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Implementation of a Polypharmacy Deprescribing Protocol Among Older Adults in a Community-based Care Organization

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A Doctor of Nursing Practice Scholarly Project

By

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Abstract

Background: Polypharmacy, defined as the use of five or more medications, has the potential to increase morbidity, mortality and decrease quality of life. Older adults are disproportionately affected by polypharmacy. Decreasing polypharmacy could prevent morbidity and mortality while saving millions of dollars annually. The use of the ARMOR tool has been shown to decrease polypharmacy and the prescribing of inappropriate medications among the elderly.

Local problem: There is a high prevalence of polypharmacy among older adult patients at the managed care organization where this quality improvement project was implemented. Among a panel of 30 members, almost all (n=29) were taking at least 10 medications.

Methods: The ARMOR tool, was implemented using a polypharmacy deprescribing protocol among older adults in a community-based care organization. This quality improvement project tested the feasibility, acceptability, and effectiveness of the ARMOR tool among older adults enrolled in a managed care organization in Massachusetts. Older patients taking 10 or more medications were eligible for a multidisciplinary team-based review using the ARMOR tool. The ARMOR tool was used as a guide using sequential steps in deciding whether medications should be discontinued.

Intervention: The ARMOR tool was used to enhance knowledge and deprescribe as necessary with primary care provider approval. During the twelve-week implementation, older adults taking 10 or more medications were screened using the ARMOR tool's criteria. The clinical pharmacist was consulted as necessary.

Results: Following the implementation of the ARMOR step by step process, there was a meaningful decrease in polypharmacy for those participants who could complete all phases of the tool. Thirty patients were deemed eligible for the pathway; 30% (n=9) were able to complete all phases of the ARMOR tool. Of these nine members, there was an 18 percent decrease in the number of medications prescribed.

Summary: For those patients in whom the full ARMOR tool could be implemented; there was a clinically significant improvement in polypharmacy. However, in the majority of patients, clinicians were not able to complete the final step in the ARMOR tool which was to coordinate deprescribing with the PCP. Education about polypharmacy and organizational changes to partner with primary care providers around polypharmacy is needed.

Keywords: ARMOR tool, polypharmacy, older adults, deprescribing tools, prescription of inappropriate prescribing, drug interactions, adverse drug events.

Introduction

Polypharmacy is a significant problem for both the elderly and the healthcare system. An increase in the number of medications that are taken, especially if an elderly patient is taking five or more medications increases the risk for adverse drug events: including adverse drug interactions, medication non-adherence, and reduced functional capacity such as neurological impairments and increase incidents of falls.

Despite the high prevalence and known issues, there is no real consensus definition of polypharmacy, although it is commonly accepted as five or more medications (Masnoon et al., 2017). The term polypharmacy is often used when multiple medications are used by a patient or when more drugs are prescribed than clinically necessary (Haque, 2009). Eighty percent of the elderly are on as many as seven medications while fifty eight percent takes five or more (Cantlay et al., 2016). Polypharmacy and associated adverse drug events were responsible for approximately 100,000 emergent hospitalizations in the older adult population and approximately 136 billion dollars are spent annually on the treatment of over 2 million adverse drug events (Terrery & Nicoteri, 2016). Polypharmacy and the use of inappropriate drugs have immediate consequences on drug interactions, adverse effects, higher frequency of required healthcare visit, and functional outcomes.

The number of older adults dealing with polypharmacy is growing rapidly due to disease-specific guidelines that recommend multiple drugs at lower doses to attain the best possible health outcomes with the minimum of side effects (Nobili et al. 2011). Despite public health advances that have increased the life expectancy of older adults by 30 years, the risk of developing a chronic disease increases as individuals age, which in

turn, could lead to multiple medications being prescribed. The potential for increased problems with polypharmacy can occur when patients are prescribed medications by multiple healthcare providers as a result of fragmented care. System-level factors which contribute to polypharmacy are related to poorly updated medical records, the use of multiple specialties and lack of communications between providers, automatic refills of medications that have already been discontinued by providers and the lack of consistency in using just one pharmacy (Halli et al., 2019).

Local Problem

At the organization where the project was carried out, there is a high prevalence of polypharmacy among the elderly members. A preliminary review of one provider's panel of 72 members revealed that of the 30 members who were ages 60 and older, every member (n=30) was on ten or more medications, and most were taking in excess of 10 medications a day. Of note, 16 members (52%) were taking 10 to 19 medications, eight members (28%) were taking between 24 to 27 medications and six (20%) were taking 31 medications. This illustrates the complexity and the magnitude of the polypharmacy issue among patients seen at this organization.

The factors associated with polypharmacy at the site managed care organization include but are not limited to a lack of protocol to identify members that are on 10 or more medications and multiple comorbidities. Due to the volume of members served by each clinician, it can be challenging to manage member's polypharmacy without a set protocol in place and the collaboration of each team and primary care provider (PCP). Active collaboration is needed between the PCP's and the clinicians at this organization to better manage polypharmacy for all members that are 60 years of age and older.

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Available Knowledge

A Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guided literature search examined effective strategies for reducing polypharmacy. The databases searched included: Cumulative Index to Nursing and Allied Health Literature (CINAHL), Cochrane, OVID, and NLM journal articles database (PUBMED). The key terms used were *ARMOR tool, polypharmacy, older adults, deprescribing tools, prescription of inappropriate prescribing, drug interactions, adverse drug events*.

To identify potential solutions to decreasing polypharmacy, the literature search focused on answering the PICO question, "Among older adults aged 60 and older, what strategies have been shown to decrease polypharmacy?"
Deprescribing is an important step in making sure medications are reconciled effectively, and in ensuring safety, and preventing prescribing cascades. There are several literature reviews and guidelines that show how polypharmacy is higher in older individuals and those with complex morbidities and highlight the negative correlation with prescription of inappropriate medication (PIM) and polypharmacy. Best et al. (2013) agree that trends of polypharmacy in the elderly often ended up in incomplete medical histories and mistakenly, providers end up prescribing more medications than needed, thereby increasing the problem of polypharmacy.

