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Improving Practitioners Knowledge and Confidence to Identify High Risk Medications with Older Adults: A Quality Improvement Intervention

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Abstract

Adults 65 years and older are at increased risk for complications of drug therapy and are vulnerable to medication prescribing patterns of poor quality because of age-related changes, comorbidities, polypharmacy, and medication interactions. Potentially inappropriate medications contribute to adverse drug events, falls, delirium, and gastrointestinal bleeding and are deemed preventable. The aim of this intervention was to increase practitioners' knowledge and confidence to identify which medications are potentially inappropriate medications for older adults by implementing the skill-training educational intervention for 79 practitioners using the *Beers Criteria for Potentially Inappropriate Medications use in older adults* and high risk Centers for Medicaid and Medicare medications. This was a one group pre and posttest design study from February 2014-March 2015. Results showed an increase improvement in practitioners' knowledge of identifying potentially inappropriate medications by 69.63%, confidence level by 27% and decrease in the number of potentially inappropriate medications filled by 36%, post intervention. Findings suggest by increasing a practitioner's knowledge and confidence to identify potentially inappropriate medications, potentially inappropriate medications could be decreased, thus improving patient outcomes.

Keywords

Adverse drug events, Beers criteria, Prescribing patterns, Screening tools, STOPP/START, Older adults, Potentially inappropriate medication, Nurses

Introduction

Adults 65 years and older have a history of being prescribed potentially inappropriate medications (PIMS) [1]. These medications contribute to adverse drug events (ADE), falls, delirium, and gastrointestinal bleeding. Practitioners are in a position to identify PIMS and either prescribes alternatives or monitor to prevent complications and improve patient outcomes. Older adults are at increased risk for complications of drug therapy and vulnerable to medication prescribing patterns of poor quality because of age-related changes such as a decline in glomerular filtration rate, decrease hepatic flow, changes in body composition, comorbidities, polypharmacy, and medication interactions [1,2]. One study found in a cohort of 865,354 community dwelling older adults, 28% had at least one medication identified as PIMS [3]. These medications contribute to ADE, falls, delirium, and gastrointestinal bleeding [4]. Roth, et al. reported the estimated expenditure of $177 billion annually associated with medication-related mortality and morbidity [1].

Medication-related problems are not only costly and commonly lead to poor outcomes, but they are also preventable. Gurwitz, et al. found 51% of the ADEs in nursing homes and 42% of ADEs in long-term care were preventable [5,6]. In addition, recommendations for the healthcare team to be aware of PIMS and to utilize

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guidelines when prescribing medications are key to quality care for older adults [7]. Yet, medications that are inappropriate for older adults continue to be prescribed and continue to contribute to poor outcomes.

Inappropriate prescribing patterns

Studies showed that many older adults have been prescribed one or more PIMS. Curtis, et al. [8] studied an insurance database sample of 765,423 participants who filled one or more prescription claims over a 1-year period. The study team found that 21% of the participants had one PIM, and 4% had three or more PIMS prescribed. In a sample of 22,031 participants from a two large databases, Goulding identified that 7.8% of the participants per visit had at least one PIM [9].

A study by Perri, et al. examined PIMS and adverse health outcomes in Georgia nursing homes [10]. Of the 1,117 patient medical records reviewed, when providers prescribed patients PIMS, the patients had more than a twofold increase in the "likelihood of experiencing at least one adverse health outcome" [10]. Similarly, Hustey, et al. conducted a review of consecutive emergency department (ED) visits during a 2-week period with a sample of 352 charts [11]. Study participants admitted through the ED had a mean of 8.4 currently prescribed medications, and 111 of the participants had at least 1 PIM (32%; 95% CI, 27-36). The results suggest a high prevalence of PIMs with older adults who presented to the ED and received a PIM prescription upon discharge.

