and less biased by low education and literacy.	true MMSE bias. Interrater reliability of the Mini-Cog averaged greater than 95%.
Sorenson, L. Stokes, J. A., Purdie, D. M., Woodward, M., & Roberts, M. S. (2005).. Medication management at home: medication-related risk factors associated with poor health outcomes. *Age and Ageing*, *34*(6), 626-632. https://doi.org/10.1093/ageing/afi202	Research Article	Cross-sectional study	This study aimed to determine the association between medication-related risk factors and poor patient health outcomes	204 individuals living at home and at risk for poor health outcomes related to medication	Pharmacists and physicians identified medications and medication-related risk factors in individuals homes. Risk factors were used as determinants of self-reported quality of life and medication use and impression of patient adverse drug event and health status.	Multivariate analysis was used to determine associations between risk factors and health outcomes.		medication-related risk factors for poor health outcomes	lack of administration routine, therapeutic duplication, hoarding, confusion between generic and trade names, multiple prescribers, discontinued medication repeats retained and multiple storage locations were identified as medication-related risk factors for poor health outcomes. These findings support that polypharmacy and medication-related risk factors due to polypharmacy are associated with poor health outcomes.	Limitations: Study was cross-sectional and risk factor data and health outcome data was collected at the same time. Therefore, it is hard to understand whether the risk factors were affecting the health outcomes or vice-versa. Variations in data collection due to home visits as method of collection.

										Incomplete collection data at times due to participants or providers not completing it.
Jeraisy, M. A., Alshammari, H., Albassam, M., Aamer, K. A., & Abolfotouh, M. A. (2023). Utility of patient information leaflet and perceived impact of its use on medication adherence. *BMC Public Health, 23*, 488. https://doi.org/10.1186/s12889-023-15346-y	Research Article	Cross-sectional study	This study aimed to investigate perception of patient information leaflet quality and impact on medication adherence	1138 individuals in Saudi Arabia	Anonymous questionnaire via Survey Monkey. The questionnaire was created by modifying and adopting a previously validated questionnaire.	Statistical analysis using chi-square test, sample t-test, and ANOVA using SPSS.		medication information pamphlets, medication adherence, medication education	The study examined the rate that individuals read the pamphlets, predictors of whether or not they read them, perception of the impact of the pamphlets, and reasons for not reading them. They found that ⅔ of the participants reported that reading the pamphlets positively affected their medication adherence. Additionally, most participants found that reading the pamphlet added to their knowledge of their medications.	Limitations: survey conducted online, which excluded people without access to internet → possible selection bias. Potential recall bias due to self-report of data. Difficult to determine cause and effect due to cross-sectional design.
Lee, S., Yu, Y. M., Han, E., Park, M. S., Lee, J.-H., & Chang, M. J. (2023, May). Effect of pharmacist-led intervention in elderly patients through a comprehensive medication reconciliation: A randomized clinical trial. Yonsei medical journal. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10151230/#B18	Research Article	Randomized controlled trial	This study aimed to investigate the feasibility and effectiveness of a collaborative medication review and comprehensive medication reconciliation intervention by a pharmacist and hospitalist for older patients	Patients aged 65 years or older admitted to the Department of Hospital Medicine at Inha University Hospital in South Korea from July to December 2020, who were taking at least 5 medications. Excluding patients who were discharged within 24 hours and	Demographic information and laboratory data (hemoglobin, sodium, potassium, albumin, ALT, ALP, and creatinine clearance). Clinical data including International Classification of Diseases 10th edition-Clinical Modification, length of stay, and destination after discharge. Ability to swallow, patient-reported adverse events,	The medication regimen complexity was evaluated using the Korean version of the medication regimen complexity index which is a tool used to evaluate the degree of medication complexity to improve the effective and safe use of medications in clinical practice		Medication reconciliation for potentially inappropriate medication use and medication regimen complexity in the elderly	studies have demonstrated that interventions by clinical pharmacists can improve drug-related problems and affect positive clinical outcomes in both inpatient and outpatient care facilities. Pharmacy-led interventions via medication reconciliation are essential for reducing the occurrence of medication discrepancies that may lead to adverse drug events in the care transition processes. However, studies have found that not only medication discrepancies, but also comprehensive approaches, such as	This was a preliminary descriptive study with limitations in deriving decisive results. The medication regimen complexity index and potentially inappropriate medication criteria were used, and the differences in the distribution of scores and adverse events between two groups could be used as a basis for future

