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Application of Beers Criteria and a Brown Bag Event to Increase Prescribing Safety in Older Adults

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**APPLICATION OF BEERS CRITERIA AND A BROWN BAG EVENT TO INCREASE
PRESCRIBING SAFETY IN OLDER ADULTS**

by

KRISTEN GARZA, BSN, RN, SANE

EVIDENCE-BASED PRACTICE PROJECT REPORT

Submitted to the College of Nursing and Health Professions

of Valparaiso University,

Valparaiso, Indiana

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For the degree of

DOCTOR OF NURSING PRACTICE

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Kristen Garza 4-16-19
Student Date

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Advisor Date

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DEDICATION

I want to dedicate this evidence-based practice report to my family who have been an integral part of my education. I want to say special thank you to Brian who has stood by my side and supported me since I started this program four years ago. It has been a blessing to have family that has been so graciously encouraging.

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ABSTRACT

With older adults making up about 14.5% of the U.S. population, polypharmacy may be an unintended consequence of adhering to clinical practice guidelines (Kim & Luck Parish, 2017). Effective polypharmacy interventions are needed in the primary care setting to increase prescribing safety and lower the risk of adverse drug events among older adults. The application of the Beers criteria, in conjunction with a brown bag medication reconciliation event, was initiated as focused interventions for a private primary practice without electronic health records. Outcomes included medication reduction, identification of possible inappropriate medication, decrease of medication dosages, and identification of duplicate medication. The sample population included 34 patients whom were 65 years and older and prescribed five or more medications. The evidenced based Stetler model was utilized for project implementation for a progressive approach within a primary care setting. The theoretical framework was guided by Paterson and Zderad's Humanistic Nursing Theory. A paired samples *t*-test was used to analyze the number of medications Pre- and Post- implementation of the Beers criteria and findings showed statistical significance in the reduction of medication of ($t(33) = 1.787, p < .05$). A single-sample *t*-test was used to analyze the identification of possible inappropriate medications, number of discontinued medications, decrease in medication dosages and duplicate medications. There was statistical significance found with the identification of possible inappropriate medications ($t(33) = 4.68, p < .05$). Results demonstrated that there is statistical evidence to encourage application of the Beers criteria for safe prescribing in older adults. Although the brown bag medication reconciliation event did not yield statistical significance, utilizing medication reconciliation at every patient visit is standard of care.

Keywords: polypharmacy, older adults, prescribing safety, polypharmacy intervention

CHAPTER 1

INTRODUCTION

Background

In 2010, the United States (U.S.) documented 29 million households with residents 65 years old and greater (Cameli et al., 2012). It is predicted by the year 2020 there will be 55 million people over the age of 65 within the U.S. (Skinner, 2015). Within the older adult population there is usually a co-existence of multiple chronic conditions which may increase complexity of medication management for patients and health professionals (Masnoon, Shakib, Kalisch-Ellett, & Caughey, 2017). Polypharmacy is defined as the use of one or more medicines to treat medical conditions and is currently an issue that needs to be addressed in the older populations (Masnoon et al., 2017). While polypharmacy may be clinically appropriate, it could also place patients at risk of negative health outcomes. Approximately 28% of older adult people have inclusion criteria that includes polypharmacy in the medication regimen (Patterson et al., 2014). Inappropriate medications can be defined as medications, or medication classes, that should generally be avoided in persons 65 years or older because of an unnecessarily high risk for older persons (Patterson et al., 2014).

Polypharmacy has been previously associated with negative health outcomes that can include adverse drug reactions, poor adherence to medication regimen and geriatric syndromes such as urinary incontinence, cognitive impairment, and increased risk for falls (Patterson et al., 2014). Increased use of clinical guidelines has influenced prescribing patterns and often advocates for the use of more than one drug to manage chronic health conditions (Patterson et al., 2014). Use of clinical guidelines, in many cases, promote polypharmacy and can have increased negative health outcomes from the risk of adverse drug events and drug-drug

interactions. Within the older adult population, the risk of adverse drug reaction is 13% with the use of two medications (Patterson et al., 2014). With the use of five medications the risk drastically increases to 58%, and the use of seven or more medications the risk relatively increases more to 82% (Patterson et al., 2014). This is a phenomenally high amount of risk placed on the older adult population with many having numerous comorbidities and chronic health conditions such as diabetes, depression, hypertension, and hypercholesterolemia. If medication-related events could be ranked as a disease by cause of death, it would be the fifth leading cause of death (Cameli et al., 2012). Adverse drug events can be the cause of unnecessary emergency department visits and hospitalizations and can contribute to increased health care costs for both the patient and the health care system (Kim & Luck Parish, 2017).

Multiple chronic illnesses, normal ageing changes, multiple care providers, altered pharmacokinetics, and longer life expectancy increase the risk for medication events in the older adult population. There are numerous factors that can lead to negative health outcomes such as patients taking unnecessary medication via self-medication, polypharmacy, wrong medication for medical condition, inappropriate dose, and individuals not taking medication correctly (Cameli et al., 2012). It has been documented that 90% of older adults take medications on a daily basis, with nearly half (46%) taking five or more medications and of those older adults with three or more chronic health conditions (52%) do not take all of their medication as prescribed (Cameli et al., 2012).

In the primary care setting, managing multi-morbid patients with polypharmacy requires coordination of multiple prescribers, pharmacological knowledge, and intense medication monitoring (Jager, Szecsenyi, & Steinhauser, 2014). Interventions that can be implemented to improve polypharmacy are likely to achieve improved appropriate polypharmacy through

removal of inappropriately prescribed medication and increased appropriate medications by promotion of adherence to established evidence-based therapy (Patterson et al., 2014). There are multiple interventions that can be applied in the primary care setting to help reduce the risk of adverse medication events involved with polypharmacy.