The Beers Criteria (BC)

The BC for PIMS was created by Mark Beers in 1991 to identify polypharmacy, potentially inappropriate medications resulted in increased costs, inappropriate prescribing, and poor health outcomes [12]. Since that time the original BC, three updates and revisions have been made. The most recent update in 2012 was done by an interdisciplinary panel of 11 experts in pharmacotherapy and geriatric care by the American Geriatric Society (AGS). The expert panel used a "modified Delphi method to the systematic review" to identify PIMS and graded the evidence on both ADEs and medications-related problems [3]. The final criteria includes 43 medications or medication classes divided into three groups: (a) PIMS and classes to avoid, (b) PIMS and classes to avoid with certain diseases, and (c) syndromes and medications to be used with caution. The updated criteria, titled *2012 American Geriatric Society Beers Criteria for Potentially Inappropriate Medications use with Older Adults* (2012AGSBC) include strength of evidence and application of the evidenced-based approach used by the Institute of Medicine (IOM) [3,6,13,14]. See link to Beers Criteria Tables: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3571677/. The 2012AGSBC is a standard of practice for quality agencies such as National Committee for Quality Assurance (NCQA), Pharmacy Quality Alliance, Centers for Medicare and

Medicaid (CMS), and Healthcare Effectiveness Data and Information Set (HEDIS); Agency for Healthcare Research and Quality [AHRQ] [14-16]. These agencies have relied on the BC "when developing quality measures addressing the pharmacological care of older adults" [15]. The Medicare Part D policy incorporates the 2012AGSBC as an evaluation of a nursing home's adherence to regulations related to medications [3]. In 2013, CMS published the revised *2014 Clinical Quality Measures Adult Recommended Core Measures.* Included in this document was the New CMS e-measures ID numbered 156v1 titled *Use of High Risk Medications* [17]. https://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/Downloads/2014_CQM_AdultRecommend_CoreSetTable.pdf

Studies using the beers criteria

Studies have shown that educational programs targeted at identifying PIMS use and of BC decreased PIMS prescriptions, thus improved patient outcomes [18,19]. Studies by Mattison, et al., Tamuraet, et al. and Zillich, et al. showed similar results [20-22]. Zillich, et al. [22] and Mattison, et al. [20] examined two different types of warning messages that signaled the provider about PIMS ordered, according to BC. This type of intervention decreased the number of high risk medications order, after the warning was sent to provider. Similarly Tamura, et al. conducted interventional studies using the BC and found a statistically significant reduction (p < 0.001; p < 0.001; p < 0.001, respectively) in the number of high-risk medications prescribed post-intervention [21].

Kojima, et al. examined the costs associated with PIMs and found an overall cost reduction of $30.71 healthcare dollars per patient per month (p < 0.0001) [23]. Fu, et al. found PIM utilization was a significant predictor (p < 0.05) of higher healthcare expenditures [24].

Fick, et al. conducted a study using an administrative database of 17,971 participants. Forty percent of the participants had a least one PIM prescribed and filled [25]. Thirteen percent of the participants had two or more PIMS prescribed and filled, which increased healthcare costs.

The review of the literatures showed that BC has a demonstrated use in healthcare and specifically with nursing practice in a few selected settings. However, a lack of knowledge, inconsistent use, and a lack of application of the BC in practice still remain [16,23]. Practitioners could use the BC as an assessment tool for identifying PIMS in all settings.

Conceptual model

This project engaged Lewin's Model of Change. The model applies to practitioners and presents the opportunity to change prescribing patterns and monitor patient's responses to a medication regimen, thus improving patient outcomes [26,27].

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Lewin's Model of Change has three stages: unfreezing, moving and freezing, and refreezing. The theory suggests the unfreezing stage is practitioners practicing in a busy healthcare environment and are subject to forces that resist change. Some restraining forces are staff resistance to changing prescribing patterns, lack of confidence with identifying medications on the BC and CMS high-risk medication, lack of skills to initiate discussions about PIMs, and time constraints. In this project, the unfreezing was identification of the population served by the Medicare Advantage (MA) organization who are at risk for inappropriate prescribing and poor health outcomes. The moving and freezing stage was the educational intervention, which includes planning and implementing the proposed expectations of addressing PIMs within the patient population served. This stage required the movement of a behavior change to a new state of equilibrium, which often requires a new viewpoint of why the current status is not beneficial, or a new perspective of accomplishing desired patient outcomes. In the last stage, the refreezing occurred over time as employees adopted the new behaviors and integrated them into the expected outcomes. This step required reinforcement and possibly policy and procedure changes that integrated the proposed expectations [26,27]. During this stage, stabilization of a new practice and expected outcomes such as a decrease in the number of high-risk CMS medications prescribed and an increase in the number of patients who had their medication regimen assessed using the 2012AGSBC [28].