Complex medication regimens can sometimes be a burden even in the most committed patients. Cadogan et al., 2016) state the concern of polypharmacy may be resolved through a step-by-step protocol like the ARMOR tool. It is recommended for

providers to advise patients to only take medications that have been prescribed, as this will reduce chances of drug-drug interactions (Nawaz et al., 2015). The use of Proper protocol or procedure has improved adherence to medication regimens (Nawaz et al., 2015). Many clinicians are familiar with the Beer' s Criteria ((Dagli & Sharma, 2014), but may not be familiar with other guidelines/tools such as the Assess, Review, Minimize, Optimize, and Reassess [ARMOR] tool.

The ARMOR tool was developed to aid in evaluating and protecting patients from prescriptions of inappropriate and possible harmful medications in the elderly population. It focuses on identifying the indication and efficacy for medications (Witticke et al., 2013). It takes into consideration the patient's overall medical plan and functional status. The ARMOR tool also takes a closer look at a patient's quality of life prior to making decisions on decreasing or discontinuing medications. The use of the ARMOR tool requires an effective multidisciplinary approach which includes involvement from nurses, providers, pharmacists, and physical therapists as needed.

Several studies report that the application of the ARMOR tool has led to a considerable reduction in polypharmacy, reduction of cost of care, and decrease in hospitalization in settings where it was implemented as part of a quality improvement project (Dagli & Sharma, 2009; Haque, 2009). The ARMOR framework provides a step-by-step and structured approach for a thorough analysis of current medications taken while accounting for most of the prescription's aspects. The ARMOR tool incorporates the Beer criteria in the assessment phase of deprescribing Dagli & Sharma (2014).

Residents showed a decline in the frequency of falls and other harms when the use of the ARMOR tool was used to reduce unnecessary medications (Haque, 2009).

Additionally, the ARMOR tool supports the idea of optimizing and re-evaluating the risk-benefit of any pharmacological agent and possible drug-body and drug to drug interaction (Sechana et Rashmi, 2020).

This review of the evidence suggests that the ARMOR tool can be useful in decreasing the number of medications being prescribed which in turn has been found to decrease drugs and adverse events; and to promote an efficient and intentional approach for a systematic analysis of medications while being deliberate about most of the prescribing aspects in improving quality of life of the patient. Equally important, the tool fits with the needs of the organization where this improvement project was undertaken. Therefore, implementation of the ARMOR tool will be the foundation for the project intervention.

Rationale

This project was guided by the Evolution of Care [EMOC] model which is utilized at the organization where the improvement project was carried out. The model emphasizes the need for in-depth comprehensive health delivery processes in order to successfully implement complex interventions in the homecare setting. In alignment with EMOC, the organization provides quality, compassionate care that meets the unique needs of each member. This approach to care is based on every member having a dedicated team to coordinate all aspects of their care plan. Care is delivered in interdisciplinary teams with clinical and nonclinical caregivers chosen to meet the member's needs. This care model focuses on including members and their families in the day-to-day planning of current and future care according to their goals and wishes.

Clinician's such as advance practice providers and registered nurses are available to assist with home visits for members that are not able to participate in telehealth. Members can improve their quality of life and stay in their home, or other settings, of their choosing.

The process of implementing this change project was guided by Kurt Lewin's Change Management Model in the 1940s. This model helps in understanding innovative organizational change (Bozak, 2003). The Unfreeze – Change – Refreeze refers to the three-stage process of change. The theory suggests providers in a busy workplace setting are subject to forces that resist change and often deter the need to follow guidelines closely.

The Lewin's change theory for this quality improvement project was chosen to guide and improve the prescribing process in adults 60 and older using the ARMOR tool and in turn decrease polypharmacy and deprescribing of inappropriate medications. To initiate change, discussions initially started about the restraining or static forces that prevented change and focused on unfreezing those forces. Some restraining forces identified were providers resistance to changing prescribing patterns, lack of knowledge of implementing the ARMOR tool, newer providers not having the necessary skills to initiate discussions about polypharmacy in older adults, high workload and time constraints. During the unfreezing stage, polypharmacy was identified as a priority problem. (Bozak, 2003).

 Based on the evidence and fit with the organization, the project will implement the ARMOR tool to assess opportunities for deprescribing.

Specific Aims

The purpose of this improvement project was to decrease polypharmacy and the prescription of inappropriate medications among older adults enrolled in a community-based care program. The overarching goal was to design, implement and evaluate a deprescribing pathway, and empower prescribing clinicians in using the ARMOR tool. These goals were accomplished by the following objectives:

Objectives:

1. Identify 30 community dwelling elders' age 60 or older on 10 or more medications and bring them to huddle.

2. The ARMOR tool will be used to assess all 30 identified patients who met criteria of polypharmacy and a list of recommendations regarding the medication regimen will then be sent to the primary care provider for review and approval.

3. Medication use will be reduced by at least 10% for this group of community dwelling elders.

Methods

Context

This project took place at a not-for-profit community-based healthcare organization devoted to better the health of individuals who are dually eligible for MassHealth (Medicaid) and Medicare. Most of the eligible members have complex medical, behavioral health and social needs, as well as some physical disabilities. This organization offers two types of health plans: One Care program for dual eligible

individuals ages 21 to 64 and Senior Care options for individuals ages 65 and over who have Medicare and Medicaid as well as four different sites across the state.

This organization provides members with a comprehensive range of services that includes preventive care, medical and dental care, behavioral health care, durable medical equipment, and social services and supports. Utilizing The EMOC model provides an individualized, patient-centered, and comprehensive plan of care. Each member has a dedicated care manager (usually a registered nurse if the primary diagnosis is medical and a social worker if the primary problem is behavioral health) and a care team that includes advance practice clinicians, registered nurses, licensed social workers, occupational and physical therapists, and pharmacists who meet on a daily basis to discuss patients. The care manager coordinates patient-specific services wherever the member needs them, whether at their home, via video/telehealth or in a medical office. The microsystem assessment found in Appendix (G) provides additional context for the organization.