Computerized decision support (CDS). CDS is commonly used with Electronic Medical Records (EMRs) and is aimed at prescribers (Patterson et al., 2014). Electronic alerts prompt the prescriber to the right treatment and medication dosage, as well as, alerting prescriber of any medication interaction. CDS has been successful in reducing inappropriate prescribing for older adults but is only useful if the prescriber has an electronic medical record charting system.

Professional interventions. Professional interventions can include a multitude of interventions that could be implemented at the primary care level. Interventions that directly affected prescribing includes educational programs aimed at prescribers (Patterson et al., 2014). Educational programs that include the patient, such as Structured Medication Counseling (SMC), where patient would receive SMC at least once per year and comprises a complete inventory of actual medication taken, consequent use of medication lists, and medication reviews to reduce potentially inappropriate medication (PIM), a brown bag event, and use of screening tools such as the use of Beers Criteria (Jager et al., 2014). Deprescribing is also a used as a professional intervention that is patient-centered and has been considered for older adults in congruency with life expectancy and care goals. Deprescribing can provide clinicians with a structured process for considering relative risks and benefits with polypharmacy and can be used to reduce the total number of medications a patient is prescribed (Kim & Luck Parish, 2017).

Organizational interventions. Organizational led interventions may include pharmacist-led medication review services, medication specialist clinics, information and communication technology interventions which are organization specific, and use of organizational risk screening tools (Patterson et al., 2014). Organizational case study exercises may also be implemented for providers to evaluate knowledge of complex medication regime (Jager et al., 2014).

Medication regimens are essential for treating chronic medical conditions and providing quality of life for the older adult population. With older adults having longer life spans it is important to provide safe interventions to decrease prescribing of inappropriate medications that can increase the risk for adverse drug reactions. If a medication is used incorrectly, or inappropriately, it can cause physical or psychological harm to the patient (Skinner, 2015). There is a need for clinical interventions to guide practicing prescribers to reduce adverse drug events and decrease polypharmacy among the older adult population.

Statement of the Problem

Managing older adult patients with multiple chronic health conditions in the primary care setting can be complex with increased risk of negative health outcomes. With older adults making up about 14.5% of the U.S. population, and elderly individuals purchasing a total of 33% of all prescription drugs, polypharmacy may be an unintended consequence of adhering to clinical practice guidelines (Kim & Luck Parish, 2017). There have been well documented clinical consequences regarding polypharmacy in older adults such as worsening geriatric syndromes, cognitive impairment, increased falls, increased risk for adverse drug events, and increased health care costs. In the older adult population treatment of adverse drug events are estimated to cost more than 880 million dollars per year (Kim & Luck Parish, 2017). Effective

polypharmacy interventions are needed in the primary care setting to lower the risk of adverse drug events in the older adult population and augment the safety of prescribing multiple medications.

Data from the Literature Supporting Need for the Project

Data has shown that prescriptions for the elderly account for 25-40% of all prescriptions written in the U.S. (Skinner, 2015). In the year 2020 adults over the age of 65 will represent 20% of the U.S. population and will consume 50% of health care costs (Skinner, 2015). It has been documented throughout the literature that the larger number of medications used by the older adult can lead to increased risk of adverse drug reactions and events, poor patient compliance, and economic burden (Skinner, 2015). Managing patients with polypharmacy is demanding in the primary care setting (Jager et al., 2014). Current literature has revealed that there is a lack of a clear direct solution to solve the polypharmacy dilemma when managing multiple chronic health conditions. The improvement of appropriate polypharmacy can be achieved through a wide range of interventions and can be provided by healthcare professionals, educators, and health care service planners (Patterson et al., 2014). Currently there is a risk paradox when patients with higher risk of complications are determined to have the lowest probability of receiving the recommended medications (Patterson et al., 2014). Educational programs that included the patient such as SMC where patient would receive SMC at least once per year and comprises a complete inventory of actual medication taken, consequent use of medication lists, and medication reviews to reduce PIM, and use of screening tools such as the use of Beers criteria can increase patient medication adherence and improve patient understanding of medication regimen (Jager et al., 2014). Adverse drug events can have the potential to contribute to patient decline in health and premature death (Tjia, Velten, Parsons,

Valluri, & Briesacher, 2013). With 90% of older adults taking medication on a regular basis it is imperative to consider strategies to prevent adverse drug reactions among the older adult population with polypharmacy. These strategies include interventions such as identifying unnecessary medications, identifying inappropriate prescribed medications, medications being inappropriately taken, and duplicate medications prescribed by multiple doctors.

Data from the Clinical Agency Supporting Need for the Project

The use of multiple medicines (polypharmacy) is common in the older adult population with multiple morbidity, as well as chronic health conditions, and is associated with adverse drug events such as mortality, falls, adverse drug reactions, hospital admission and hospital readmissions (Masnoon et al., 2017). The risk of adverse events with polypharmacy also increases due to the aging process along with decreased renal and hepatic function, lower lean body mass, reduced hearing, reduced vision, and decreased cognition and mobility (Masnoon et al., 2017). Currently, at the clinical agency, there is no electronic medical record charting system and there is a need for polypharmacy interventions to decrease risk in the older adult population with polypharmacy and provide safe prescribing regarding medication management. Electronic medical record technical safeguards that are built in to electronic charting systems for prescribing are not used in this facility, therefore, the risk for adverse medication events is increased. At this facility, medication reconciliation is compared to previous records or against a list of medication the patient brings to their scheduled appointment. Sustainable interventions such as improved medication reconciliation, use of Beers criteria, yearly brown bag event to compare what medication is being taken to the medical record, and education given to patient regarding how to appropriately take their medication would greatly improve older adult prescribing safety.