Methods

Specific aim of the quality improvement project

The aim of this quality improvement project was to increase practitioners' knowledge and confidence to identify which medications are PIMS by implementing a skill-training educational intervention for 79 practitioners. The intervention was developed based on an evidence-based assessment tool called the 2012AGSBC and a current revised CMS high-risk medications list.

Design

This project utilized the one group pretest-post design. Before the educational intervention, two pre-tests; a Content Evaluation Questionnaire and *My Confidence Ruler* were administered. Each participant received the two pretests when they entered the room, after they signed into the education intervention. Immediately after the educational intervention, a case study, and three posttests: a Content Evaluation Questionnaire, *My Confidence Ruler,* and Process Program Evaluation were administered to each participants, while they stayed in the same room. This project evaluated the practitioner's knowledge and confidence in identifying PIMS with older adults.

Sample

The implementation site was a well-respected MA organization corporate office. Presently, this MA organization services over 57,000 Medicare beneficiaries in 23 parishes in the southeastern section of the USA. The project participants included 79 participants (37 RNs, 15 Pharmacists, 10 NPs, 9 Social Workers, 4 administration, 1 LPN, 3 non identified). These practitioners coordinate care for patients in outpatient and inpatient settings in the six market care teams (MCT).

Educational intervention

The educational intervention included a tool called the *2012AGSBC* and CMS high-risk medications related to each MCT enrollees. Specific delivery methods to accommodate this approach included a presentation using Power Points with handouts, interactive group discussions, followed by a skill-based case study (Appendix A).

Data collection

Educational intervention and data collection was in January 2015. Participants' knowledge was measured by two instruments: the Content Evaluation Questionnaire and the skill-building case study. The questionnaire was developed by the author (EB) and included four items to identify (a) two quality agencies that use the 2012AGSBC as a standard of practice, (b) two methods to engage and empower patient or caregiver, (c) two methods of provider approach and engagement, and (d) the top three CMS high-risk medications for their MCT, with rationale and potential alternatives.

The skill-building case study was a developed by Smith G, Kireuk and used after getting permission to use. The case study was about an older adult, age 65 years and older with comorbidities and multiple medications [29]. Each participant was asked to assess the patient in the case study and identify medications according to the 2012AGSBC.

Participants' confidence was measured by *My Confidence Ruler* [30]. This is a readiness-to-change assessment adopted from motivational strategies to facilitate adolescent change. The scale allows the learner to rate their own confidence on a scale of zero to ten, with ten being extremely confident. The scale evaluates where the learner is on the confidence scale and what needs to be done to facilitate the practice change (January 2015).

Aggregate data of PIMs prescribed and filled were collected for a specific time period, two months before the intervention and two months afterward. The data was obtained from MA plan's electronic database (February and March 2014 and February and March 2015).

Ethical considerations

This project evaluated the practitioner's knowledge and confidence in identifying PIMS with older adults, and therefore posed no or minimal risk to the participants, and did not involve personal identifiers. Each individual participant's pre and posttest results were anonymous and confidential.

Table 1: Results of pre and post intervention.

Content evaluation questionnaire	Pre intervention results	Post intervention result	Difference
Stated two or more quality agencies that used the *2012AGSBC for PIM use in older adults* as a standard of practice before the intervention	N = 72 13.89%	N = 79** 81.18%	36% Increase
Stated two methods of patient or caregiver engagement and empowerment before the intervention	N = 72 48.61%	N = 79 88.24%	39.63% Increase
Stated two approach and engage providers in discussion about patient's PIM and CMS high-risk medication	N = 72 19.44%	N = 79** 74.12%	54.68% Increase
Stated top three CMS high-risk medications prescribed to their MCT, rationale, and potential alternatives	N = 72 9.72%	N = 79** 14.12%	4.4% Increase
After the education of skill building case study, participants correctly identified appropriate medications using the *2012AGSBC for PIM use in older adults*		N = 79 69.62%	
My confidence ruler	Percent Mean, SD	Percent Mean, SD	Difference
Participants self-rated they were confident to identify PIMs using the *2012AGSBC for PIM use in older adults*	N = 73 45.34% Mean 4.53, SD = 3.08	N = 77** 72.34% Mean 7.23, SD = 2.10	27% Increase
Aggregate data of PIMs prescribed and filled			
Aggregate data of PIMs prescribed and filled were collected for a specific time period, two months before the intervention and two months afterward (data was obtained via electronic database)	4899 PIMs	1739 PIMs	36% Decrease