				those with a life expectancy of less than 3 months	use of OTC drugs, and CAM. Medical history such as syncope, delirium, dementia, cognitive impairment, gastric ulcer, constipation, falls or fractures. Antibiotic use and duration				structured medication review and multidisciplinary cooperation, are required to resolve drug-related problems	research. However, with a small sample size, further work needs to be done to establish the effectiveness of intervention. In addition, this study was conducted at a single center and lacked information on disease severity at the 30-day follow-up. Furthermore, the patients reported that adverse events at the 30-day phone call could be subjective which could be affected by confounders, whereas adverse events during hospitalization were confirmed by the pharmacist and the physician. However, all adverse drug events, including patient reporting, have been monitored and recorded in the adverse drug event reporting system of Inha Hospital.
Franco, J. V. A., Terrasa, S. A., & Kopitowski, K. S. (2017). Medication discrepancies and	Research Article	Cross-sectional study	This study aims to describe the frequency and type of both medication discrepancies (MD)	Elderly individuals (>65 years old) with more than ten	Demographic characteristics (age, education, marital status) and the complete list	Sample size calculation was based on an estimated proportion of MD	This study protocol and its oral consent form were approved by	Medication reconciliation,	Out of 214 randomly selected individuals, 150 accepted to participate (70%). The mean number of medications referred to	There are several limitations in our study. The use of telephone

potentially inadequate prescriptions in elderly adults with polypharmacy in ambulatory care. Journal of family medicine and primary care. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5629905/			and potentially inadequate prescription (PIP) medications	medications recorded in their EMR, who had not been hospitalized in the past year and were not under domiciliary care, affiliated to a private community hospital	of medications currently consumed by the patients (P-LIST). Each patient was called three times at a different time and day before listed as "nonrespondent." The P-LIST was then compared with the list present in the EMR (EMR LIST), and MD was consigned and classified. PIP was detected using STOPP criteria applied to the P-LIST	of 75% and a semi-amplitude confidence interval (CI) of 7%. From previous experience in our institution, we estimated a response rate of approximately 50%. Therefore, a randomized sample of 214 patients was needed to achieve 150 individually completed telephone interviews. We calculated summary statistic measurements using STATA 13 (StataCorp, College Station, Texas, USA) software. We used Chi-square test and two-sample t-test for dichotomous and continuous hypothesis testing respectively. Measures of associations were tested using regression models. We defined an alpha level of P = 0.05.	our Hospital's Research Ethics Committee.	polypharmacy	be consumed by patients was 9.1 (95% confidence interval [CI] =8.6–9.6), and the mean number of prescribed medications in their EMR was 13.9 (95% CI = 13.3–14.5). Ninety-nine percent had at least one discrepancy (total 1252 discrepancies); 46% consumed at least one prescription not documented in their EMR and 93% did not consume at least one of the prescriptions documented in their EMR. In 77% of the patients, a PIP was detected (total 186), 87% of them were at least within one of the following categories: Prolonged used of benzodiazepines or proton pump inhibitors and the use of aspirin for the primary prevention of cardiovascular disease.	interviews could have selected a population of elderly adults, nevertheless there was a high response rate and the demographic characteristics of responders were similar to those who did not. The recall could be a source of bias, especially in patients trying to remember a long list of prescriptions or when medication taken by the patient and not registered in EMR could not be recalled. Our data collection method adapted from Stewart and Lynch and Ekedahl et al. was not validated in our population, but was compatible with our current medical practice of comprehensive MR and review.
Wouters, H., Scheper, J., Koning, H., Brouwer, C., Twisk, J. W., van der Meer, H., Boersma, F., Zuidema, S. U., & Taxis, K. (2017). Discontinuing inappropriate medication use in nursing home residents: A cluster	Research Article	Randomized controlled trial	This study aimed to examine successful discontinuation of inappropriate medication use and improve prescribing in nursing home residents.	59 Dutch nursing home wards for long term care (including elder care physicians and nursing home residents)	Multidisciplinary Multistep Medication Review (3MR) assesses the patient perspective, medical history, critical appraisal	Study used a power analysis, expecting that 40% of participants in the intervention group and 20% in the control group would successfully discontinue use of	The Medical Ethical Committee of the University Medical Center Groningen approved the study. Written informed	Medication reconciliation, polypharmacy, older adults	3MRs resulted in successful discontinuation of use of at least 1 drug in a greater proportion of nursing home residents. Successfully discontinued drugs included drugs for the	3MR only conducted once. Researchers could have missed withdrawal symptoms or relapses if they were mild or