Purpose of the Evidence-Based Practice Project

Advanced practice registered nurses (APRNs) are at the forefront of providing primary care and should consult the Beers Criteria for Potentially Inappropriate Medication Use in Older Adults. The Beers criteria was developed to decrease the risk of potentially inappropriate or harmful medications in older adult patients and proper medication prescribing should be a health care priority (Terrery & Nicoteri, 2016). Use of the Beers criteria guides providers to improve the quality care, medication prescribing safety, and patient education. Within the older adult population polypharmacy is becoming increasingly common, and there has been documentation of higher risk for confusion about medication regimen, especially with multiple prescribers. APRNs need to incorporate the Beers criteria for safe prescribing practice and proper assessment of older adults' individual needs (Terrery & Nicoteri, 2016). At the clinical site facility, the APRN role would be to incorporate the Beers criteria and brown bag event into medication reconciliation and include patient medication regimen education, when appropriate. Approximately 80% of adverse medication events that cause hospital admission are type A reaction that are dose dependent, often preventable, and related to the pharmacologic effects of the drug in the elderly (Terrery & Nicoteri, 2016). The purpose of the evidence-based practice project was to improve appropriate polypharmacy prescribing by identifying possible inappropriate prescribed medication, discontinue or decrease dosage of possible inappropriate medication, and identify duplicated medication therapies to reduce adverse medication related events in older adults.

Compelling Clinical Question.

Many patients over the age of 65 have multiple chronic conditions that require them to take more than 5 medications daily. Within the older adult population polypharmacy is

becoming increasingly common, and there is documented higher risk for confusion about medication regimen, risk for prescribing inappropriate medication, and duplicate medications due to multiple prescribers. The population of older adults is expected to grow to 83.7 million by the year 2050 and health care prescribers need to be aware of current guidelines and practices to prevent adverse drug events in this generation (Terrery & Nicoteri, 2016). Polypharmacy has been documented to have association with adverse outcomes that can affect health outcomes negatively. It is with this relevance that the need for applicable interventions in primary care setting triggered the initiation of this Evidence Based Project: “Would medication reconciliation with the application of the Beers criteria identify possible inappropriate prescribed medication, guide prescribing to decrease or discontinue dosages of possible inappropriate medication?” and “Would the implementation of a brown bag event identify duplicate medication therapies?”.

PICOT Question.

This EBP project used the PICOT (patient population, intervention of interest, comparison intervention or status, outcome and timeline) framework to guide the project development of the PICOT question. The best evidence available was retrieved by using a systematic approach during the literature search. By developing this EBP projects clinical question in the PICOT format the following PICOT question was developed: “Would medication reconciliation with the application of the Beers criteria and implementation of a brown bag event identify possible inappropriate prescribed medication, discontinue or decrease dosages of medications, and identify duplicate medication therapies when compared to standard facility medication reconciliation over a period of two months?”

Significance of the EBP Project

This EBP project was implemented to build on established guidelines, advanced practice nursing recommendations and prescribing safety measures already established in the health care field aimed at improving polypharmacy interventions in the older adult population in the primary care setting. Easy applicable in-office interventions are beneficial to both the prescriber and the patient by decreasing possible negative health outcomes within the older adult population. Within the primary care setting organizations may be able to further develop patient safety measures related to polypharmacy and develop in-office protocols in which the patient has regular medication reconciliation interventions to promote patient education, understanding, and participation in their health care regimen. This EBP project was designed to introduce easy applicable interventions in an office setting that did not have an electronic medical record charting system. These interventions could be applied in other office settings, with or without electronic medical record charting systems, to improve already developed medication reconciliation standards of practice.

CHAPTER 2

THEORETICAL FRAMEWORK, EBP MODEL, AND REVIEW OF LITERATURE

Theoretical Framework

Overview of Theoretical Framework

The theoretical framework is based on Paterson and Zderads' Humanistic Nursing Practice Theory. Paterson and Zderad published Humanistic Nursing in 1976 to create a platform for authentic dialogue with patients, students, and colleagues (Paterson & Zderad, 1988). Humanistic Nursing Practice Theory proposes that nurses consciously approach nursing as an existential experience. Nurses embrace more than the benevolent technical competent subject-object one-way relationship guided by a nurse in behalf of another (Paterson & Zderad, 1988). Therefore, nursing is a responsible searching, transactional relationship in which meaningfulness needs conceptualization based on the nurses' own awareness of self and of the other (Paterson & Zderad, 1988).

The existential experience involves four separate components of uniqueness-otherness, authenticity-experiencing, moreness-choice and value-nonvalue. Paterson and Zderad (1988) describe uniqueness-otherness as the human characteristic of uniqueness and the commonality with all other humans. Authenticity-experiencing is described as authenticity to ones' own self and both the degree of awareness and the meaning we attribute to this awareness (Paterson & Zderad, 1988). Furthermore, self-awareness, in-touchness, self-acceptance, and actualization of our potential allows us to share with others, so others can be in an experiencing relationship with us (Paterson & Zderad, 1988). The concept of moreness-choice is stated to involve how nurses choose their nursing world and that it is a chosen deliberate life-long process (Paterson & Zderad, 1988). The process is described as generative with one experience opening the door for

the next. Each unique nurse is faced with chaos of alternatives in a situation that they choose and how those choices can relate their nursing world to others (Paterson & Zderad, 1988).

Paterson and Zderad explain that for a nurse to offer genuine presence to others, a belief must exist that such a presence is of value and can make a difference in a situation. It is those beliefs that give rise to value-nonvalue and nurses offering their genuine presence to the nursing situation.

Within Humanistic Nursing Practice Theory, the nurse is asked to interpret (1) the nurse's unique perspective and responses, (2) the other's knowable responses, and (3) the reciprocal call and response, as they occur in the nursing situation (Paterson & Zderad, 1988). The essence of human phenomena dictates that each individual nursing situation affects the quality of the nursing situation, human general knowledge of the variation in human capacity for beingness, and the development and form of the evolution of nursing theory and science (Paterson & Zderad, 1988). Within this theory, existentially every nursing event is unique, a live intersubjective transaction created and formed by the individual participants with the result of experiential knowledge that is lasting and cumulative (Paterson & Zderad, 1988). Even with daily nursing occurrences it is common to grow a vast amount of clinical wisdom. The actualization of humanistic nursing is dependent on practicing nurses and the development of humanistic practice within theoretical foundations.

