Implementation of Screening for High Fall Risk Medications in Assisted Living Residents

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Abstract

Problem: Falls are often preventable, yet they continue to be the leading cause of injury and injury-related death of adults over 65 years old in the United States. In 2021, 24% of residents in an urban assisted living facility had a reported fall, and over half of hospital transfers were related to falls. The literature supports deprescribing high fall risk medications in older adults as a fall prevention strategy. At this assisted living facility, there is currently not a standardized screening or validated way to encourage deprescribing high fall risk medications. ***Purpose:*** The purpose of this Quality Improvement (QI) initiative is to implement a standardized screening process for use by prescribers to support identification and deprescribing of medications that increase risk of falling. ***Methods:*** The Screening Tool for Older Persons' Prescriptions in older adults with high fall risk (STOPPFall) was implemented over 15 weeks in 2022 at an urban assisted living facility. Prior to implementation, education was provided to the nurse practitioner and nursing staff. All assisted living patients were eligible for screening. STOPPFall was utilized when reviewing the patients' medication administration record at regulatory visits. An audit tool was then completed by the nurse practitioner for data collection including date of patient encounter, if screening was used, and high fall risk medications identified and deprescribed. Number of patients with a reported fall was tracked weekly. ***Results:*** One hundred percent of staff was educated on the process change. Since completion of education, 100% of eligible residents have been screened. Three high fall risk medications were deprescribed. There were fifteen falls during implementation. However, there were six weeks throughout implementation with zero patient falls. ***Conclusions:*** Implementation of STOPPFall successfully identified high fall risk medications in assisted living residents. Findings suggest that medication screening and deprescribing is a feasible addition to fall prevention strategies for assisted living residents.

Keywords: high fall risk medications, assisted living, falls, screening, deprescribing

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Problem Description

Adults over 65 years old in assisted living facilities in the United States are particularly vulnerable to complications of polypharmacy and potentially inappropriate medications (PIMs) due to their multiple comorbidities. PIMs are medications that when used in older adults, the risks often outweigh the benefits due to altered pharmacokinetics related to aging (Rantsi et al., 2022). PIMs are shown to increase the risk for falls, hospitalizations, and physical and cognitive impairment (Bloomfield et al., 2020). Falls are often preventable, yet they continue to be the leading cause of injury and injury-related death of adults over 65 years old in the United States (Centers for Disease Control and Prevention [CDC], 2021). Throughout the State of Maryland, falls are the leading cause of emergency department visits and hospitalizations in adults 65 years and older (Department of Health and Mental Hygiene, 2016). With the rising older adult population, falls cause significant financial burden on the United States healthcare system with medical costs reaching 50 billion dollars annually (Haddad et al, 2021). Even though the risk of falls in the aging population can be reduced by modifying risk factors, it has become a significant healthcare issue nationally and statewide.

The cause of falls is typically multifactorial, however, use of PIMs that increase risk of falls was identified as a patient safety priority by staff at an urban assisted living facility in Maryland. 24 % of residents at this facility had a reported fall in 2021 and over half of hospital transfers were related to falls. Appendix A shows the numerous factors, both modifiable and non-modifiable, that contribute to falls at this facility. Ultimately, fall prevention by optimizing drug therapy should be prioritized because the consequences can be detrimental. At this assisted living facility, there was not a validated or standardized screening used to encourage deprescribing high fall risk medications. The purpose of this Quality Improvement (QI) initiative

was to implement the STOPPFall tool for use by prescribers to support identification and deprescribing medications that increase risk of falling.

Available Knowledge

A review of evidence was conducted to determine best practices for fall prevention and high fall risk medications. Eight studies and articles were reviewed and analyzed using the Johns Hopkins Nursing Evidence-Based Practice Model for evidence appraisal (Dang et al., 2022). These eight sources included, one randomized control trial and two systematic reviews with an overall B quality rating, two level II studies with a B quality rating, two level IV articles with an A quality rating and one level V literature review with a B quality rating. Overall, the literature supports deprescribing high fall risk medications in older adults as a fall prevention strategy (See Appendix B). The two systematic reviews and randomized control trial found that deprescribing interventions, such as chart reviews along with trigger tools or checklists ultimately improved medication safety for older adults (Earl et al., 2020; Gray et al., 2018; Page et al., 2016). Frankenthal et al. (2014) and Kua et al. (2019) both identified the Screening Tool of Older Persons' Potentially inappropriate medications (STOPP) as efficient in reducing PIMs and falls in older adults. Seppala et al. (2021) created the Screening Tool for Older Persons' Prescriptions in older adults with high fall risk (STOPPFall), derived from the STOPP screening tool, to assist with clinical decision making and improve medication review of high fall risk medications. Clinical practice guidelines for fall prevention in older adults, including the United States Preventative Services Taskforce and American Geriatrics Society support the use of a high fall risk medication screening among fall prevention interventions (Montero-Odasso et al., 2021). A literature review by Scott et al. (2017) suggested that structured guides in combination with screening tools used for deprescribing is best as it offers a logical sequence of clear decision-making steps, easy for providers to understand and apply to patient care. Based on the evidence

synthesis, there was good and consistent evidence to support the use of a screening tool to guide deprescribing of high fall risk medications in older adults.

Rationale

The Knowledge to Action (KTA) framework was chosen to guide implementation of this quality improvement project (Graham et al., 2006). This framework is appropriate to guide implementation of this project because it can be adapted to the specific behavior change. The KTA framework, shown in Appendix C, outlines the steps needed to reach goals throughout implementation. The two components of the KTA framework are knowledge creation and the action cycle. These are comprised of many phases that influence each other. The knowledge creation component involves knowledge inquiry, knowledge synthesis and knowledge tools. The action cycle includes identifying a problem, adapting knowledge to the local context, assessing barriers to knowledge use, select and tailor interventions, evaluating outcomes and monitoring and sustaining knowledge use. The knowledge generated from the literature review was adapted to the local context to overcome barriers and use facilitators for successful outcomes and knowledge use (Graham et al., 2006). The knowledge found and reviewed by the project leader was adapted to be implemented into the context of the site. Involving stakeholders in the phases helps adapt knowledge to the needs of the project site to ensure project success. The action cycle forms a process of the activities needed for the knowledge found to be applied in practice (Graham et al., 2006). Before implementation, assessment of site-specific barriers ensured that interventions were tailored to overcome barriers. Audits and feedback from stakeholders allowed for monitoring of knowledge use throughout implementation. Feedback from stakeholders also helped evaluate outcomes and any barriers to screening use. Project outcomes were evaluated

using run charts to assess changes over time. It is important to go through all the phases of the framework for successful implementation.

Methods

Context

Many contextual elements of this assisted living facility were considered when introducing the STOPPFall screening. This QI initiative was conducted in an assisted living facility in an urban retirement community over a 15-week period in the Fall of 2022. In the months preceding the project, the QI project lead mobilized a team of stakeholders at the project site to plan workflow changes to include the integration of STOPPFall. The implementation team was made up of the DNP student project lead, the nurse practitioner, the nurse manager, staff nurses and geriatric nursing assistants (GNAs). Eligible patients included all patients over 65 years old residing at the assisted living facility. Two providers see the residents and manage their medical care and prescriptions. The nurses and GNAs give the patients medications, as well as mitigate any environmental risk factors for patient falls. An electronic medical record was used to review the medication lists as well as reported patient falls.