Using a cause-and-effect diagram to illustrate the factors associated with polypharmacy in patients care Appendix (B) the primary cause identified was the lack of a centralized process to manage members that are on ten or more medications. Although there is a team pharmacist available for consults as needed, the pharmacists are not identifying or overseeing all the members that are on ten or more medications. The pharmacists are working independently through this process and the team advance practice clinicians are not being utilized. There are currently no policies or written process that identifies or targets members on ten or more medications or to identify the need to deprescribe with the collaboration and approval of the Primary Care provider.

Another caveat is that the care partner for members that are on multiple medications are not always a registered nurse. If the member's primary problem is behavioral health, many of the care partners are licensed social workers, who do not have the medical knowledge to identify polypharmacy and medications that are harmful to the members. Furthermore, on average the care partners are assigned approximately 150-250 members who are complex, medically and mentally, and must prioritize their acute needs such as housing, ordering supplies, medications refill throughout the day. These factors make it difficult for the assigned social workers to keep track of members who are on inappropriate medications or members that can be flagged for the possibility of deprescribing or harmful medications.

The intervention would address key factors such as removing duplicate and high-risk medications using the ARMOR tool and the Beers criteria, streamlined, and coordinated care between specialties, assessed functional status for each medication, avoided adverse drug reactions and inappropriate prescribing by assessing patients as a group and made a coordinated plan for polypharmacy.

There are several contextual factors specific to this organization that have implications for successful implementation of this improvement project. A force field analysis Appendix (B) was constructed to illustrate the driving and restraining forces that will influence the success of implementing the ARMOR tool and deprescribing protocol. A lack of buy-in to reinforce coordination between the APCs at the current organization and the PCPs. Furthermore, there is a lack of coordinated approach that integrates all team members which can be related to conflict in scheduling, lack of time and high case load amongst staff members. The discussions started about the restraining or static forces

that enhance or prevent change and focused on providing new ways of thinking and integrating of new system of practice into existing processes. Some of the driving forces for this quality improvement project are organizational expectations for meeting and exceeding safety standards, needing better benchmarks for polypharmacy, monitoring medication changes in a systematic way (using the ARMOR tool by all clinicians) and achieving a higher level of patient safety and quality of life. Some of the restraining forces are providers resistance to changing prescribing patterns, lack of confidence with identifying medications that may be inappropriate, lack of skills to initiate discussions about potential inappropriate medications, as well as time constraints. Successful implementation helped build on the driving forces and helped manage the restraining forces with continuous collaborations from each team member as well as the support from leadership.

Project Intervention

The improvement project implemented a polypharmacy deprescribing intervention using the ARMOR tool which is illustrated in Figure 1. A full- page copy of the intervention is contained in Appendix G. The project leader, who served as the advanced practice nurse for this project, reviewed her panel of 80 members and identified members who are 60 and older and on 10 or more medications with complex needs and high risk for polypharmacy based on co-morbidity. She brought these individuals up for discussion during the interdisciplinary morning team huddle (Step 1). Next, the project leader assessed these individuals using the ARMOR protocol (Assess, Review, Minimize, Optimize, Reassess) using the Beer criteria (Step 2)

Using the ARMOR tool in step 2, the 30 members brought to huddle were evaluated by the project leader for the total number of medications they are on and for certain groups of medications such as beta blockers, utilization of the Beers criteria, pain medications, antipsychotics or psychotropics medications, vitamins, and supplements. The project leader also reviewed electronic medical record and identified common over the counter/ prescription interactions (i.e antacid medications, iron supplements, and thyroid medications; coumadin and aspirin), any duplication of medications and any medications that were added to treat side effects of another medications (step 3).

 If the member was on fewer than 10 medications, they were not reassessed at the morning team huddles as previously planned due to time constraints. The plan for future PDSA cycle is to reassessed members on 10 or less medications at each subsequent interdisciplinary team huddle to determine if they have had mediations added and now meet the criteria for polypharmacy.

If upon the initial review, the member was on 10 or more medication, and was brought to the team morning huddle, the Review phase of the ARMOR tool was utilized to review possible drug-drug interactions, impact of functional status, subclinical adverse drug reactions were weighed for individual medication benefits against appetite, mood, weight, pain, and activity level. In Step 4, when deprescribing was needed for unnecessary/redundant/unsafe medications, the project leader collaborated with the primary care provider and made recommendations to minimize and optimize the medications the member was on. Medication recommendations were based on the member's renal and liver function as well as adjusting dosage by considering the effects on the patient's body such as blood sugar, pulse, and blood pressure. Minimizing focused

on decreasing or discontinuing nonessential medications that does not have clear evidence for their use, as well as medications whose risk outweigh benefits and had the potential for negative impact on primary functions. Optimizing focused on addressing duplication and redundancy. For the individuals whose primary care provider were not able to be reached, the individual continued their medications as prescribed (Step 4a). For those that the primary care provider agreed with the deprescribing plan (Step 4b), the project leader scheduled a visit with the member and/or caregiver to discuss medication changes. After the scheduled visit was completed (step 5), the project leader contacted the primary care provider's office within 48 to 72 hours and discussed the outcome of the visit. During the final step (6), reassessment of the ARMOR tool, project leader scheduled follow up visit with member and or caregiver within 1-2 weeks to monitor functional status, medication adherence, blood pressure monitoring, heart rate, blood sugar level, bowel pattern, fall risk, appetite, and sleep as needed.

The patient and/or caregiver were involved in shared decision making regarding any medications which were discontinued or changed.

Polypharmacy ARMOR Deprescribing pathway

Step 1
Project leader reviewed a panel of 80 members and identifies 30 complex members that are 60 years and older and on 10 medications or more and bring them for discussions to morning huddle.