Application of Theoretical Framework to EBP Project

In the primary care setting, patients have their own unique health backgrounds, educational needs, and cultural diversity. Paterson and Zderad's Humanistic Nursing Practice Theory is designed to give special attention to each individualized patient situation. Applying the Humanistic Nursing Practice Theory as the theoretical framework to this EBP project allows

each patient encounter to be holistic in nature, individualized to each situation, and uses the APRNs experience to guide needed education related to patients' knowledge of their own medication regimen. Each patient encounter is a nursing event that is considered an intersubjective transaction formed between the individual participants. With relation to this EBP project, the intersubjective transaction is the APRN/patient interaction and shared knowledge of appropriate medication education. Each medication education experience would be based on the patients individualized needs following the basis of the Humanistic Nursing Practice Theory. Humanistic nursing will be actualized by the interaction between the APRN and the patient creating a unique nursing event while initiating the medication brown bag event and appropriate medication education.

Strengths and Limitations of Theoretical Framework for EBP Project

There are multiple strengths for using the Humanistic Nursing Practice Theory for the theoretical framework for this EBP project. One would include being able to individualize medication regimen education to each patient encounter. Another would be that this theory encompasses humanistic nursing which allows for the holistic treatment of each patient. Also, using this theory allows for the maintenance of nursing phenomena within the primary care setting. Limitations of using this theoretical framework would include having only a brief amount of time within office setting to assess the educational needs of each patient. Another would be that the nursing event would be limited to only the patients allotted time with the provider. Also, within the time frame of the project implementation, there is not a way to measure if the humanistic nursing approach was effective in the educational encounter.

Evidence-based Practice Model

Overview of EBP Model

The Stetler Model was used to guide this EBP project by following the five progressive phases of activity. The Stetler Model is grounded in critical thinking and is enhanced by professionals with a culture of clinical scholarship (Stetler, 2001). The conceptual framework utilizes knowledge by using Stetler's definition of knowledge utilization as "a complex process involving political, organizational, socioeconomic, and attitudinal components of knowledge" (Stetler, 1994, p. 15). With knowledge utilization this model's steps and concepts can be integrated into a practitioner's routine practice (Melnyk & Fineout-Overholt, 2015). The Stetler Model is complex in appearance but is very fluid regarding the different phases of the model. The model was formulated with a series of critical-thinking and decision-making steps designed to facilitate effective research finding (Stetler, 2001). The progressive phases of activity include the (I) preparation, (II) validation, (III) evaluating/decision making, (IV) translation/application, and (V) evaluation.

There are six assumptions for the practitioner-oriented Stetler Model. The assumptions are (1) the formal organization may or may not be involved in an individual's utilization of research, (2) utilization may be instrumental, conceptual or symbolic, (3) other types of evidence and/or nonresearch-related information are likely to be combined with research findings to facilitate decision-making or problem-solving, (4) internal and external factors can influence an individual's or group's view and use of evidence, (5) research and evaluation provide probabilistic information, not absolutes, and (6) lack of knowledge and skills pertaining to research utilization and EBP can inhibit appropriate and effective use (Stetler, 2001).

Within the first phase of preparation potential issues are defined for the purpose. The perceived problem is then clarified and the identification of internal evidence, such as current practice, is defined. Other influential internal and external factors are then considered. Focus is then set on high priority issues and decisions are made to form a team and to involve formal stakeholder (Melnyk & Fineout-Overholt, 2015). Evidence is then sought out such as systematic reviews and guidelines first to determine need for research evidence and then research sources are selected (Melnyk & Fineout-Overholt, 2015).

The second progressive phase is the validation phase. This phase critiques and synthesizes essential components, operational details, and qualifying factors of each evidence source (Melnyk & Fineout-Overholt, 2015). This model assumes that in the practice setting both formal and informal use of research finding, and supplemental use of evidence can occur (Melnyk & Fineout-Overholt, 2015). After documents are disseminated practitioners are expected to translate the findings. Variations can occur due to the context of a patient's circumstances, status and preferences (Melnyk & Fineout-Overholt, 2015). Systematic reviews and guidelines are also critiqued and re-assessed. The level and quality of each individual evidence source is rated and created into a table of evidence. Statistical and clinical significance is differentiated, and non-credible sources are eliminated (Melnyk & Fineout-Overholt, 2015). This portion of the phase is ended when there is clearly insufficient credible external evidence that meets the need (Melnyk & Fineout-Overholt, 2015).

During the third phase, all the cumulative findings are synthesized for appropriate application. The degree and nature of the criteria are evaluated, and the decision is made whether to use the relevant research found. If the decision is made to use the evidence,

recommendation can be made for or against a specific practice (Melnyk & Fineout-Overholt, 2015).

The translation/application phase identifies the type, method, and level of action or change (Melnyk & Fineout-Overholt, 2015). It also is the phase where the direct instrumental use, cognitive use, or symbolic use is designated for the action (Melnyk & Fineout-Overholt, 2015). Also, assessment of whether translation/product or use of action goes beyond actual findings or evidence. Formal dissemination and change/implementation strategies are planned from the relevant searches and local barriers (Melnyk & Fineout-Overholt, 2015). Then decisions to use the interventions in the local setting may be considered. The last phase of evaluation can be both formative regarding actual implementation and goal progress or summative regarding identified end goal and end-point outcomes (Melnyk & Fineout-Overholt, 2015). Evaluation may include the type of method, level, conceptual use at an individual level, and cost-benefit of change (Melnyk & Fineout-Overholt, 2015). The series of steps in this model is designed for critical-thinking and to buffer potential barriers to objective, appropriate, and effective utilization of research findings (Stetler, 2001).