Intervention

Project implementation was completed over the course of 15 weeks in the Fall of 2022. The intervention was the addition of the STOPPFall screening use by providers during medication reviews. Appendix D shows the desired process change. A variety of implementation strategies and tactics tailored to the project and project site were used throughout project implementation. These included staff education, visual cues, utilizing project champions, weekly communication of progress to stakeholders, and incentives. The initial step of the intervention was mobilizing the team of stakeholders. Then, education began September 2022, followed by

initiation of the practice change. Education was conducted with stakeholders in smaller group huddles and one on one with the QI project lead during the first two weeks of implementation. Background evidence and site data was added to education plans and communicated with staff during education sessions to show importance of the process change and successfully elicit buy-in (Ogrinc et al., 2018). The STOPPFall screening and education was provided as a printed handout to staff for them to keep for reference (See Appendix E). The education handout contained project goals, a copy of the screening tool and information on high fall risk medications. Visual project cues were created and placed on computers as reminders to screen and of implementation goals (See Appendix F).

The screening was then utilized by prescribers when reviewing medication lists of the assisted living residents when seen at regulatory visits to ensure all eligible residents were screened. High fall risk medications were identified by the screening but only deprescribed at the discretion of the prescriber. The STOPPFall audit tool was used to collect data on the date of patient encounter, if STOPPFall was used, what high fall risk medication was identified and if the screening led to deprescribing (See Appendix G). Weekly reported falls are collected via the electronic health record. Data collection was completed by the project champions and project lead. The nurse manager and nurse practitioner served as project champions to assist with data collection procedures. Weekly discussions with project champions to discuss progress towards goals were effective for identifying barriers. Falls data was displayed as a run chart on a poster board in the office to share progress toward goals openly in a public manner (Ogrinc et al., 2018). Incentives like coffee and bakery items were provided for staff throughout implementation after completing education sessions and achieving milestones and project goals.

Measurement

Structure, process, and outcome measures were chosen to continuously evaluate implementation progress and were analyzed weekly over 15 weeks. The structural measure was 100% of bedside staff complete education within two weeks of implementation. Education completion was recorded to determine the number of staff who received the education handout and education from the project leader in relation to the total number of staff involved with patient care. Two process measures were tracked during implementation: utilization of the STOPPFall screening and percentage of screenings that lead to deprescribing. Utilization of the STOPPFall screening was defined as the number of times there was documented use of the screening tool by providers against how many total regulatory visits were completed that week. The percentage of screenings that lead to deprescribing was calculated by the number of screenings leading to deprescribing over total number of screenings completed that week. Process measures were assessed through audits, using the STOPPFall audit tool. With this process change, the outcome measure was to decrease the number of reported patient falls. The number of falls was collected weekly via documentation in the electronic health record. Ongoing assessment of contextual elements that affect the success and efficiency of implementation was done with weekly staff check-ins by the project leader. Feedback from project champions and staff allowed for understanding of variation within the data and why screenings may not have been completed. Run charts were used to understand variation in the data collected over time. This allowed for data to be assessed prior to and during implementation. The use of descriptive statistics was utilized to draw inferences from the project data collected.

Ethical Considerations

Non-human subject research determination from the Human Research Protections Office (HRPO) of the University of Maryland's Institutional Review Board (IRB) was obtained prior to

project implementation and determined that this QI project does not involve human research. Ethical considerations are essential for project implementation. The name of the organization where the project implementation was completed remained anonymous. Patient information was kept confidential through collection of deidentified data to protect patient privacy. Collected data was secured in REDCap, a password-protected server. Implementation of this QI project poses no threats or harm to residents, prescribers, or staff.

Results

Categorical data was collected to determine education completion. The structural goal of one hundred percent of staff completing education was met by nurse practitioners (n=1), floor staff (n=7), delegating nurses (n=1) and nurse managers (n=1) completing educating on the process change in the first two weeks of implementation. With busy, conflicting schedules, one group education session was not feasible therefore one on one education with the project lead and handouts were utilized to ensure goal attainment. Positive and receptive attitudes of staff was imperative to successful implementation. Open communication with staff and providers allowed the project lead to address barriers as needed. Screening use was collected as continuous data as shown in the run chart in Appendix H. The process goal of screening 100% of residents was met by week three. Zero residents were screened the first two weeks but 100% of eligible residents were screened from week three to week fifteen. The run could be due to the smaller number of assisted living patients seen every week making screening completion possible and brief. A problem that was encountered was leadership turnover. There was an increase in falls that week, however, 100% of screenings were still completed. Staff turnover and leadership transitions were frequent during implementation, but large effects were alleviated with re-education of new leadership, planning and anticipation by the project lead and champions.

During the third and fifth weeks of implementation, 25% of screenings led to the deprescribing of high fall risk medications as shown in the run chart in Appendix I. Ultimately, three high fall risk medications were deprescribed throughout implementation. A small number of screenings led to deprescribing because not every patient was prescribed high fall risk medications. Additionally, a barrier encountered was important medications, such as antiepileptics and antipsychotics, could not always be deprescribed based on benefits outweighing the risks and clinical decision making by the provider. Providers must make reasonable medications adjustments that are in the patient's best interest regardless of screening results.

Weekly fall rates were collected and displayed as a run chart in Appendix J. There were fifteen total reported falls throughout implementation; however, the number of weekly falls remained below four after the first week. Six weeks throughout implementation had zero falls. There are lots of confounding variables that affect falls; however, the number of falls did decrease since completion of education, screening use and deprescribing. Across the run charts, week three shows an increase in screenings and deprescribing and a decrease in fall rate. Based on the probability of replication, there is high probability of detecting a true change when a run chart contains at least fourteen data points. In conclusion, implementation of the STOPPFall screening successfully identified high fall risk medications in assisted living residents. While medications are just one component that contributes to falls, findings suggest that medication screening was a feasible addition to fall prevention strategies.

Discussion

The process goal of 100% of assisted living patients medication lists screened using the STOPPFall tool was met. The quantity of assisted living residents and staff made this a feasible goal. The process goal of deprescribing 100% of high fall risk medications was unlikely in this

setting due to certain medical conditions. Providers had to make reasonable decisions in the patient's best interest, despite screening results, which was the cause for a difference between observed and anticipated outcomes. In some instances, the benefits of taking the high fall risk medication outweighed the risks. For example, for a patient taking antiepileptics for seizure control with no history of falls, the provider opted to keep the medication regardless of screening results. In addition, not every assisted living patient was prescribed high fall risk medications, contributing to the small number of medications deprescribed throughout the 15 weeks.

The outcome goal of decreasing the number of assisted living residents who fall was met. In fact, after deprescribing one high fall risk medication, one assisted living resident had a personal decrease in falls from an average of two falls per week to none. A limitation to the precision of this project was that many other factors do contribute to falls, such as physical debility, environmental obstacles, and staff-to-patient ratios and the reason for a fall was not tracked or investigated for purposes of this QI project. This project does show that the implementation of a screening tool to encourage deprescribing of high fall risk medications is a feasible and important addition to fall prevention strategies. A key finding was that although nurses and GNAs did not personally utilize the screening, implementation increased all bedside staff awareness of high fall risk medications, which patients were taking them, and therefore at higher risk for falls. Patients experience falls for many reasons, however, with screening use and increased medication awareness, there was a reduction of patient falls over the fifteen weeks. There is no cost to implement use of the STOPPFall tool and a reduction in fall rates can lead to fewer hospital transfers and injuries.

The findings of this QI project are consistent with evidence from other publications. Evidence-based literature supports deprescribing high fall risk medications in older adults as a fall prevention strategy to improve patient outcomes. Implementation of STOPPFall at this

assisted living facility led to an increase in recognition, screening, and deprescribing of high fall risk medications, ultimately improving patient safety. The internal validity of this project was limited due to the self-reporting method of providers using the screening tool during patient visits. Implementation over a short 15 weeks also limited the internal validity of this project.