Step 2
Project leader **Assess** member's total medications and identified certain groups of medications such as beta blockers, pain medications, antipsychotics or psychotropics medications, vitamins and supplements, common OTC/ prescription interactions (antacid medications, iron supplements, thyroid medications, members on both coumadin and aspirin, any duplication of medications and any medications that was added to treat side effects of another medications

Step 3
Project leader **R**eview possible drug-drug interactions, impact of functional status, subclinical adverse drug reactions were weighed for individual medication benefits against appetite, mood, weight, pain, activity level.

Step 4
When deprescribing was needed for unnecessary/redundant/unsafe medications, the project leader collaborated with the primary care provider and made recommendations for **M**inimizing and **O**ptimizing the medications the member was on.

Step 4a	**Step 4b**
For the individuals whose primary care provider were not able to be reached, the individual continued their medications	For those the primary care provider agreed with the deprescribing plan, the project leader scheduled a visit with the member and/or caregiver to discuss medication changes.

Step 5
After the scheduled visit, project leader contacted the primary Care Provider within 48 to 72 hours and discussed the outcome of visit.

Step 6
Project leader scheduled follow up visit with member within 1-2 weeks to monitor member's blood pressure, heart rate, bowel pattern, fall risk, appetite, and sleep.

Implementation of the intervention

For the plan phase of this PDSA cycle, the project leader sent a copy of the proposed QI project abstract to the clinical manager, team director and the vice president of the manage care program to get their approval. The project was then discussed further with the team manager during a 30-minute one-to-one session. The program manager gave approval for the project leader to implement the ARMOR tool within the panel of the project leader. Furthermore, the project leader met with the clinical pharmacist who was also the site champion for 30 minutes and discussed the aim, targeted population, the ARMOR tool, time frame of the project, the current problem of polypharmacy in the organization and how it can be addressed.

During the "study" phase of the PDSA cycle, data related to age, sex, gender, and the number of medications prescribed for current health problems was collected throughout the first 6 week of this quality improvement project from the electronic health record then analyzed for an additional 4weeks. The data collected was analyzed by the project leader and evaluated to determine if the project outcomes and objectives were met or if there were any unintentional effects of the intervention.

The last phase, "Act", the project leader will translate the findings into actions and share the results with stakeholders. The main objective is for this community-based care organization to utilize the ARMOR tool for all medications reconciliation as part of their practice routine to decrease polypharmacy in all individuals taking 10 or more medications.

Evaluation of the improvement

The ARMOR tool, appendix (G) was an integral part of the evaluation of the intervention and utilized five phases including assess, review, minimize, optimize, and reassess in all reachable members. To measure the efficacity and effectiveness of the ARMOR tool in optimizing and monitoring prescription patterns during post implementation, data collection and analysis was performed using Microsoft Excel. Furthermore, pre and post implementation data and member's subjective and objective data such as cognitive status and function, vital signs, and medication compliance was reviewed.

Measures and Analysis

Measures for the project aims and outputs were measured using both quantitative and qualitative measures. Additionally, the logic model in appendix D and the PDSA (Plan Do study Act) cycle guided the evaluation of the success of implementing, evaluation, and modification of the project.

1. Objective #1, *Identify 30 community dwelling elders' age 60 or older on 10 or more medications and bring them to huddle*. Polypharmacy was defined as being on at least 10 prescription and nonprescription medications. Evidence that 30 eligible patients being identified was abstracted from the Electronic Health Record (EMR) and noted on a tracking tool. The 30 members on 10 or more medications enrolled, suggested successful accomplishment of this objective

2. Objective #2, *The ARMOR tool was used to assess all 30 identified patients who met criteria of polypharmacy and a list of recommendations regarding the medication regimen will then be sent to the primary care provider for review and approval.*

Attainment of this objective was defined as documentation in the patients EMR that all elements of the ARMOR tool (assessment, review, minimize, optimize, and reassess) were met. The measure was operationalized as the proportion of intervention elements that were implemented in relation to the number of participants. Evidence was abstracted from documentation of the step in the chart and recorded on a project log using Microsoft Excel. Upon successful implementation of the pathway, pre- and post-chart audits were completed, data related to medications per member were gathered using both the total of medications and the category or class of medication per member (See appendix F). The primary care provider was contacted to make a judgment as to any changes needing to be made to the older adult medication

  3. Objective #3, *Medication use will be reduced by at least 10% for this group of community dwelling elders*. Medication reduction was measured by comparing the number of medications the members who participated in the QI project were on prior to the intervention in comparison to the number of medications the participants were on post-intervention. (See appendix F). This information was abstracted from the electronic health record at baseline and at the end of the six-week data collection and the additional 6 weeks data evaluation and analysis. Descriptive statistics such as frequencies, proportion, mean scores, and percentage were used to evaluate the success of this objective. The percent improvement (reduction in medications) was measured using the formula (# meds post intervention minus # meds pre-intervention (change) divided by the # meds pre-intervention times 100).

Ethical Considerations

This project was developed as a quality improvement initiative and was not used for research purposes or designed to address a research problem. As noted in the Clinical Quality Improvement Checklist (Appendix F), the project followed established techniques used in quality improvement, such as PDSA, and did not follow a research design. The project involved the implementation of an established tool, adapted to the needs of the organization, with the purpose of improving the quality of care.

The project was discussed with the clinical manager at the community-based care organization, who approved the project as a quality improvement project, designed to improve the process and delivery of care and does not require IRB approval. The project or innovation proposed is a quality improvement and does not meet the definition of human subject's research because it is not designed to generated generalizable findings but rather to provide immediate and continuous improvement feedback in the local setting in which the project is carried out. The University of Massachusetts Boston IRB has determined that quality improvement projects do not need to be reviewed by the IRB.

Results

The project team lead reviewed her panel of 80 patients and identified those patients who were age 60 and older and on 10 medications. From this list, 30 patients were identified for inclusion in this improvement project. The majority of participants were women (57%; n=17) and all were over 60 years of age with a mean age of 62 years (age range 60 to 76). All were dually eligible Medicare and Medicaid which is a proxy for low socioeconomic status. The members ethnicities were not evaluated.