Application of EBP Model to EBP Project

The Stetler Model provides a progressive approach for guidance and implementation of this EBP project. This EBP model reflects a practitioner-oriented approach within context of EBP (Stetler, 2001). The Stetler Model concepts can be easily applied within the family practice setting and during an APNs daily practices. The progressive phases of the Stetler Model were easily applicable to this EBP project and guided the dissemination of evidence to incorporate current guidelines into the interventions. Each of the progressive phases were used within the

models' construct and were integrated into the application of in-office interventions. With the preparation phase the project topic was defined as polypharmacy and the priority was affirmed with the project site facilitator. The PICOT format was developed, and evidence was systematically searched for relevance. The validation phase led to the assessment of the body of evidence which involved systematically critiquing each study, critiquing systematic reviews, and reviewing guidelines within the National Guideline Clearinghouse. Evidence was then collected and summarized based on the affirmed focus of polypharmacy. Comparative evaluation and decision making was performed after synthesizing the body of evidence and deciding which criteria identified the need for medication review intervention in the primary care office setting. Findings were then linked to the type of change that could be sustained in the primary care setting and recommended planning of intervention began in the Translation/application phase. An operational plan was established with the site facilitator with actual implementation based on the disseminated evidence-based practice. The last phase of evaluation was performed by evaluating the degree of implementation and whether application of the Beers criteria identified possible inappropriately prescribed medications, guided discontinuation or decreased dosages of prescribed medications, and whether the brown bag medication reconciliation event identified duplicate medications.

Strengths and Limitations of EBP Model for EBP Project

The applicability of the practitioner-oriented Stetler Model to a primary practice setting is considered a strength with the EBP project. This EBP model emphasizes critical-thinking as a key role which is needed when assessing patient needs regarding education and medication regimens. Limitations of the applying Stetler Model with this EBP project would include the

researchers' skills of appraising evidence and understanding of inferential statistics and applicability on an individual level. Additionally, the practitioners' personal factors can also influence the progressive phases of activity. The process of searching and evaluating evidence was an arduous process, and although knowledgeable, the researcher was not at an expert level. Needed skills were gained along with process while searching through and determining relevant evidence that was applicable at the site facility setting and only focused on affirmed priorities. Also, another limitation would be the evaluation process and adhering to the EBP project objectives and site facilitator evaluation for further sustainability after the EBP project is complete.

Literature Search

Sources Examined for Relevant Evidence

A search was conducted for relevant evidence-based sources to identify available research literature related to polypharmacy in the older adult population. The following databases were included in this literature search: The National Guideline Clearinghouse, Joanna Briggs Institute (JBI), Cochrane Library, Cumulative Index of Nursing and Allied Health Literature (CINAHL), and Medline via EBSCO. Search terms used for this literature search included "polypharmacy", "reconciliation" OR "Beers criteria", OR "brown bag", OR "medication education" OR "duplicate therapy". These search terms were used within CINAHL and Medline via EBSCO to ensure consistent literature searches. The term "polypharmacy" was used for the literature search within the National Guideline Clearinghouse, JBI and Cochrane Library.

Inclusion criteria included literature that were (a) scholarly reviewed, (b) written in English, (c) published between 2012-2018, and (d) incorporated interventions for polypharmacy in older adults. Literature exclusions included (a) not scholarly reviewed, (b) not written in English, (c) published before 2012, (d) incorporated aspects of polypharmacy in younger adults, and (e) incorporated interventions set in the hospital, or inpatient settings.

Within the literature search, there was a detailed review of the abstracts and duplicate articles were eliminated which generated a total of nine pieces of high-level evidence selected for this evidence-based project. Within the National Guideline Clearinghouse, the literature search revealed a total of 8 abstracts. Upon review of the abstracts, one national guideline was selected for the inclusion of the body of evidence. The search performed within the JBI database revealed 50 abstracts. Of the 50 abstracts reviewed, five pieces of literature were selected that included systematic reviews and systematic summaries. From one JBI systematic summary a citation chase was conducted which led to the inclusion of two additional high evidence level literature pieces. The Cochrane Library search was performed and resulted in 6 abstracts total. After reviewing the abstracts one systematic review was kept for use in the body of evidence. Within CINAHL a search was conducted for relevant literature that revealed a total of 41 abstracts. After reviewing the abstracts 0 were kept for use of evidence-based support. A search within Medline via EBSCO generated 120 relevant abstracts, in which 0 were selected for support of this evidence-based project.

Levels of Evidence

For the final body of evidence for this evidence-based project there were nine pieces of literature that were included. Of the nine pieces of literature four were systematic reviews (Level I), one a clinical practice guideline (Level I), and four were

evidence summaries (Level I) [Table 2.1].

Appraisal of Relevant Evidence

Melnik and Fineout-Overholt (2015) evidence rating system was used to categorize literature in evidence levels. This evidence rating methodology ranks evidence in a hierarchy (Melnik & Fineout-Overholt, 2015). The hierarchy of evidence provides guidance about the different types of research studies, literature, and rates evidence from the strongest to least biased (Melnik & Fineout-Overholt, 2015). To evaluate the relevant evidence chosen to support this evidence-based project the Critical Appraisal Skills Programme (CASP) checklist was chosen to appropriately appraise the systematic reviews, practice guideline, and evidence summaries. The CASP checklist was designed to be used as educational tool, but does not suggest a scoring system (Critical Appraisal Skills Programme, 2017). CASP checklists were based on The Journal of Medical Associations user guides to medical literature and piloted with healthcare practitioners (Critical Appraisal Skills Programme, 2017). After evidence appraisal literature results were assigned a grade A (good quality) if literature disclosed study design, sample population, intervention, outcomes considered and the purpose of study. Literature that disclosed most of the information was assigned a grade B (fair quality), and literature that was missing most of the components were assigned a grade C (poor quality) by the project manager.