Conclusions

Implementation of this screening process successfully identifies high fall risk medications in assisted living residents. The findings of this QI project suggest that STOPPFall screening and deprescribing is a feasible addition to fall prevention strategies for assisted living residents. Increased recognition of high fall risk medications, their effects on older adults and deprescribing can reduce falls and, ultimately injuries and hospitalizations. The STOPPFall screening can be utilized in any setting for adults over 65 years old at high fall risk to improve patient safety. Actions to support project sustainability are important to continue improving patient safety. The nurse manager was given educational materials and will continue ongoing education and communication with staff. Any new hires will also be educated on the STOPPFall screening and high fall risk medication use. After repetitive use of STOPPFall, providers report they are very familiar with high fall risk medications needing deprescribing, making continued screening use an easy addition to their workflow. Providers at this facility see independent living and long-term care patients in addition to assisted living residents. Collaboration with the assisted living nurse manager, other managers and staff throughout the facility will ensure spread of screening use to other residents' medication lists within the retirement community. Future use of STOPPFall will identify high fall risk medications, improve deprescribing, and improve patient safety.

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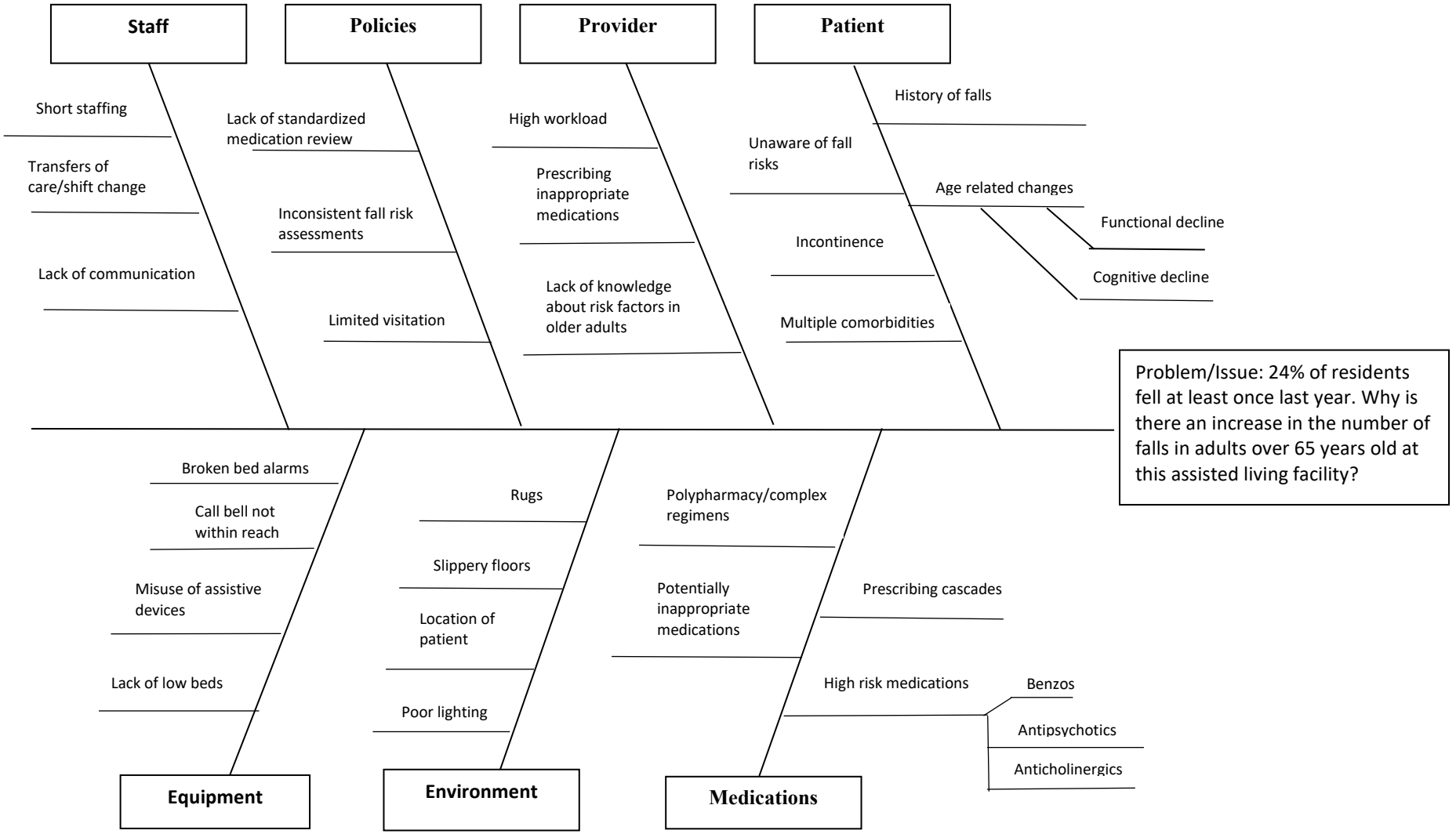
Appendix A.

Fishbone Diagram of Root Cause Analysis of Falls.



Appendix B.

Evidence Review and Synthesis.

Citation: Page, A. T., Clifford, R. M., Potter, K., Schwartz, D., & Etherton-Beer, C. (2016). The feasibility and effect of deprescribing in older adults on mortality and health: A systematic review and meta-analysis. *British Journal of Clinical Pharmacology, 82*(3). 583-623. doi: 10.1111/bcp.12975					**Level and Quality II-b**
Purpose/ Hypothesis	**Research Design**	**Sample – Population, Size, Setting**	**Intervention/Procedures**	**Primary Outcome/Measure**	**Results/Conclusions**
This systematic review aimed to "determine whether or not deprescribing is a safe, effective and feasible intervention to modify mortality and health outcomes in older adults."	A systematic review of experimental and observational studies	**Search Strategy:** A search was conducted using EbscoHost, Ovid, Scopus, Embase and ProQuest to identify studies with the following keywords: "prescribing" "prescription" "medication" "polypharmacy" "deprescrib*" "inappropriate" "reduc*" "stop*" "withdraw*" "aged" OR "ageing" OR "65 years" OR "geriatric" OR "older adult" OR "elderly." Two researchers independently screened all titles and abstracts. Differences were resolved with a third researcher. 497 studies were identified and then screened based on inclusion and exclusion criteria. The second reviewer was blinded to author, year, and place of publication of studies. **Eligible studies:** Experimental and observational studies involving deprescribing of one or more prescription medications in older people **Excluded:** (1) not English language (2) under 65 years old (3) not deprescribing (4) no relevant outcomes (5) ineligible study design (6) full text unavailable (7) protocol only (8) drug unavailable today. **Included:** 116 studies; 56 RCTs with 17,428 participants. 22 comparative studies with a concurrent control group and 37 comparative studies without concurrent control group.	**Control:** No deprescribing intervention in place. **Intervention:** Deprescribing a single medication or class of medication was the most common type of intervention investigated. Eleven studies investigated withdrawing two medications. 18 were patient-specific interventions. Of these, 11 studies interventions were led by providers, 2 by pharmacists, 1 by nursing 4 studies by multidisciplinary teams. 10 of these focused on medication reviews, 8 studies used recommendations to the prescriber and 3 studies were educational programs delivered at residential aged care facilities to nurses and to the prescribing doctors	**DV:** Researchers selected studies with a primary outcome of mortality. Secondary outcomes included withdrawal events, health outcomes, quality of life, the number of medications and potentially inappropriate medications use. **Measure:** Meta-analysis of RCTs was done using Mantel-Haenszel method using the fixed effects model. If heterogeneity was detected, the random effects model was used. Nonrandomized studies with concurrent control groups used generic inverse-variance method with a fixed effects model to pool data. Data was reported narratively for nonrandomized studies without a concurrent control group.	**Statistical results:** Mortality was significantly reduced when patient-specific interventions were applied (OR 0.62, 95% CI 0.43–0.88). The studies that evaluated falls found that those who had previously fallen had significantly fewer falls overall in the deprescribing group compared to the control group. (MD 0.11, 95% CI 0.21–0.02). **Conclusions:** Deprescribing to reduce polypharmacy is safe and feasible as it was not associated with an increase in drug withdrawal events. The participants in the deprescribing group who had previously fallen had significantly fewer falls compared to those in the control group. **SR Bias Risk:** The Cochrane Collaboration's Risk of Bias tool was used to assess the risk of bias for each included RCT. 32% of studies had a low risk of bias.