randomized controlled trial. *Annals of Internal Medicine*, *167*(9), 609–617. https://doi.org/10.7326/M16-2729				Total: 19 physicians and 992 nursing home residents (ages 65-95, 4-17 prescribed medications, length of stay between 4 months-87 months)	of medications, and a meeting between the treating elder care physician and pharmacist, and implementation of medication changes. Primary and secondary outcome measures collected at baseline and after 4 months. Primary outcome is proportion of residents who successfully discontinued at least one inappropriate medication after 4 months of follow up. Secondary pharmacologic outcomes were the number of residents for whom at least 1 underprescribed medication was initiated between baseline and follow-up, at least 1 dose was adjusted, and at least 1 potentially hazardous drug was replaced by a safer alternative. In addition, assessed cumulative exposure to anticholinergic and sedative drugs as measured with the Drug Burden Index (DBI) at follow-up	at least 1 inappropriate medication. Study estimated differences between the groups that were calculated from linear mixed models. In all analyses, first estimated unadjusted effects, then adjusted for residents' sex, age, marital status, length of nursing home stay, Charlson Comorbidity Index score, and dementia diagnosis by including these as fixed effects. Analyses of DBI score, cognitive function, neuropsychiatric symptoms, and quality of life were also adjusted for baseline values. Study used 95% CIs for all variables. All generalized linear mixed-model analyses were conducted with MLwiN, version 2.32, and all other analyses were done with SPSS Statistics for Windows.	consent was requested from residents. The study's methods have been published		alimentary tract, cardiovascular drugs, drugs for disorders of the musculoskeletal system, drugs for the nervous system, and respiratory drugs. Researchers observed a 10% improvement in the intervention group, which was smaller than the 20% anticipated in the power analysis; this could have been due to a lower response in the intervention group or improved prescribing in the control group	were not documented in residents' medical charts. In addition, we were unable to assess long-term disease relapse related to discontinuation of use of certain medications, such as preventive medication. nursing home residents from only the 3 northern provinces of the Netherlands.

Sun, W., Tahsin, F., Abbass Dick, J., Barakat, C., Turner, J., Wilson, D., Reid-Haughian, C., & Ashtarieh, B. (2021). Educating homecare nurses about deprescribing of medications to manage polypharmacy for older adults. *Western Journal of Nursing Research, 43*(11), 1034–1042. https://doi.org/10.1177/0193945920982599	Research Article	Evaluation research study using survey design	This study aims to evaluate the acceptability, appropriateness, and effectiveness of educational intervention with homecare nurses about deprescribing of medications among older adults. The study provided important implications into the barriers that impact the effectiveness of deprescribing education, and facilitators that support the future refinement of learning modules	Ontario, Canada: 45 participating homecare nurses age 26-68 years Participants were registered nurse or registered practical nurse with a casual/part-time/ full-time status who has direct clinical contact with patients, having experience in working with older adults in homecare settings, being over the age of 18 years, and having the ability to understand and speak English.	Scalability assessment conducting focus group sessions to assess homecare nurses' learning needs about deprescribing medications. Development of scale-up plan including developing deprescribing learning modules based on focus group findings. Research study collected both quantitative descriptive statistics and open-ended qualitative descriptions to evaluate nurse deprescribing education in homecare	Post-training evaluation data were evaluated using Likert scale and open-ended questions were analyzed using descriptive statistical analyses and qualitative thematic analysis. Post-intervention questionnaire responses provided descriptions about homecare nurses' perspectives related to deprescribing education, as well as the effectiveness of training in addressing their knowledge gaps.	Ethics approval by Research Ethics Board at the University. All potential participants were assessed for their eligibility using the participant screening form that clearly outlined the inclusion and exclusion criteria. Informed consent.	Medication reconciliation, older adults, polypharmacy	Deprescribing is a was found to be a novel concept in homecare, advancing the learning of evidence-based deprescribing, and optimizing medication management through deprescribing education. Homecare nurses expressed high levels of interest and motivation in supporting the implementation of deprescribing activities in their clinical practice after participating in the educational intervention. After the educational training, homecare nurses indicated that they became more receptive to adopt deprescribing practices in the management of polypharmacy for older adult populations, as well as becoming more aware of their role in holding these conversations for medication management.	Study participants were provided with lunch, snacks, and drinks to compensate for the time spent during their educational training sessions. This could have led to selection bias where participants who attended the training could have been highly motivated by their interests in the study topic or by the compensation. Another study limitation is that the educational training module was only pilot-tested in one designated partnered homecare organization in Ontario.