These patients were brought to the team huddle, and the patient's medications were discussed including the assessment and review component of the ARMOR tool. The team huddle involved two community advance practice clinicians, four care partners, one community registered nurse and the team pharmacist, clinical director and medical director depending on their availability. Following the huddle, the project leader further analyzed the members medications using the optimization and minimizing phase of the ARMOR tool. If it was determined that there were medications which could be discontinued, the project leader called the primary care provider to discuss minimizing polypharmacy and inappropriate medications. The aim of identify 30 members who met the eligibility criteria for the deprescribing pathway was met.

Of the 30 members with polypharmacy brought to huddle the project leader used the ARMOR tool to assess and review each member's medication list including the number and category of both prescription and over-the-counter medications they were on. Following this review, all 30 members were considered candidates for deprescribing, and the advanced practice nurse contacted the primary care provider to discuss optimizing and minimizing the inappropriate medications. . . Up to this stage of the deprescribing pathway, the project leader was able to implement the **A**ssess and **R**eview phase for all members. Only nine primary care providers were reachable (30% response rate). The goal was that 100% of eligible members would be included in all aspects of the pathway. Although 100% (n=30) of the participants were assessed, reviewed, and ready for optimizing and minimizing their medications, only 30 percent(N=9) completed the entire pathway due to breakdown in communication with the primary care provider. For those patients who completed the pathway and had medications deprescribed (n=9), the project

leader scheduled a follow up visit within 1 week after the completion of the pathway to reassess vital signs as well as functional and mental status. Objectively there were no significant changes in vital signs, the vital signs were stable. Additionally, all members appeared more engaged in their medication schedule post implementation. Subjectively, all nine members who completed the pathway self-reported improvement in functional and mental status. One patient was on multiple sedative medications and self-reported improvement in functional status.

The demographic characteristics of the nine patients who participated in all steps of the deprescribing pathway were similar to the demographic characteristics of all eligible patients. The average number of medications pre implementation of the ARMOR tool was 22.5 with a range of 10 to 30 medications per person. Post implementation, the average number of medications was 18.8 which represents a reduction of four medications per person. Thus, for those patients in

Mean Number of Medications Pre and Post Intervention

N=18.8

N=22.5

Axis Title

Axis Title
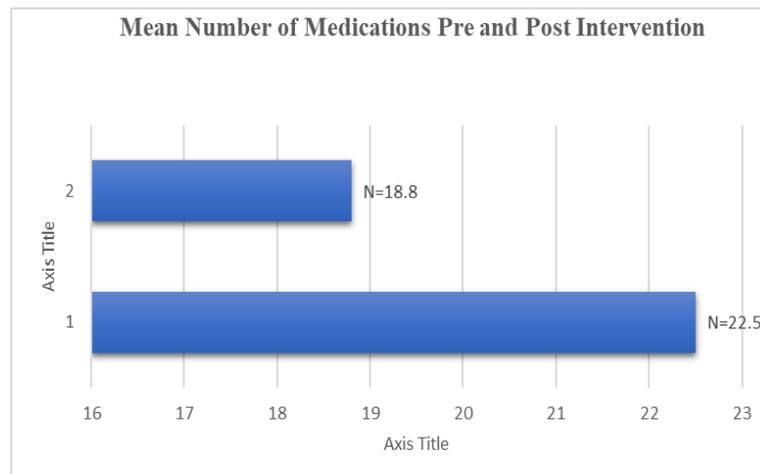
whom the complete pathway could be implemented, there was an overall improvement of 18%, which meets and exceeds the goal of reducing medications by 10%.

CHANGE IN MEDICATIONS USE

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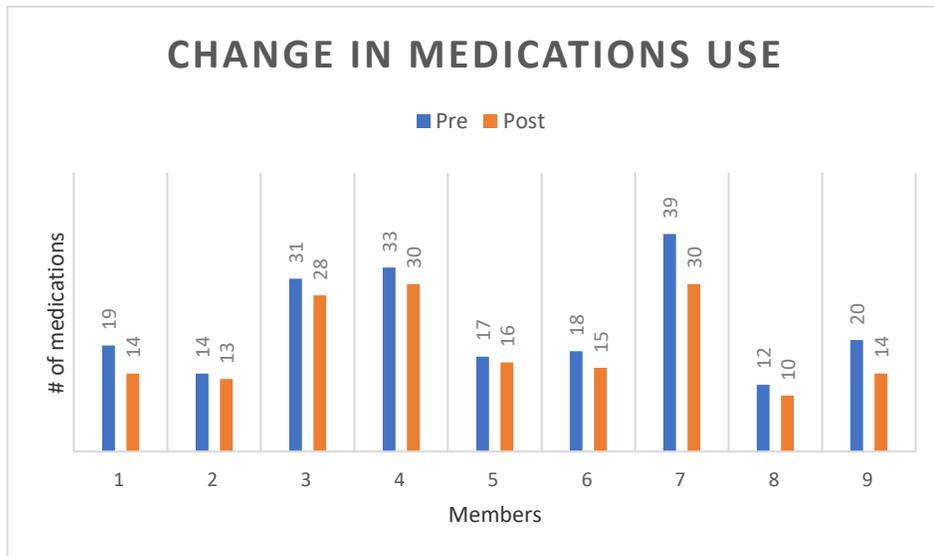
Discussion

Summary

The aim of this quality improvement project was to decrease polypharmacy and prescription of inappropriate medications among older adults enrolled in a community-based managed care program.For those individuals who could be included in the full deprescribing pathway, this aim was met. The project advanced practice clinician was able to identify members who met the criteria of polypharmacy through an electronic chart review and the use of the ARMOR tool guided the deprescribing of inappropriate medications. The success of this project validated the importance of routinely reconciling medications. This quality improvement findings revealed success in reducing polypharmacy using the ARMOR tool and meeting the objectives of this project. The findings demonstrate that if a deprescribing intervention based on the ARMOR tool is

fully implemented that members within a community-based care organization who are identified with polypharmacy can reduce the number of medications prescribed.