**Participants completed the post test that were late and did not completed the pre test.

Analysis

Data analysis was done using descriptive statistics (frequency, percent, mean and standard deviation (SD)). Pre- and post-intervention data from Content Evaluation Survey were compared to see if there was an increase in percent of correct answers. Pre- and post-intervention data from *My Confidence Ruler* were compared using mean and standard deviation.

Results

The results for the 72 participants that completed the pre test and 79 that completed the post tests showed an improvement in participants' knowledge and confidence to identify which medications are PIMS. The pre and post test number of participants differed because seven participants completed the post test that were late and had not did not complete the pre test.

Content evaluation questionnaire

The content evaluation questionnaire had four questions. The first question about quality agencies had a 67.29% increase post intervention. Results for the second question about methods of patient or caregiver engagement and empowerment post intervention improved 39.63%. Methods to approach and engage providers in discussion about patient's PIMS and CMS high-risk medication increased 54.68% increase between pre- and posttest. The last question about identifying the top three CMS high-risk medications prescribed to their MCT, rationale, and potential alternatives, improved by 14.12% (n = 79), post intervention (Table 1).

Table 2: Explanation of abbreviations and terms.

Term	Abbreviation
Potentially inappropriate medication	PIM
Potentially inappropriate medications	PIMS
Adverse drug events	ADE
Emergency department	ED
Beers criteria	BC
American geriatric society	AGS
Institute of medicine	IOM
2012 american geriatric society beers criteria for potentially inappropriate medications use with older adults	2012AGSBC
National committee for quality assurance	NCQA
Centers for medicare and medicaid	CMS
Healthcare effectiveness data and information set	HEDIS
Agency for healthcare research and quality	AHRQ
Medicare advantage	MA
Registered nurse	RN
Nurse practitioner	NP
Licensed practical nurse	LPN
Market care team	MCT

Case study

After the education intervention using a skill building case study, 69.62% of the participants correctly identified appropriate medications using the 2012AGSBC (Table 1).

My confidence ruler

A total of 45.34% (n = 73) of the participants self-rated they were confident to identify PIMs using the 2012AGSBC s before the intervention. After the intervention the rating was 72.34% (n = 77), with a 27%

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increase in confidence rating between pre- and posttest. The pre-confidence mean was 4.53, (SD = 3.08) and post confidence mean was 7.23 (SD = 2.10) (Table 2).

PIMS prescriptions filled

Over the 2-month analysis period pre- and post-intervention, a 36% decrease in PIMS prescription filled was noted. There was 4899 PIMs prescriptions filled in the 2-month pre-intervention period and the number of PIMs prescriptions decreased to 1739 during the 2-month post-intervention period (Table 1).

Discussion

Summary

The project findings showed that the educational intervention improved practitioners' knowledge and confidence in identifying PIMs using the evidence-based tool titled *2012AGSBC* and CMS high-risk medications. *2012AGSBC and* the CMS high-risk medications can be used as a standard of practice when assessing medications with older adults. For practitioners to apply this quality measure, practitioners need the knowledge of the history, application, and rationale of the *2012AGSBC and* the CMS high-risk medications. Additionally, practitioners need confidence gained by educational intervention to use the tool and interpret the results. Once the results are interpreted, practitioners are able to engage in a discussion with patients, caregivers, and providers about the patient's PIMS and CMS high-risk medications. By improving a practitioner's knowledge and confidence about PIMs, application into actual practice to reduce PIMs, can result in safe, and improved patient outcomes.