UNIVERSITY OF SAN FRANCISCO | School of Nursing and Health Professions

Appendix H. Statement of Determination and Non-Research Determination Form

Student Name: Refugio Cisneros, Veronica Williams, Rosa Paniagua, Caroline Mehta, Rick Nguyen, Erica Kim

Title of Project: Medication management among elderly at a residential facility **Brief Description of Project**

· **Data that Shows the Need for the Project:** medication related incidents · **Aim Statement:** to improve medication management at Regina House · **Description of Intervention(s)**: Safe and collaborative medication management program. Addressing technology, reconciliation, ongoing monitoring, and resident's competency.
· **Desired Change in Practice**: Reduce medication management related incidents
· **Outcome measurement(s)**: less incidents and improve patient safety

To qualify as an Evidence-based Change in Practice Project, rather than a Research Project, the criteria outlined in federal guidelines will be used: (http://answers.hhs.gov/ohrp/categories/1569)

X This project meets the guidelines for an Evidence-based Change in Practice Project as outlined in the Project Checklist (attached). Student may proceed with implementation.

☐ This project involves research with human subjects and must be submitted for IRB approval before project activity can commence.

Comments:

UNIVERSITY OF SAN FRANCISCO | School of Nursing and Health Professions

EVIDENCE-BASED CHANGE OF PRACTICE PROJECT CHECKLIST *

Instructions: Answer YES or NO to each of the following statements:

Project Title:	**YES**	**NO**
The aim of the project is to improve the process or delivery of care with established/ accepted standards, or to implement evidence-based change. There is no intention of using the data for research purposes.	Yes	
The specific aim is to improve performance on a specific service or program and **is a part of usual care**. ALL participants will receive standard of care.	Yes	
The project is **NOT** designed to follow a research design, e.g., hypothesis testing or group comparison, randomization, control groups, prospective comparison groups, cross-sectional, case control). The project does **NOT** follow a protocol that overrides clinical decision-making.	yes	
The project involves implementation of established and tested quality standards and/or systematic monitoring, assessment or evaluation of the organization to ensure that existing quality standards are being met. The project does **NOT** develop paradigms or untested methods or new untested standards.	yes	
The project involves implementation of care practices and interventions that are consensus-based or evidence-based. The project does **NOT** seek to test an intervention that is beyond current science and experience.	yes	
The project is conducted by staff where the project will take place and involves staff who are working at an agency that has an agreement with USF SONHP.	yes	
The project has **NO** funding from federal agencies or research-focused organizations and is not receiving funding for implementation research.	yes	
The agency or clinical practice unit agrees that this is a project that will be implemented to improve the process or delivery of care, i.e., **not** a personal research project that is dependent upon the voluntary participation of colleagues, students and/ or patients.	yes	
If there is an intent to, or possibility of publishing your work, you and supervising faculty and the agency oversight committee are comfortable with the following statement in your methods section: *"This project was undertaken as an Evidence based change of practice project at X hospital or agency and as such was not formally supervised by the Institutional Review Board."*	yes	

ANSWER KEY: If the answer to **ALL** of these items is yes, the project can be considered an Evidence-based activity that does NOT meet the definition of research. **IRB review is not required. Keep a copy of this checklist in your files.** If the answer to ANY of these questions is **NO**, you must submit for IRB approval.

UNIVERSITY OF SAN FRANCISCO | School of Nursing and Health Professions

*Adapted with permission of Elizabeth L. Hohmann, MD, Director and Chair, Partners Human Research Committee, Partners Health System, Boston, MA.

STUDENT NAME (Please print):
Refugio, Veronica, Rosa, Caroline, Rick, Erica

Signature of Student:

DATE 06/22/23

SUPERVISING FACULTY MEMBER NAME (Please print):

Mohamad El Najm, PhD, RN

Signature of Supervising Faculty Member

DATE 8/8/2023