For this PDSA cycle, the 30 members who were 60 and older and taking 10 or more prescribed or non-prescribed medications were identified from a panel of 80 members by this project leader. This means that 38%, or a little more than one out of every three members in the providers panel met the criteria for polypharmacy. The high prevalence of polypharmacy indicates the importance of implementing this deprescribing pathway.

A primary goal of this QI project was a 10% improvement (reduction) in the number of prescribed and non-prescribed medications. The deprescribing process effectively changed the number of medications taken by 18.8% from the reachable nine members, which exceeded the goal of 10%. A reduction in number of medications taken has shown to increase compliance, improve quality of life and members being more active with activity of daily living. Many of the older adults has initially reports concerns on being on several medications and were ready to have at least one medication de-prescribed and did not report concern regarding this decision. The success of the 18.8% reduction in medications were largely due to the nine reachable PCPs willingness to accept the recommended changes.

Although the project was successful for those individuals who could complete the pathway, the majority of eligible members (70%) were not able to complete the pathway. The primary reason for this was that the project leader was not able to connect with the primary care physician. The project leader made three attempts for each member at

different times of the day to widen the likelihood of reaching the PCPs office. The

project leader ed call the provider's office and the secretary was not reachable or the

provider would get the answering service. At times, the project leader would reach the

secretary and inform them of the deprescribing intervention using the ARMOR tool and

the plan to deprescribe, and requested that the provider return the call to discuss. These

failed attempts made it difficult for the project leader to move on to the last 3 phases of

the ARMOR intervention (minimize, optimize, and reassess) for the majority of eligible

patients.

Plausible explanations for the difficulties in reaching the PCP could be ascribed to

not enough buy-in and possible system failures between the managed care organization

and the PCP's office. Many of the PCPs do not understand the role of the managed care

advance practice clinicians in the patient care, in addition to the members seeing their

PCPs.   If more collaboration were in place in the form of quarterly or semiannual

meetings between the organization stakeholders (medical director, clinical manger and/or

the program director) this could potentially help the organization work together to

improve patient outcomes. Furthermore, the low response rate of the PCPs could also be

associated with possible high caseload and time constraint from the PCP. Finally, the

excess time needed to safely de-prescribe, as well as the complexity in discussing these

complex members can add some hesitancy and limitation in deprescribing. Formalizing

and streamlining communication for deprescribing between the managed care advanced

practice nurse and PCP could help alleviate this issue.

This pre-pilot, or first PDSA cycle, was implemented by the project leader who is

an advanced practice provider at the managed care organization. Many important lessons

were learned including the high prevalence and magnitude of polypharmacy among the patients. The initial chart audit of all 30 members showed a total of 602 prescribed and non-prescribed medications. Of the nine members who completed the entire pathway, there were a total of 203 prescribed and non-prescribed medications.

For future PDSA cycles, it would be beneficial to scale-up use of the deprescribing pathway and include all members, care partners and advance practice clinicians (APCs) in fully utilizing the pathway. To do that, staff, including APCs, stakeholders, pharmacists, and care partners, would need to be oriented to the tool. One way to do that could be a 30-minute in-service of the ARMOR tool implementation during one of the weekly two hours Interdisciplinary Team (IDT) meeting. Important messaging that could be integrated into this educational initiative include but are not limited to:

> ➢ A large amount of evidence-based literature supports the risks of polypharmacy and an already established tool like the ARMOR tool has been shown to be successful in multiple populations (Haque, 2009).

> ➢ There is a high prevalence of polypharmacy in the site managed care organization. The ARMOR tool implementation was effective in identifying prescribing of inappropriate medications for all the nine members who completed the entire pathway. This finding is aligned with the published literature.

> ➢ Provider can successfully identify polypharmacy, assess inappropriate meds and opportunities for deprescribing using similar tools like the ARMOR.

➢ The results revealed medication reconciliation is necessary, using an evidence-based tool in older adult to help expose prescribing of potentially inappropriate medication.

Conclusion

Polypharmacy is a public health crisis particularly among older adults with numerous comorbidities and who are socioeconomically challenged. Implementing an interdisciplinary deprescribing pathway that utilized the ARMOR tool was effective in reducing polypharmacy in this managed care organization in a population that was diverse and socioeconomically disadvantaged. The primary challenge to deprescribing utilizing the pathway was care coordination between the managed care organization and the primary care provider. Despite these caveats however, this project demonstrated that when a standardized deprescribing pathway which utilized the ARMOR tool is used in eligible managed care patients, and if the patients can be brought through the full pathway, deprescribing is possible. Improving collaboration with primary care providers would be critical to improving the number of patients who could benefit from the intervention.

It is also be important to continue research in this area. Interventions focusing on polypharmacy are complex and lack broad evidence of effectiveness. Although research has showed some optimistic results with the utilization of the ARMOR tool, there is no set guidelines for deprescribing, and implementation is complex as noted in this project. Additional research should be done that focus on different patient populations with polypharmacy to strengthen the evidence base of the ARMOR tool in deprescribing and polypharmacy reduction.