		PRISMA: Included decision making criteria for retaining/omitting studies.			
Citation: Montero-Odasso, M., Kamkar, N., Pieruccini-Faria, F., Osman, A., Sarquis-Adamson, Y., Close, J. . . & Masud, T. (2021). Evaluation of clinical practice guidelines on fall prevention and management of older adults: A systematic review. *Jama Network Open, 4*(12). doi:10.1001/jamanetworkopen.2021.38911					**Level and Quality IV-a**
Purpose/ Hypothesis	**Research Design**	**Sample – Population, Size, Setting**	**Intervention/Procedures**	**Primary Outcome/Measures**	**Results/Conclusions**
To perform a review of clinical practice guidelines for falls prevention and management for adults over 60 years old in all settings.	Systematic review and meta-analysis	**Search Strategy:** A search was conducted using MEDLINE, PubMed, PsycINFO, Embase, CINAHL, the Cochrane Library, Physiotherapy Evidence Database, and Epistemonikos. The following keywords were used: "falls" "clinical practice guidelines" "management and prevention" and "older adults." Three reviewers selected full texts to be reviewed, and three different reviewers who were blinded assessed guideline quality using the AGREE-II tool. **Eligible studies:** Clinical practice guidelines for preventing or managing falls (consensus or evidence-based) with outcomes of fall reduction, prevention, and management and if the target population was older adults. **Excluded:** (1) not clinical practice guidelines (2) did not address falls (3) were not evidence-based. **Included**: 15 high quality practice guidelines were included with 198 total recommendations for risk assessment, prevention, and management of falls for older adults.	**Control:** The 3 blinded reviewers assessing the guidelines **Intervention:** Quality assessment of guidelines using the AGREE II tool.	**DV:** The quality of the evidence-based guidelines **Measure:** Mean Appraisal of Guidelines for Research & Evaluation II (AGREE-II) total and domain-specific scores across guidelines	**Statistical results:** Agreement across the guideline topic areas was assessed using the Fleiss κ statistic. All 15 selected guidelines had high-quality AGREE-II total scores (mean [SD], 80.1% [5.6%]). Fleiss κ statistic for medication review across all guidelines was κ = .68. **Conclusions:** All guidelines recommended medication review, and the majority of guidelines strongly recommended medication review for fall-risk increasing drugs as a key element in the prevention of falls. Recommendations to evaluate and manage medication-related risks for falls varied from reasonable deprescribing of psychotropic and cardiovascular medications to performing a comprehensive medication review although resources and tools for deprescribing were lacking.
Citation: Kua, C. H., Mac, V., & Lee, S. (2019). Health outcomes of deprescribing interventions among older residents in nursing homes: A systematic review and meta-analysis. *The Journal of Post-Acute and Long-Term Care Medicine, 20*, 362-372. https://doi.org/10.1016/j.jamda.2018.10.026					**Level and Quality I-b**
Purpose/ Hypothesis	**Research Design**	**Sample – Population, Size, Setting**	**Intervention/Procedures**	**Primary Outcome/Measures**	**Results/Conclusions**

The purpose of this systematic review is to look at the impact of multiple deprescribing interventions on clinical outcomes among the older residents in nursing homes.	Systematic review with meta-analysis of randomized controlled trials.	**Search Strategy:** A search was conducted using the databases CINAHL, Cochrane Library, EMBASE, International Pharmaceutical Abstracts, and MEDLINE/PubMed with the following keywords: "prescribing" "deprescribing" "long term care or nursing home or residential care" and "healthcare provider." 1,566 studies were identified and assessed based on inclusion and exclusion criteria. Two investigators extracted the data and rated the quality using GRADE and the Cochrane Risk of Bias Tool. A third investigator was available to reach a consensus when unable to agree. **Eligible Studies:** Randomized controlled trials that examined deprescribing in a nursing home setting. Population in these trials contained residents over 60 years old. **Excluded:** (1) Title and abstract not relevant (2) studies looking at terminal or palliative care-requiring residents were not included (3) studies not focused on interventions (4) lack of randomization. **Included**: A total of 41 studies enrolling 18,408 residents were included. PRISMA included for decision making criteria for retaining/omitting studies.	**Control:** Controls varied between studies in the review. Most studies compared deprescribing with routine care or with an intervention. **Intervention**: 14 studies examined drug discontinuation by pharmacists, nurses, and doctors, mostly targeting antipsychotics, antidepressants, or hypnotics. 11 studies looked at the impact of a medication review using tools such as the STOPP or Beers criteria. Six studies evaluated the impact of educational programs delivered to nursing home staff. Most interventions compared were medication review, educational training, case conferences and outreach visits.	**Dependent Variable:** 27 articles examined mortality rates post deprescribing intervention. 10 studies looked at the number of falls and 8 studies looked at hospitalization rates post intervention. Five studies reported data on the number of potentially inappropriate medications discontinued using the STOPP or Beers criteria which was self-reported by the provider. **Measure:** The most reported outcomes were all-cause mortality, number of fallers, the number of hospitalizations, and number of PIMs deprescribed.	**Statistical results:** In studies with the same outcome measures, fixed and random effects meta-analysis was performed. Random effect models were used if heterogeneity was significant (Cochran Q test P value < .05). Deprescribing interventions significantly reduced the number of residents with potentially inappropriate medications by 59% (odds ratio [OR] 0.41, 95% confidence interval [CI] 0.19-0.89). A subgroup analysis suggests that a medication review deprescribing intervention could significantly reduce the number of fallers by 24% (OR 0.76, 95% CI 0.62-0.93). **Conclusions:** The evidence discussed suggests that deprescribing through doctor or pharmacist-directed medication reviews, compared to other deprescribing interventions, can significantly reduce falls and all-cause mortality in nursing home residents. All studies using the STOPP criteria showed a significant decrease in PIMs. **Risk of Bias:** The absence of blinding was common because of the nature of the intervention and setting, leading to both performance and detection bias. Variations in the reported measures for the same outcome between studies contributes to reporting bias.