Construction of Evidence-based Practice

Synthesis of Critically Appraised Literature

For this evidence-based project, relevant literature was appraised and reviewed for detailed comprehension of polypharmacy in the care of older adults. The literature searches established the most current evidence-based practice from national guidelines, systematic

reviews and evidence summaries of the highest evidence level. The critically appraised evidence was synthesized according to relevance regarding the projects purpose. Using a systematic review polypharmacy was first defined as the use of multiple medicines (Masnoon et al., 2017). Polypharmacy has previously been documented to be associated with adverse outcomes that can include mortality, falls, adverse drug reactions, increased length of stay in hospitals and increased emergency visits. There was a multitude of interventions described throughout the literature regarding polypharmacy within the older adult population. Interventions included within the systematic review authored by Patterson et al. (2014) were listed as: computerized decision support, medication review, reduction of inappropriate prescribing using a tool such as the Beers criteria, multidisciplinary case conferences, and brown bag medication event (Patterson et al., 2014). Other interventions found in the literature include deprescribing strategies, and medication reconciliation strategies.

Within an evidence summary authored by Bellman (2017), regarding the many barriers to reducing medication in practice, describing is used to withdrawal inappropriate medications that is safe and effective (Bellman, 2017). Deprescribing inappropriate medications have shown to reduce adverse drug events, improve patient medication compliance and reduce both financial costs and mortality (Bellman, 2017). This evidence-based summary was developed from one random control trial, two evidence based clinical practice guidelines, and a systematic review involving 22,438 participants. Evidence found that quality deprescribing requires patient to be at the center of the process, consideration needs to be made using a baseline assessment and patient, family and caretaker wishes (Bellman, 2017). Pharmaceutical care continues to improve with a multi-intervention approach when describing is used in conjunction with medication reviews, face-to-face interviews, counseling, patient education, and staff education

(Bellman, 2017).

The Beers criteria was used throughout the literature and was originally created in 1991 by Mark Beers and has been updated in 1997, 2003, 2012, and 2015. Current guideline objectives to update the Beers criteria used a comprehensive, systematic review and grading of evidence on drug related problems and adverse drug events in adults older than 65 years of age. Interventions included in the 2015 update included avoidance of potentially inappropriate medications and use of alternative medications within the older adult populations (American Geriatrics Society 2015 Beers Criteria Update Expert Panel, 2015). The Beers criteria is widely used throughout literature and is held as a standard of care for prescribers regarding describing and safe prescribing measures. Systematic reviews and meta-analysis have revealed that potentially inappropriate medication, defined by the Beers criteria, are associated with a 1.6-fold increase in mortality in older adults (Muhlack, Hoppe, Weberpals, Brenner, & Schottker, 2017).

With the use of describing it can also optimize patient's adherence to medication. Currently, patient centered care is becoming used more widely in healthcare and patients' views on polypharmacy intervention should be considered to improve patient adherence to their own medication regimen. Evidence summary findings have suggested that patients should receive education on the benefits of deprescribing and risks of medication discontinuation. Challenges to the patient were disagreement towards appropriateness of cessation, lack of support, influence of other people, fear, and lack of experience (Li, 2017). Individual attitudes of patients should be considered when deprescribing medications and using other intervention methods (Li, 2017).

Throughout the literature improvement in polypharmacy can be achieved through a

variety of interventions. One systematic review included 36 intervention studies and suggested a systematic and multidisciplinary approach as well as including personalized interventions such as medication reconciliation, application of the Beers criteria and brown bag event on a regular basis (Craven, 2018). These interventions could easily apply in the primary care setting. Cameli et al. (2012) states that medication reconciliation is an integral part of safety for older adults living in the community. Medication reconciliation is further reviewed by how accurate the obtained list of medication is, screening for adverse drug interactions, identifying primary or secondary diagnosis, of the individuals' current medications and verifying prescribed medication with prescribing providers. Other essential steps in the medication reconciliation process is assessing the older adults' knowledge of medications, if they understand instructions given, and to monitor side effects to report at future visits (Cameli et al., 2012).

Tjia et al. (2013) conducted a systematic review that included 15 randomized controlled trials, 4 non-randomized control trials, 6 pre-post studies, and 11 case series that focused on reducing unnecessary medication in frail older adults. Studies included 13,906 participants and the criteria for discontinuing medications was evaluated by questions aimed at determining medication appropriateness with implicit criteria (Tjia et al., 2013). There significant clinical findings within medication reduction regarding pharmacist review in interdisciplinary teams, academic detailing of interventions, audit and feedback report studies, and clinician medication reviews (Tjia et al., 2013). Although the use of a pharmacist review may not be readily applicable in the primary care setting, academic detailing of interventions, audit and feedback reports and clinician medication reviews would be applicable.

Best Practice Model Recommendation

To determine the best practice model recommendations for this evidence-based practice project, relevant literature was reviewed accordingly. After the relevant literature was reviewed, best practice recommendations would include multi-modal interventions in the primary care setting to decrease inappropriate polypharmacy. Interventions recommended would include deprescribing strategies, use of Beers criteria, detailed medication reconciliation, yearly brown bag events, and verifying prescribed medications with prescribers to eliminate duplicate medication therapy. Other best practice recommendations would include patient education about the medication regimen. Patient education would include what the medication is for, possible side effects, dosage of medication, and how often to take the medication. Having the patient participate in their care would increase the patients' adherence to their prescribed medication regime.

How the Best Practice Model Will Answer the Clinical Question

This practice model will answer the clinical question by providing evidence-based recommendations for interventions applicable in the primary care setting. By implementing interventions, which include using a brown bag event and Beers criteria to note reduction in medication, reduction in medication dose, and reduction in duplicate therapy. The clinical question of "Would medication reconciliation with the application of the Beers criteria and implementation of a brown bag event identify possible inappropriate prescribed medication, guide the decrease of dosages or discontinuation of possible inappropriate medication, and identify duplicate medication therapies?" will be answered by the documentation of outcomes and whether the outcomes led to improved appropriate prescribing of polypharmacy in older adults.