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Appendix A

Table A1: Summary Table

Number of studies	Study intervention	Leve/Quality of study	Findings
Intervention: Deprescribing protocol			
Bilyeu et al (2011)	An algorithm to guide the staff during medical assessment and medication reconciliation upon admission	VB	46% of the PIMs identified in the cohort, providers chose to either discontinue the medication, or change the medication to a safer dose, or safer medication
Haque, R. (2009)	The use of the ARMOR tool in a LTC facility with an interdisciplinary team–based approach.	V (Quality Improvement)	The application of the ARMOR tool has led to a considerable reduction in polypharmacy, reduction of cost of care, and decrease in hospitalization. Falls and behaviors with potential of harm to self and other residents also showed a decline in frequency.
Sechana et al. Rashmi, (2020)	Evaluation of the common reasons of admission, comorbidies, and echocardiography and to assess this polypharmacy using ARMOR TOOL	V, In this study, classified the age group into four categories that is 60-69, 70-79, 80-89 and 90-99 years	Careful and thoughtful drug prescription strategy seems to be able to eliminate most of the cases of polypharmacy even in patients who are suffering with multiple disorders.
Witticke et al., (2013)	The aim of the study was to investigate the prevalence of medication regimen characteristics that are known to reduce patient adherence to drug therapy. Furthermore, we assessed to what extent complex medication regimens can possibly be simplified through different strategies.	V	Almost one-fifth of all regimen complexity characteristics relevant for patient adherence were avoidable by simple modifications of the medication scheme, stressing the need for targeted interventions.

Appendix B

Figure: Force Field Analysis

Prescriber specific factors	**Sociocultural**	**Patient**

Heavy workload and inexperience with certain guidelines

Inadequate and lack of understanding

forgetting to remove and replace old medications.

Not effectively evaluating chart

Using OTC meds with no indications

Lack of communications regarding new and D/C medications

Language Barriers

Complicate medication regimen and poor health literacy

Cause and Effect: Polypharmacy

Difficulties using EHR

Focus on individual vs system.

Lack of an electronic record system that interface prescription and clinical data.

Policies not in place for polypharmacy

Limited alternatives

High workload

Methods/Procedures

Organizational

33

APPENDIX C

LOGIC MODEL

Problem: The current system has no consistent and reliable method in keeping track of older adults that are on 10 medications or more, assessing the risks of polypharmacy and assessing for deprescribing needs when necessary using a stepwise approach.

AIMS: The overall aim of this quality improvement was to decrease polypharmacy and the prescription of inappropriate medications among older adults enrolled in a community-based care program. The overarching goal was to design, implement and evaluate a deprescribing pathway, and empower prescribing clinicians in using the ARMOR tool.

Short Term:
Providers need to review all medications at each visit including herbal products, supplements, and over-the-counter products.

If a medication has no clear indication must be discontinued.

Intermediate:
Educated the patients about drugs in detail before initiating a new medication.

Reduction of adverse events related to polypharmacy.

Long Term:
Starting the conversation between providers and interdisciplinary team on the danger of polypharmacy

Resources:

Pharmacist

Community Clinician

Electronic health record.

Resources

Caregiver and patient motivation.

Primary Care

Time

Activities:

Define deprescribing protocol.

Adapt the ARMOR tool.

Adapt deprescribing and Beer protocol into current process.

Assess each drug and identify patients on 10 and more medications and prioritize drugs for discontinuation.

Outputs:

Develop a collaborative workflow between APC, pharmacist, and PCP to monitor members that meet the criteria for deprescribing.

Documentation of adherence.

Documentation of members responses with protocol.

Rationales and Assumptions: Older adults that are on multiple medications are at increased risks of adverse drug events, increase morbidity and mortality and decrease quality of life

Imbedding the American Geriatrics Society Beer Criteria Into the pharmacist current initiative will help identify older adults that are on more than five medications and can benefits from deprescribing.

The ARMOR TOOL

A	Assess	● Beers criteria ● -blockers ● Pain medications ● Antidepressants ● Antipsychotics ● Other psychotropics ● Vitamins and supplements
R	Review	● Drug–disease interactions ● Drug–drug interactions ● Adverse drug reactions
M	Minimize	● Number of medications according to functional status rather than evidence-based medicine
O	Optimize	● For renal/hepatic clearance, PT/PTT, -blockers, pacemaker function, anticonvulsants, pain medications, and hypoglycemics; gradual dose reduction for antidepressants
R	Reassess	Functional/cognitive status in 1 week and as needed ● Clinical status and medication compliance