Citation: Earl, T., Katapodis, N., Schneiderman, S., & Shoemaker-Hunt, S. (2020). Using deprescribing practices and the screening tool of older persons' potentially inappropriate prescriptions criteria to reduce harm and preventable adverse drug events in older adults. *Journal of Patient Safety, 16*(3) S23-S35. doi: 10.1097/PTS.0000000000000747					**Level and Quality II-b**
Purpose/ Hypothesis	**Research Design**	**Sample – Population, Size, Setting**	**Intervention/Procedures**	**Primary Outcome/Measures**	**Results/Conclusions**
This study examined deprescribing interventions to reduce polypharmacy and ultimately reduce preventable adverse drug events in older adults. Specifically, use of the Screening Tool of Older Persons' Potentially Inappropriate Prescriptions (STOPP) to screen for potentially inappropriate medications.	A systematic review of studies published between 2008 and 2018.	**Search Strategy:** Two databases (CINAHL and MEDLINE) were searched for peer-reviewed literature published from 2008 to 2018 using terms related to deprescribing and STOPP interventions. Evidence quality was assessed using the Cochrane risk of bias tool and GRADE. The titles and abstracts were screened independently by two authors against the inclusion criteria. Any disagreement was resolved by consensus through discussion with another author. **Eligible Studies:** Studies published in English, focused on deprescribing, polypharmacy, use of STOPP and related interventions, in any setting that targeted people over 65 years old. The studies had to examine the effectiveness of interventions on potentially inappropriate medications and preventable adverse drug events. Randomized controlled trials (RCTs), controlled clinical trials, controlled before-and-after studies and interrupted time series analyses were eligible if they used a validated measure of prescribing appropriateness. **Excluded:** Articles were excluded if (1) the study was not relevant, (2) focused on children or pediatric care, (3) not an intervention study, or (4) outcomes were not reported. **Included:** 26 studies and 1 systematic review (14 for deprescribing and 12 for STOPP) were included. PRISMA included for decision making criteria.	**Control:** The interventions were compared to routine care without deprescribing interventions. **Intervention:** Studies evaluated a range of interventions used to help providers deprescribe, from protocols and clinical decision support tools to patient education and medication reviews. The use of the Screening Tool of Older Persons' Potentially Inappropriate Prescriptions (STOPP) criteria is a validated, evidence-based list of 8-criteria that was evaluated and can be used to assess for potentially inappropriate prescribing in older adults.	**DV:** Varied by study with the majority measuring the effect of interventions on process outcomes. 2 studies evaluated the effect on clinical outcomes. Primary outcomes were the change in prevalence of appropriate polypharmacy and hospital admissions. Medication-related problems (eg, adverse drug reactions), medication adherence and quality of life were included as secondary outcomes. **Measure:** Many deprescribing studies focused on process-related outcomes such as number of medications prescribed or polypharmacy, which is expected to lead to clinical improvements or a reduction in ADEs. Clinical outcomes were measured by number of hospital visits, number of falls, and the Edmonton frailty scale.	**Statistical Results:** The number of falls and frailty measured using the Edmonton frailty scale dropped by a mean difference of 1.35 ($P < 0.05$). In addition, the number of adverse drug reactions decreased by 4.24 ($P < 0.05$) after 6 months. Physician-led medication reviews lead to an average reduction of total medications from 16.64 to 15.53 ($P < 0.001$ and average number of PRN medications from 5.33 to 4.56 ($P < 0.001$). Educational interventions led to a 27% discontinuation of benzodiazepines among patients 65 years or older in the intervention group compared with 5% in the control group (95% CI, 14%–32%) at 6 months after the intervention. **Conclusion:** Deprescribing interventions and using the STOPP criteria were found to be effective in reducing polypharmacy and PIMs in older adults. Interventions using the STOPP criteria, regardless of who or how it was used, decreased PIMs significantly. Strength was limited in deprescribing interventions by the study designs and small sample sizes. The STOPP criteria studies were fewer but with larger sample sizes.

Citation: Gray, S. L., Hart, L. A., Perera, S., Semla, T. P., Schmader, K. E., & Hanlon, J. T. (2018). Meta-analysis of interventions to reduce adverse drug reactions in older adults. *Journal of the American Geriatrics Society, 66*(2), 282–288. https://doi.org /10.1111/jgs.15195					**Level and Quality** **I-c**
Purpose/ Hypothesis	**Research Design**	**Sample – Population, Size, Setting**	**Intervention/Procedures**	**Primary Outcome/Measures**	**Results/Conclusions**
The purpose of this study is to examine the effect of interventions on optimizing medication use on adverse drug reactions (ADRs) in older adults.	Systematic review and meta-analysis of randomized controlled trials.	**Search Strategy**: A systematic review of the literature was done using EMBASE, PubMed, OVID, Cochrane Library, Clinicaltrials.gov, and Google Scholar with the keywords "aged" "adverse drug events" or "reaction" "randomized controlled trials" and "English language." 10,176 studies were initially identified and reviewed based on inclusion and exclusion criteria. Two reviewers examined the titles and abstracts and independently assessed the quality of the studies using the Cochrane Collaboration tool for assessing risk of bias. **Eligible Studies:** Studies eligible had participants with the average age of 65 and older, used a randomized controlled trial design, and measured ADRs as a primary outcome or as part of an overall assessment of drug-related problems. **Excluded:** (1) not relevant (2) not a randomized controlled trial (3) participants were less than 65 years old (4) intervention was not described **Included:** 13 studies involving 6,198 participants were eligible for inclusion in this review. PRISMA flow diagram included for decision making criteria for retaining/omitting studies.	**Control:** The control groups did not receive any intervention to reduce adverse drug reactions **Intervention:** Interventions are categorized as pharmacist-led interventions (8 studies), other health professional-led interventions (3 studies), such as patient interviews or chart reviews using trigger tools or checklists. One study did a brief educational session, and another implemented a clinical decision support software. Most studies used medical record review to detect potential ADRs.	**Dependent Variable:** Any adverse drug reaction. Medical record review was used to detect potential ADRs. **Measurement:** Random-effects models were used to combine the results of multiple studies.	**Statistical results:** The intervention group was 21% less likely than the control group to experience any ADR (OR = 0.79, 95% confidence interval (CI) = 0.62–0.99). **Conclusion:** Interventions to optimize medication use were associated with lower risk of ADRs compared to usual care. Implementation of these interventions can ultimately improve medication safety in older adults. Most studies had low risk of detection bias.
Citation: Frankenthal, D., Lerman, Y., Kalendaryev, E., Lerman, Y. (2014). Intervention with the screening tool of older persons potentially inappropriate prescriptions/screening tool to alert doctors to right treatment criteria in elderly residents of a chronic geriatric facility: A randomized clinical trial. *The American Geriatric Society, 62*(9), 1658-1665. 10.1111/jgs.12993					**Level and Quality** **I-a**
Purpose/ Hypothesis	**Research Design**	**Sample – Population, Size, Setting**	**Intervention/Procedures**	**Primary Outcome/Measures**	**Results/Conclusions**