Table 2.1

Levels of Evidence

Authors (s)	Level of Evidence/ CASP Grade
American Geriatrics Society (2012)	I/ (A)
Bellman (2017)	I/ (A)
Cameli et al. (2012)	I/ (A)
Craven (2018)	I/ (A)
Li (2017)	I/ (A)
Masnoon et al. (2017)	I/ (A)
Muhlack et al. (2017)	I/ (A)
Patterson et al. (2014)	I/ (A)
Tjia et al. (2013)	I/ (A)

CHAPTER 3

IMPLEMENTATION OF PRACTICE CHANGE

The primary focus of this EBP project and proposed practice change was to improve polypharmacy prescribing in older adults. The objective of implementing interventions at the project site included incorporating sustainable practice change within a family primary practice. More specifically a primary practice that does not utilize electronic medical record, which would have a technical prescribing safeguard to increase prescribing safety within the older adult population.

Participants and Setting

This EBP project was implemented at a private primary practice located within Porter County, Indiana. Permission was granted to implement this EBP project from the project site facilitator and private practice physician. This project was also approved by the Valparaiso University (VU) Institutional Review Board (IRB). Patient demographics were collected for use by the project site facilitator. Implementation of this EBP project was based on dates and times established following several meetings between the project manager and site facilitator. This evidenced based project was implemented October 10th through November 30th, 2018. A power analysis was completed and a convenience sample of 34 patients was selected from the private primary practice patient list to participate in the project. Patient inclusion consisted of patients over the age of 65 and prescribed five or more medications. Patients were called the morning of their scheduled office visit and were invited to participate in the EBP project. Upon consent, patients were asked to bring in all home medications, including over the counter (OTC) and supplements. Patients whom declined participation were excluded from the project and did not participate in medication reconciliation or medication education.

Outcomes

The outcomes for this project consisted of: 1) Identification of possible inappropriate medication, discontinuing medication, and decreasing medication dosages. 2) Identifying duplicate medication therapy. Both outcomes were measured with data collection sheets provided to the project manager and the project site physician. These two outcomes were congruent to outcomes found throughout current literature.

Intervention

The project manager, in collaboration with the project site facilitator, reviewed multiple patients charts prior to patients scheduled appointments for inclusion/exclusion criteria. After patients were called based on inclusion/exclusion criteria, patients were offered to participate in the brown bag medication reconciliation event at their scheduled appointment time. The project manager encouraged patients to bring all their prescribed medicine, OTC medication, and supplements to their scheduled appointment. During the selected patient office visit, medication reconciliation was performed comparing the patient medication that they brought for the brown bag event, medication history from chart, and application of the Beers criteria to find any possible inappropriate medication or inappropriate medication dosage. Patient regimen medications that were listed on the Beers criteria were documented on a data collection sheet. After the visit, the physician documented if medications that were listed on the Beers criteria were discontinued or had a dosage decrease. Medication regimens were compared pre and post visit to note any decrease in medication amount or decrease in medication dosages with application of the Beers criteria and physician review. During the brown bag event patients' medication was compared to a medication list provided in the patient's health record. Any

duplicate medication therapy was then recorded on the data sheets. Patients were then given appropriate medication education at the end of the medication reconciliation based on each patients' individual knowledge of their own medication regimen. Statistical analysis pre- and post-medication regimens and dosages were compared for statistical significance after application of the Beers criteria. Duplicate medication therapy was also documented and statistically analyzed to determine statistical significance of identifying duplicate medication regimens within the sample population.

Planning

The site project facilitator was emailed asking for schedule availability to review interventions that were customized to fit the needs of the project site facility. Meetings were scheduled among the project manager, site facilitator and project site facility staff to develop interventions that would be sustainable at the project site facility and that also did not need an electronic medical record charting system. Interventions were developed and agreed upon by the project manager and project site facilitator. The planning of implementing the interventions was than discussed over several one-on-meetings during the week of July 2st-July 6th, 2018. Input was received from site office manager regarding normal office operations which was taking into consideration for patient pre-appointment calls. Staff members were informed by the site facilitator on the decided interventions and agreed upon implementation plan.

Data

An email that included the purpose and implementation planning of the EBP project was sent to the project site facilitator. This email was sent to explain the evidence base project, what the project entails, and appropriate interventions related to the polypharmacy focus. The project site facilitator than collaborated with the project manager to determine what demographic data

was of interest to include in the project. Project site facility staff was then informed by the project facilitator the purpose and implementation planning dates for the EBP project. The project site facilitator then informed staff of what data will be collected during the implementation process.

Measures

Prior to calling the patients before their appointment, patient demographics were collected while reviewing patient charts for inclusion/exclusion criteria. Patient demographics were excluded if the patient did not want to participate in the brown bag medication reconciliation event. During pre-appointment calls patients were explained thoroughly that participation in the brown bag medication reconciliation event was voluntary. Patients whom agreed to participate by bringing in all prescribed medication, OTC medication, and supplements also signed a consent prior to the brown bag event. The Beers criteria is a widely used evidence-based approach that is substantially followed by the Institute of Medicine and is considered highly reliable and valid. After the Beers criteria was implemented as an intervention possible inappropriate medication identified, medication that was discontinued, and medication dosage decreases were analyzed using single sample *t*-test methods which compares the mean of a single sample order to determine whether there is statistical evidence (Gravetter & Wallnau, 2013). A paired *t*-test that uses the means from related samples was used to compare the means of the number of medications prior to applying the Beers criteria and after the application of the Beers criteria (Gravetter & Wallnau, 2013). In addition, duplicate medication therapy that was found during the medication reconciliation brown bag event were recorded by the project manager and then was analyzed by using a single sample *t*-test method.

Collection

The project manager obtained the project site facilitators patient schedule before the scheduled appointment day and implementation of the agreed upon interventions. The patient schedule was not removed from the project site facility to secure patients' confidentiality. Patients were randomly assigned a number and demographics were documented without any personal information. Data was collected from Oct 10th - Nov 30th of 2018, and stored in a locked file cabinet and kept confidential within the project managers home.