Interpretation

Although the data showed increase in all outcomes measured, a few outcomes, for examples, showed little increase. The outcome that asked participants about the top three CMS high risk medications in their own MCT, with rationale showed a very little increase, 4.4%. This question was complex and had multiple answers that may have been too advanced for the participants. The educational intervention program was not mandatory, and a majority of the participants were required to travel back and forth to their daily responsibilities, and motivational incentives were not offered. These could have been contributing factors to the small increase in the outcomes. For many participants, the *2012AGSBC* and *My Confidence Ruler* were new concepts and unfamiliar to participants. When the project was implemented, the author (EB) identified that the majority of the participants had never used *My Confidence Ruler* or any type of self-assessment for confidence level. In future studies, a brief training session utilizing the tool is recommended. This would allow the participants to familiarize themselves with the tool and its purpose, in a non-threatening environment.

The project findings highlight the importance of the use of case studies in educating practitioners. Case studies challenged the practitioners to think critically, analyze issues, and synthesize theory content to patient and family life scenarios [31]. Using a skill-based case study, practitioners were able to combine theory and reality. For the participants' to complete and understand the top three CMS high-risk medications per MCT enrollees with rationale and alternatives required documentation of nine possible answers, for this one question. This question was complex and the participants' motivation could have affected the answers and results. The importance of CMS high-risk medication is ongoing and continuously changing, which provides an opportunity for future education and study recommendations. Another opportunity for future study is to provide the pretest electronically, in preparation for the education intervention.

Analysis of the PIMs filled in each MCT for 2 months pre-intervention and 2 months post-intervention was an excellent indicator of practitioner's application of the educational intervention of increasing practitioners' knowledge and confidence. A decrease in the percentage of PIMS indicates improved patient safety and outcomes related to ADEs, falls, gastrointestinal bleeding, and delirium.

Limitations

This project had limitations related to attendance and the pre- and posttests' design. Although the pretests were given upon entering and completion was encouraged, some participants chose to not complete them. A recommendation to improve this would be to have the participants complete the pre-test electronically ahead of time and change the hours of the education intervention.

Implications for practice

One major implication for increasing practitioner's knowledge and confidence of PIMS and high-risk CMS medications is to provide evidence based education on the topic of PIMS and the application into practice. These medications contribute to falls, gastrointestinal bleeding, delirium, and ADEs. By educating practitioners about inappropriate prescribing patterns, fewer medications may be ordered and there will be better monitoring of the PIMS and high-risk CMS medications that are ordered, thus contributing to safety for patients and improved quality of life.

This educational intervention was offered with a multidisciplinary framework. By incorporating all members of the team, the patient is at the center and individual disciplines do not work in silo. All members of the team have received the knowledge to identify PIMS and CMS high-risk medications. Therefore, all members the team can monitor for side effects that contribute to falls, delirium, ADEs, or gastrointestinal bleeding.

Another strength of this educational intervention was that it was easy and inexpensive to implement. Educational offerings could be conducted in small groups at different locations throughout the organization, with timely refresher courses that target the most current information. This educational module on PIMs and CMS high-risk medication could be Web-based module or an annual competency, therefore reaching a larger population, thus improving patient outcomes.

Conclusion

Adults 65 years and older have a history of being prescribed potentially inappropriate medications. These medications contribute to adverse drug events, falls, delirium, and gastrointestinal bleeding. Practitioners are in a position to identify PIMs and either prescribe alternatives or monitor closely to prevent complications and improve patient outcomes.

The evidence-based educational intervention increased practitioners' knowledge and confidence about an assessment tool called *2012AGSBC and* the CMS high-risk medications. Results showed increased knowledge and confidence to identify which medications are PIMS post-intervention. The number of PIMS filled in each MCT decreased when comparing a specific time period 2014 and 2015. Analysis of all the MCT combined resulted in a decrease of PIMs filled post-intervention of 36%.

Having the knowledge and confidence to identify PIMS, CMS high-risk medications, and use the evidence-based assessment tool called *2012AGSBC is* important for practitioners working with older adults. Often nurses are the first contact into a health care system and positioned to identify PIMS and CMS high-risk medications that could contribute to falls, ADEs, delirium, and gastrointestinal bleeding. An intervention targeted toward identification and monitoring PIMS and CMS high-risk medications has the potential to improve patient outcomes and promote safety. Interventions utilizing technology as warning signals, education or trending data of ADEs should be explored.

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