The purpose of this study was to evaluate the effect of screening medications according to the STOPP/START criteria on clinical and economic outcomes like the number of hospitalizations, falls, functioning, quality of life, and medication costs of residents in a geriatric facility.	Parallel group randomized controlled trial	**Sampling Technique:** Fixed stratified randomization **Eligible participants:** All residents 65 years and older who are prescribed at least one daily medication were eligible **Excluded:** Residents who were terminally ill and those who stayed in the facility shorter than 3 months were excluded. **Accepted**: 359 residents were randomized and placed in either the control group or the intervention group **Control:** 176 residents; 30/176 were lost during the trial. **Intervention:** 183 residents; 23/183 were lost during the trial. **Power analysis:** 134 participants were required in each group with a 5% significance level and 90% power. Considering a 15% decrease in numbers due to dropouts and death, the sample size was set at 191 residents per group. **Group Homogeneity:** Both groups are homogeneous. The baseline characteristics of the study population were compared using the chi-square test or Fisher exact test for categorical variables and the student t-test for continuous variables.	**Control Protocol:** Usual medication reconciliations and care. **Intervention Protocol**: A medication review was done screening medications with the STOPP/START criteria for all residents at the start of the study, 6 months, and 12 months. **Treatment Fidelity:** A physician who was not part of the study randomized the participants. Participants were assigned to one of the two groups using sealed envelopes.	**Dependent Variable:** The average number of medications, the number of patient falls, hospitalizations, and functional independence. A fall was defined as "unintentionally coming to rest on the ground or some lower level." Functioning was assessed using the Functional Independence Measure (FIM). **Measure**: To compare inappropriate prescribing before and after the intervention, the McNemar test was used for paired data to examine any changes over time, and the chi-square test was used to compare between groups. The chi-square test was used to compare group differences in the prevalence of falls before and after the intervention	**Statistical Results:** The average number of falls in the intervention group dropped significantly during the follow-up period (P = .006), whereas that of the control group did not (P = .66). There was a significant reduction in the average number of medications in the intervention group throughout the follow-up period (P < .001). In contrast, the average number of medications increased in the control group. **Conclusions:** The application of STOPP/START criteria is an efficient method of enhancing medication appropriateness by reducing potentially inappropriate prescriptions. There was a significant reduction in the number of falls in the intervention group but not in the control group.
Citation: Scott, I., Anderson, K., Freeman, C. (2017). Review of structured guides for deprescribing. *European Journal of Hospital Pharmacy, 24*(1) 51-57. doi:10.1136/ejhpharm-2015-000864					**Level and Quality** **V-b**
Purpose/ Hypothesis	**Type of Evidence Research Design**	**Sample – Population, Size, Setting**	**Intervention/Procedures**	**Primary Outcome/Measures**	**Results/Conclusions**
This narrative review assesses structured deprescribing guides that are	Literature review of 7 deprescribing algorithms	**Search Strategy:** A search was conducted in PubMed, Cochrane Library and CINAHL for relevant articles published between January 1, 1990 and December 10, 2015, in print or online.	**Control:** The same three reviewers for each algorithm.	**Dependent Variable:** Evidence of effectiveness of the deprescribing tools	**Statistical results:** The heterogeneity of studies made pooling of data across studies impossible and so results were reported in narrative form.

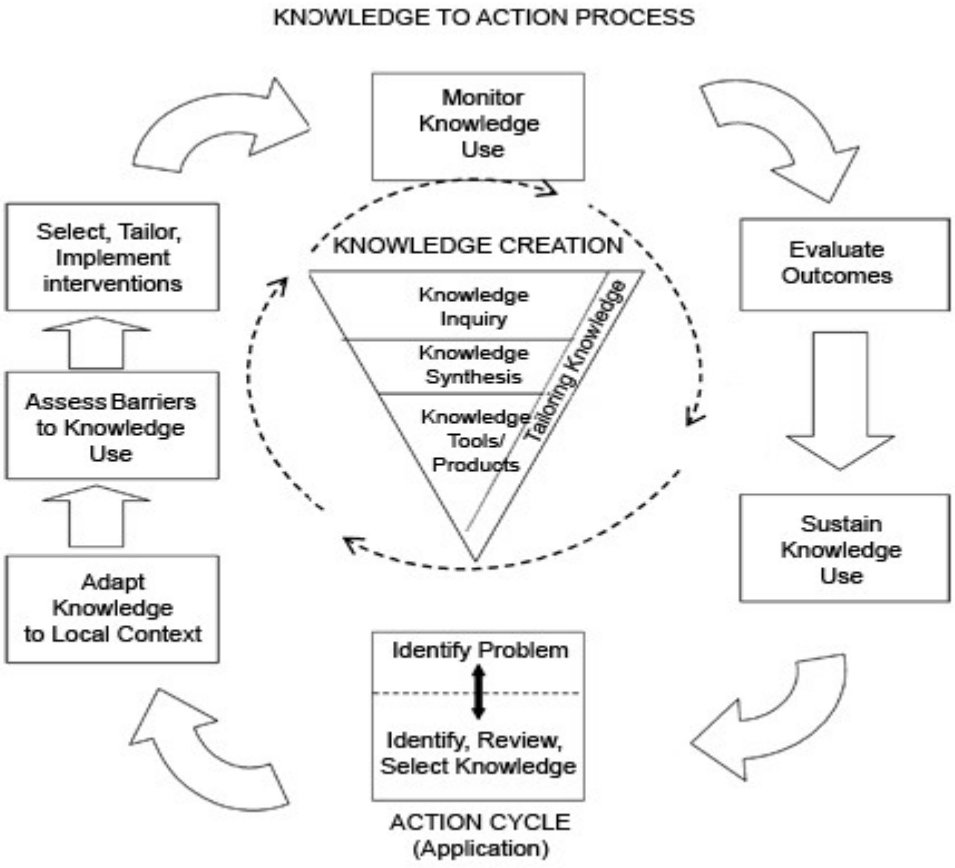
reported in published literature and comments on the evidence supporting their clinical use.		Keywords used were "deprescribing" or "discontinuation" or "withdrawal" AND "medicines", "medications", AND "algorithm" or "flowchart" or "checklist" or "tables" or "guides." Articles were screened by one author and reviewed by 2 other authors. **Eligible:** 186 retrieved articles. **Excluded:** (1) if the stated purpose excluded deprescribing (2) restricted to one drug or drug class (3) no efficacy testing **Included:** 15 reports discussing 7 different algorithms were included based on the selection criteria.	**Intervention:** Review of the type of deprescribing algorithm	**Measure:** The level and strength of available evidence.	**Conclusions:** The strongest evidence of efficacy and clinician acceptability is seen for the Good Palliative-Geriatric Algorithm and the confirm, estimate, assess, sort, eliminate (CEASE) steps. Structured guides offer a logical sequence of clear decision-making steps that are easy to understand and apply to patient care.
Citation: Seppala, L., Petrovic, M., Ryg, J., Bahat, G., Topinkova, E., Szczerbinska, K., Van Der Cammen, T., Hartikainen, S., . . . Van Der Velde, N. (2021). STOPPFall (screening tool of older persons prescriptions in older adults with high fall risk); a Delphi study by the EuGMS Talk and Finish Group on fall-risk increasing drugs. *Age and Aging, 50*(4), 1189-1199. https://doi.org/10.1093/ageing/afaa249					**Level and Quality** **IV-b**
Purpose/ Hypothesis	**Research Design**	**Sample – Population, Size, Setting**	**Intervention/Procedures**	**Primary Outcome/Measures**	**Results/Conclusions**
The aim of this expert panel consensus was to create a comprehensive STOPPFall (screening tool of older persons prescriptions in older adults at high fall risk) by Delphi consensus. Secondly, was to combine STOPPFall with a deprescribing tool to add structure to deprescribing of high fall risk medications (FRIDs).	Expert consensus panel	**Strategy:** 24 members of EuGMS Task and Finish Group on FRIDs and Special Interest Group (SIG) on Pharmacology accepted an invite to participate in the Delphi process.	**Control:** STOPPFall was created by two facilitators based on evidence from recent meta-analyses and national fall prevention guidelines in Europe. **Intervention:** 24 panelists chose their level of agreement of the Likert scale with the items in the STOPPFall in three Delphi panel rounds.	**Dependent Variable:** Medications that should be included in the STOPPFall screening. **Measure:** If >70% of panelists agreed with the proposed STOPPFall medication class and evidence it was considered consensus.	**Statistical results:** 14 medication classes were agreed on to be included in the STOPPFall. **Conclusions:** The STOPPFall screening was created using an expert Delphi consensus process to assist with clinical decision making and improve medication review of older adults at a high risk of falling. STOPPFall is more comprehensive than the section of drugs that increase the risk of falls in older adults in the STOPP/START screening.