Source: From Haque R. ARMOR: a tool to evaluate polypharmacy in elderly persons

APPENDIX F

Evidence of the following ARMOR activities in the patient's record

ID/Gender	Care Partner: Pt brought to huddle (y/n)	# medications (#)	APC Assess: b-blocker (y/n)	anti depressents (y/n)	psychotropic meds (y/n)	Respiratiory medication	vit supplements (y/n)	APC Review: drug to drug interactions (y/n)	all indicated? (y/n)	Minimize: rec to decrease meds (y/n)	Optimize: was pt specific parameters reviewed?	Was PCP called for review and rec	did PCP agree w recommendations	was visit scheduled with Pt	Did pt/caregiver agree w recommendations	Reassess: did APC review functional status after deprescribing	OUTCOME: # meds post	Change # meds pre/post	% improvement	Comments
MS1356/Male	YES	19	Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y Pt agreed	Y	14	5	26%	
LS5661/Male	YES	14	N	N	N	N	Y	N	N	Y	YES(chronic low BP)	Y	Y	Y	Y Pt agreed	y	13	1	7%	
MK4670(F	YES	32	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	N	N/A	NA	N	32	0	0%	
CL73062/F	YES	31	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y Pt agreed	Y	28	3	7%	
GM11154(F)	YES	33	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y Pt agreed	Y	30	3	10%	Patient was hospitalized f
DM12672(F)	YES	19	N	Y	Y	Y	Y	Y	N	Y	N	Y	N	N	NA	NA	19	0	0%	
OM22470(M)	YES	10	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	NA	NA	10	0	0%	
MC72162(F)	YES	17	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y Pt agreed	Y	16	1	6%	
NG73063(F)	YES	18	N	Y	Y	N	N	Y	Y	Y	Y	Y	Y	N	UTR	N	18	0	0%	
NH82462(F)	YES	18	Y	Y	Y	N	N	Y	N	Y	Y	Y	Y	Y	Y Pt agreed	Y	15	3	20%	Patient has had multiple a
KJ31964(F)	YES	39	Y	Y	Y	N	N	Y	N	Y	Y	Y	Y	Y	Y Pt agreed	Y	30	9	30%	
NK11759(F)	YES	35	Y	Y	Y	N	N	Y	N	Y	Y	Y	N	N	N	N	35	0	0%	
FG41456(M)	YES	39	Y	Y	Y	N	Y	Y	Y	N	N	Y	UTR	N	na	na	39	0	0%	
MJ21151(M)	YES	12	Y	Y	N	N	N	Y	N	Y	Y	Y	Y	Y	Y Pt agreed	Y	10	2	20%	
JB121250(M)	YES	20	Y	Y	Y	Y	N	Y	N	Y	Y	Y	Y	Y	Y Pt agreed	Y	14	6	43%	
MC113050	YES	10	N	Y	N	N	N	Y	N	Y	Y	Y	UTR	N	NA	NA	NA			
CA03201961	YES	23	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	UTR	N	NA	NA	NA			
AB05091950	YES	8	N	N	N	Y	N	Y	N	Y	Y	Y	UTR	N	NA	NA	NA			
DC05101936	YES	14	N	Y	Y	Y	Y	Y	N	Y	Y	Y	UTR	N	NA	NA	NA			
JW06261961	YES	19	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	UTR	N	NA	NA	NA			
PQ12081960	YES	10	Y	Y	Y	N	Y	Y	N	Y	Y	Y	UTR	N	NA	NA	NA			
HM01081961	YES	24	Y	Y	Y	Y	Y	Y	N	N	Y	Y	UTR	N	NA	NA	NA			
MW406191	YES	21	Y	Y	Y	Y	Y	Y	N	N	Y	Y	UTR	N	NA	NA	NA			
CJ04061966	YES	15	Y	Y	Y	Y	Y	Y	N	N	Y	Y	UTR	N	NA	NA	NA			
OW04191961	YES	23	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	UTR	N	NA	NA	NA			
AJ11221953	YES	12	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	UTR	N	NA	NA	NA			
PM0131966	YES	10	Y	Y	N	N	Y	N	N	Y	Y	Y	UTR	N	NA	NA	NA			
GW1954	YES	17	N	Y	Y	N	Y	Y	N	Y	Y	Y	UTR	N	NA	NA	NA			
IJ3251960	YES	12	Y	N	N	Y	Y	Y	N	N	Y	Y	UTR	N	NA	NA	NA			
SB05101946	YES	18	Y	N	N	Y	Y	Y	N	N	Y	Y	UTR	N	NA	NA	NA			
GM08141960	YES	10	N	N	N	Y	Y	Y	N	N	Y	Y	UTR	N	NA	NA	NA			

Note:UTR=Unable to reach

Polypharmacy ARMOR Deprescribing pathway

Step 1

Project leader reviewed a panel of 80 members and identifies 30 complex members that are 60 years and older and on 10 medications or more and bring them for discussions to morning huddle.

Step 2

Project leader **Assess** member's total medications and identified certain groups of medications such as beta blockers, pain medications, antipsychotics or psychotropics medications, vitamins and supplements, common OTC/ prescription interactions (antacid medications, iron supplements, thyroid medications, members on both coumadin and aspirin, any duplication of medications and any medications that was added to treat side effects of another medications

Step 3

Project leader **R**eview possible drug-drug interactions, impact of functional status, subclinical adverse drug reactions were weighed for individual medication benefits against appetite, mood, weight, pain, activity level.

Step 4

When deprescribing was needed for unnecessary/redundant/unsafe medications, the project leader collaborated with the primary care provider and made recommendations for **M**inimizing and **O**ptimizing the medications the member was on.

Step 4a

For the individuals whose primary care provider were not able to be reached, the individual continued their medications

Step 4b

For those the primary care provider agreed with the deprescribing plan, the project leader scheduled a visit with the member and/or caregiver to discuss medication changes.

Step 5

After the scheduled visit, project leader contacted the primary Care Provider within 48 to 72 hours and discussed the outcome of visit.

Step 6

Project leader scheduled follow up visit with member within 1-2 weeks to monitor member's blood pressure, heart rate, bowel pattern, fall risk, appetite, and sleep.

Table: Clinical Quality Improvement Checklist   **APPENDIX F**

CLINICAL QUALITY IMPROVEMENT CHECKLIST		
Date:11/4/2020 **Project Leader: Johanne Cazeau**		
Project Title: Implementation of the Beers Criteria and Deprescribing-Based Educational Intervention tool among older Adults**.**		
Institution where the project will be conducted: Commonwealth Care Alliance South POD		
Instructions: Answer YES or NO to each of the following statements about QI projects.	**YES**	**NO**
The specific aim is to improve the process or deliver of care with established/ accepted practice standards, or to implement change according to mandates of the health facilities' Quality Improvement programs. There is no intention of using the data for research purposes.	**X**	
The project is **NOT** designed to answer a research question or test a hypothesis and is **NOT** intended to develop or contribute to generalizable knowledge.	**X**	
The project does **NOT** 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 over-rides clinical decision-making.	**X**	
The project involves implementation of established and tested practice standards (evidence-based practice) 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.	**X**	
The project involves implementation or 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.	**X**	
The project has been discussed with the QA/QI department where the project will be conducted and involves staff who are working at, or patients/clients/individuals who are seen at the facility where the project will be carried out.	**X**	
The project has **NO** funding from federal agencies or research-focused organizations and is not receiving funding for implementation research**.**	**X**	
The clinical practice unit (hospital, clinic, division, or care group) agrees that this is a QI project that will be implemented to improve the process or delivery of care	**X**	
The project leader/DNP student has discussed and reviewed the checklist with the project Course Faculty. The project leader/DNP student will **NOT** refer to the project as research in any written or oral presentations or publications.	**X**	
ANSWER KEY: If the answer to **ALL** of these questions is **YES**, the activity can be considered a Clinical Quality Improvement activity that does not meet the definition of human research. **UMB IRB review is not required**. **Keep a**		