Category (Level Type)	Total Number of Sources/Level	Overall Quality Rating	Synthesis of Findings
Level 1 - Experimental study · Randomized Controlled Trial (RCT) · Systematic review of RCTs with or without meta-analysis	3 sources- 1 RCT and 2 Systematic Reviews	B	All studies found that deprescribing interventions, such as chart reviews using trigger tools or checklists ultimately improved medication safety for older adults. Frankenthal et al. (2014) and Kua et al. (2019) found that the STOPP/START screening is efficient in reducing potentially inappropriate medications. Using these criteria through medication reviews resulted in a significant reduction in the number of falls in older adults.
Level II · Quasi-experimental studies · Systematic review of a combination of RCTs and quasi-experimental studies, or quasi-experimental studies only, with or without meta-analysis	2 systematic reviews of a combination of RCTs and quasi-experimental studies.	B	Page et al. (2016) found that deprescribing is safe and feasible. Participants in the deprescribing group did not experience withdrawal events and those who had previously fallen had significantly less frequent fall events. Earl et al. (2020) found that deprescribing interventions and using the STOPP criteria were found to be effective in reducing polypharmacy and PIMs in older adults.
Level III · Non-experimental study · Systematic review of a combination of RCTs, quasi-experimental, and non-experimental studies, or non-experimental studies only, with or without meta-analysis.			
Level IV · Opinion of respected authorities and/or reports of nationally recognized			Both reports support the need for a screening of high fall risk medications to be implemented into fall prevention for older adults.

expert committees/consensus panels based on scientific evidence	2 reports of expert committees	A	Seppala et al. (2021) created the STOPPFall screening to assist with clinical decision making and improve the medication review of high fall risk medications.
Level V · Evidence obtained from literature reviews, quality improvement, program evaluation, financial evaluation, or case reports · Opinion of nationally recognized expert(s) based on experiential evidence	1 literature review	B	Scott et al. (2017) suggests the strongest evidence of efficacy and clinician acceptability is seen for the Good Palliative-Geriatric Algorithm and the confirm, estimate, assess, sort, eliminate (CEASE) steps. Structured guides can be combined with screening tools and offer a logical sequence of clear decision-making steps that are easy to understand and apply to patient care.
Recommendations Based on Evidence Synthesis: There is good and consistent evidence to support deprescribing of high fall risk medications in older adults.			

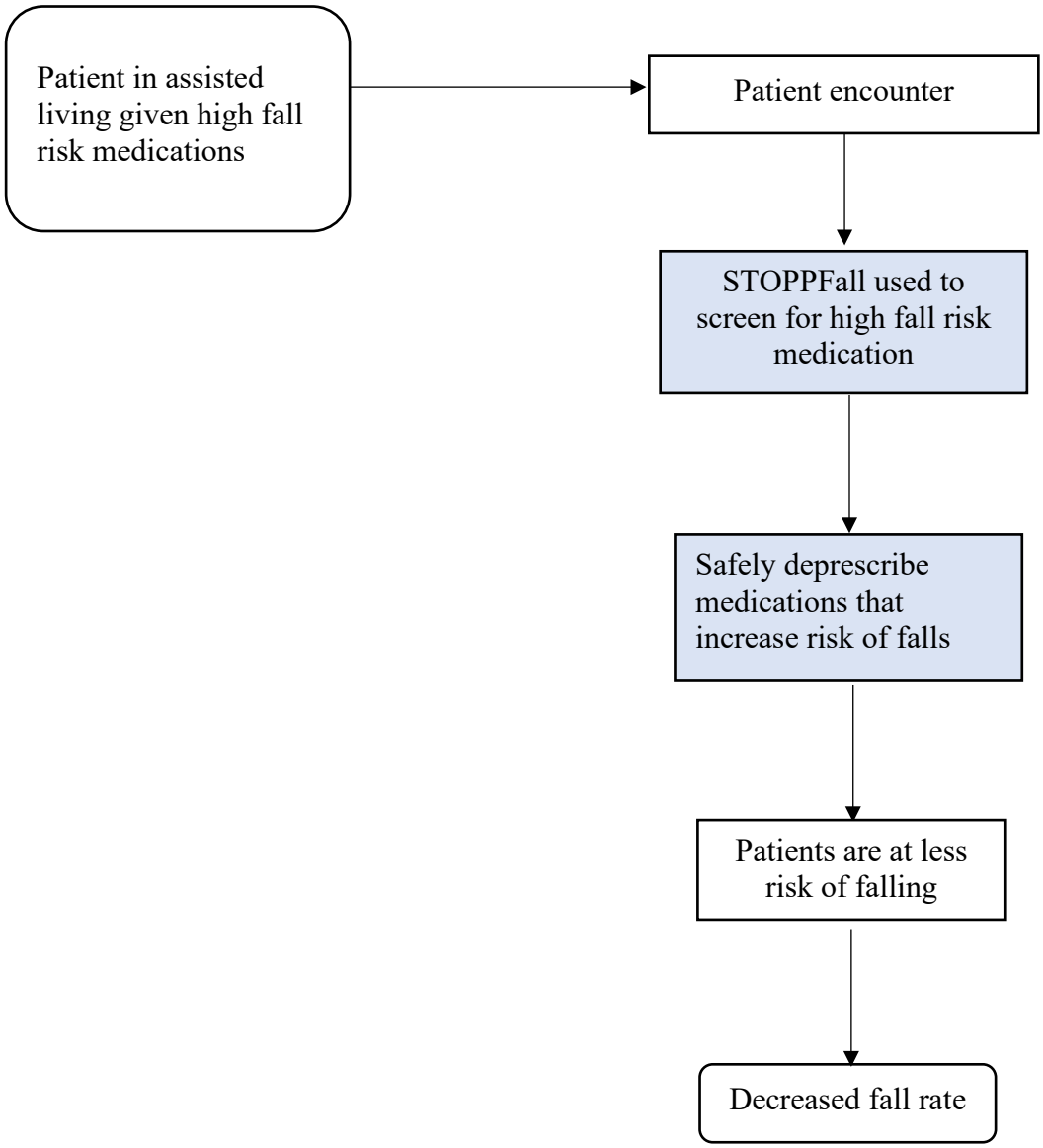
Appendix C.

Knowledge to Action Framework (Graham et al, 2006).



Appendix D.

Desired Process Map.



Appendix E.

Education Handout.

STOPPFall Education Handout

1). Practice change

Screening for high fall risk medications during provider patient encounters

2.) Use Screening Tool of Older Persons Prescriptions in older adults with high fall risk (STOPPFall)

Antipsychotics	• Risk difference is related to variation in (i) sedative, (ii) anticholinergic and (iii) alpha-receptor properties
Opioids	• Strong opioids are more fall-risk-increasing than weak opioids
Antidepressants	• Tricyclic antidepressants (TCA's) are more fall-risk-increasing than others • Risk difference is related to the variation in (i) sedative effects, (ii) propensity to cause orthostatic hypotension and (iii) anticholinergic activity
Anticholinergics	• Medications with high anticholinergic activity are more fall-risk-increasing than weak anticholinergics
Antiepileptics	• Older generation antiepileptics are more fall-risk-increasing than newer antiepileptics • Risk difference is related to the variation in sedative effects
Diuretics	• Loop diuretics are more fall-risk-increasing than other diuretics
Alpha-blockers for benign prostatic hyperplasia	• Non-selective alpha-blockers are more fall-risk-increasing than selective
Antihistamines	• First-generation antihistamines are more fall-risk-increasing than second-generation antihistamines • Risk difference is related to variation in (i) sedative effects and (ii) anticholinergic activity
Medications for overactive bladder and urge incontinence	• Risk difference is related to variation in anticholinergic activity
Oral hypoglycaemics	• Oral hypoglycaemic agents that can cause hypoglycaemia, sulfonylureas, are more risk-increasing than other agents

Seppala, L., Petrovic, M., Ryg, J., Bahat, G., Topinkova, E., Szczerbinska, K., Van Der Cammen, T., Hartikainen, S., . . . Van Der Velde, N. (2021). STOPPFall (screening tool of older persons prescriptions in older adults with high fall risk); a Delphi study by the EuGMS Talk and Finish Group on fall-risk increasing drugs. *Age and Aging, 50*(4), 1189-1199. https://doi.org/10.1093/ageing/afaa249

3.) Document

Upon screening for high fall risk medications document findings on the STOPPFall Audit tool

Appendix F.

Computer reminder.

Did you screen for high fall risk medications today?

Appendix G.

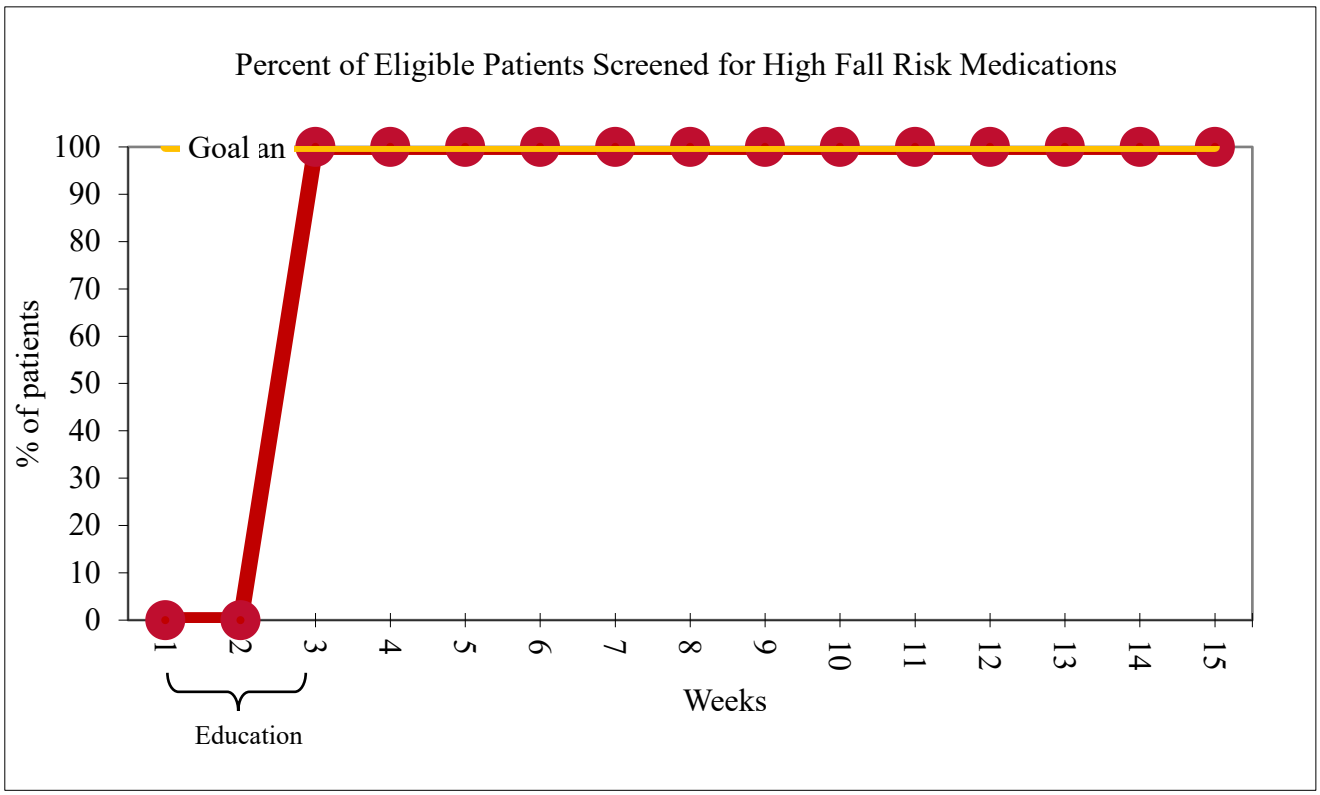
STOPPFall Audit Tool.

STOPPFalls Audit Tool

Record ID	_____
MRN	_____
Date of patient encounter	_____
Was the STOPPFalls tool used during the patient encounter?	◯ Yes ◯ No
Why not?	_____
Is the patient currently prescribed high fall risk medications?	◯ Yes ◯ No
List medications and the documented indication	_____
Is the medication able to be safely deprescribed or dosage decreased?	◯ Yes ◯ No
Why not?	_____
Was a pharmacist consult placed?	◯ Yes ◯ No
Did the patient have a reported fall in the last month?	◯ Yes ◯ No

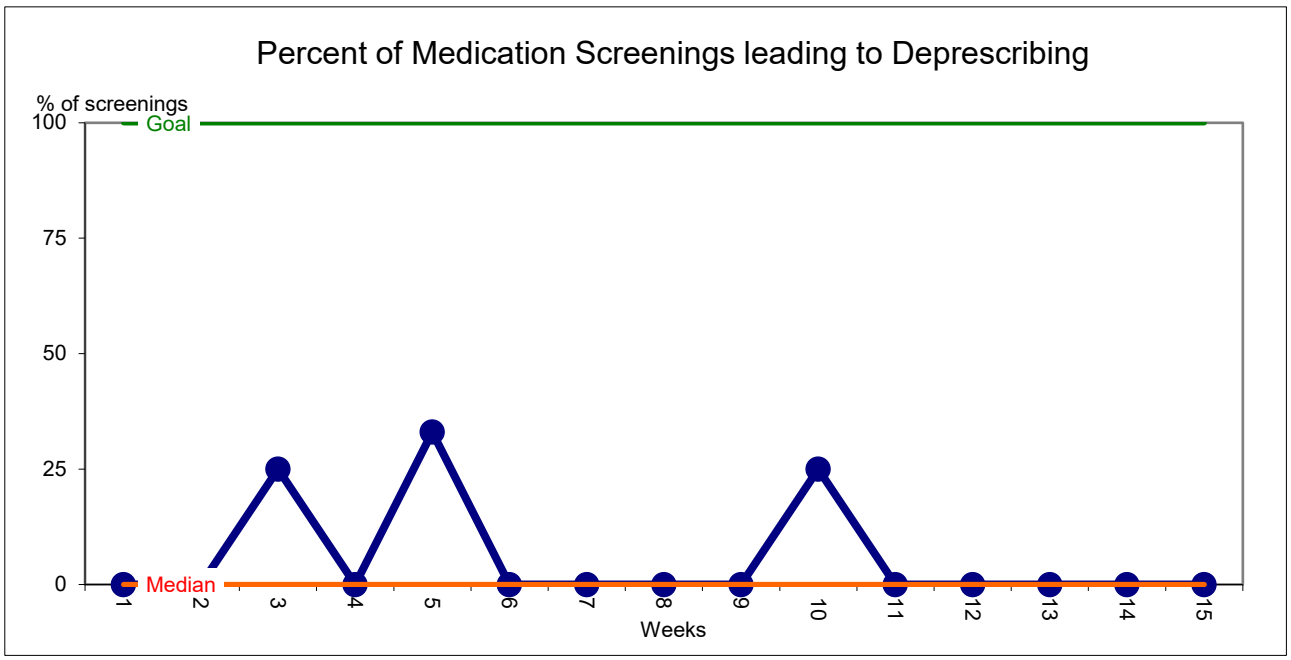
Appendix H.

Run chart of completed screenings.



Appendix I.

Run Chart of Screenings that led to Deprescribing.



Appendix J.

Weekly Fall Rate.