Management and Analysis

Patients whom agreed to participate in the medication reconciliation brown bag event names and demographic information was kept private and was not shared or published in presentations or publications. Patient demographic data was collected prior to implementing project interventions and was utilized for descriptive analysis of the sample population. All patient information, demographic data, and medication reconciliation information was kept confidential and in a secure locked location. Data analysis of the data collected was written after the project intervention implementation was complete.

Protection of Human Subjects

The project manager ensured the protection of human rights by completing training offered through National Institute of Health (NIH) prior to the EBP project implementation. Permission to implement the EBP project was obtained by the project site facilitator and IRB approval was sought and obtained from Valparaiso University and the local privately-owned family practice. Patient consent was obtained prior to implementation of this EBP projects interventions and all patient information and data collected was kept confidential and secure. No

procedures were performed on human subjects. Participants were not exposed to any high-risk health situations such as: invasive procedures, physical testing, or psychological testing during interventions used in this EBP project. Interventions were based on the patients previously prescribed medications. Patient interactions were kept confidential in the office setting.

CHAPTER 4

FINDINGS

Implementation of this EBP project using the Beers criteria and a brown bag medication reconciliation event was designed as an evidence-based intervention specifically for a primary care practice setting, which does not utilize an electronic health record (EHR). The interventions were developed to evaluate if the application of the Beers criteria and brown bag event was successful in identifying possible inappropriate medication, discontinuing medication, decreasing medication dosages, along with identifying duplicate medications. The data analysis provided details of this EBP projects outcomes and post intervention analysis.

Participants

Participants were chosen based on the inclusion/exclusion criteria previously described. Patient inclusion consisted of patients over the age of 65 whom were prescribed five or more medications. Patients were called the morning of their scheduled office visit and were invited to participate in this EBP project. Demographic data were collected on all participants after consent to participate was granted.

Size

After a power analysis was completed, a convenience sample of 34 patients was selected from various daily patient lists. Participants that were included in the sample population were required to consent to all components of the EBP project to participate. Patients that did not consent to participate were excluded from this EBP project and were not included in the sample population or statistical analysis.

Characteristics

During implementation of this EBP 34 patients (N=34) consented to participate in this project. One patient consented to participating in the project but did not want his data used in statistical analysis, which was omitted from use in the project. Within this sample population 64.7% were males (n=22) and 35.3% were females (n=12) [Diagram 4.1]. The age of the sample population ranged from 65 years old to 97 years old with a median age of 79.5 years of age [Table 4.1]. The sample population that participated was 100% Caucasian (n=34). Comorbidities were documented within this sample population [Diagram 4.2]. There were 26.5% (n=9) with two comorbidities, 29.4% (n=10) had three comorbidities, 11.8% (n=4) had four comorbidities, and 32.4% (n=11) with five or more comorbidities.

Changes in Outcomes

Statistical Testing

For this EBP project there were two analysis methods used to determine the effectiveness of the application of the Beers criteria and brown bag medication reconciliation event. Regarding the Beers criteria intervention, a paired samples *t*-test was used to analyze the number of medications pre- and post-implementation of the Beers criteria. A single-sample *t*-test was used to determine statistical significance of the identification of possible inappropriate medications, number of discontinued medications, and decrease in medication dosages. Analysis for the statistical significance of the implementation of a brown bag medication reconciliation event to identify duplicate medication was determined by using a single-sample *t*-test. Statistical testing was conducted using the Statistical Package for Social Sciences (SPSS) Version 25 (2017).

Significance

A paired-samples *t* test was calculated to compare the mean number of medications pre-application of the Beers criteria to the mean number of medications post application of the Beers criteria. The mean pre-application of the Beers criteria was 9.82 (*sd* = 5.46), and the mean on the post-application of the Beers criteria was 9.73 (*sd* = 5.33) [Table 4.3] [Table 4.4]. There was a statistical significance in the reduction of medication between pre- and post-Beers criteria application ($t(33) = 1.787, p = <.05$) [Table 4.5].

A single-sample *t* test was used to analyze possible inappropriate medication post-application of the Beers criteria. The single-sample *t* test compared the mean number of possible inappropriate medication identified of the sample to the population value of 34. There was a statistical significance found ($t(33) = 4.68, p = <.05$) [Table 4.6]. The sample mean of .6765 (*sd* = .842) was significantly greater than the population mean [Table 4.7].

To determine if the number of discontinued medication post- Beers criteria was clinically significant, a single-sample *t* test was used. The single-sample *t* test compared the mean number of discontinued medication post- Beers criteria of the sample to the population value of 34. There was no significant difference found ($t(33) = 1.00, p = .162$) [Table 4.8]. The sample mean of .0294 (*sd* = .17150) was not significantly greater than the population mean [Table 4.9]. Although application of the Beers criteria to discontinue medication was not statistically significant, application of a Beers criteria during prescribing would be clinically significant within the elderly population.

Analysis of the amount of medication that decreased in dosages post- application of the Beers criteria was performed by using a single-sample *t* test. The single-sample *t* test compared the mean number of medications that decreased in dosages of the sample to the population of 34.

There was no significant difference found ($t(33) = 1.436, p = 0.080$) [Table 4.10]. The sample mean of .0588 ($sd = .23883$) was not significantly greater than the sample population mean [Table 4.11]. The medication dosage decreases may not have been statistically significant but clinically significant and beneficial to lower patient dosages of higher risk medications when possible.

To determine statistical significance of the duplicate therapies identified using the brown bag medication reconciliation a single-sample t test was used to compare the mean number of duplicate medications identified of the sample population of 34. There was no significant difference found ($t(33) = 1.436, p = .080$) [Table 4.12]. The sample mean of .0588 ($sd = .23883$) was not significantly greater than the sample population mean [Table 4.13]. Clinically, throughout the literature it is recommended to have a brown bag medication event to keep the patients medication list up-to-date, for patient safety, and to identify other prescriptions written by other providers.

Diagram 4.1

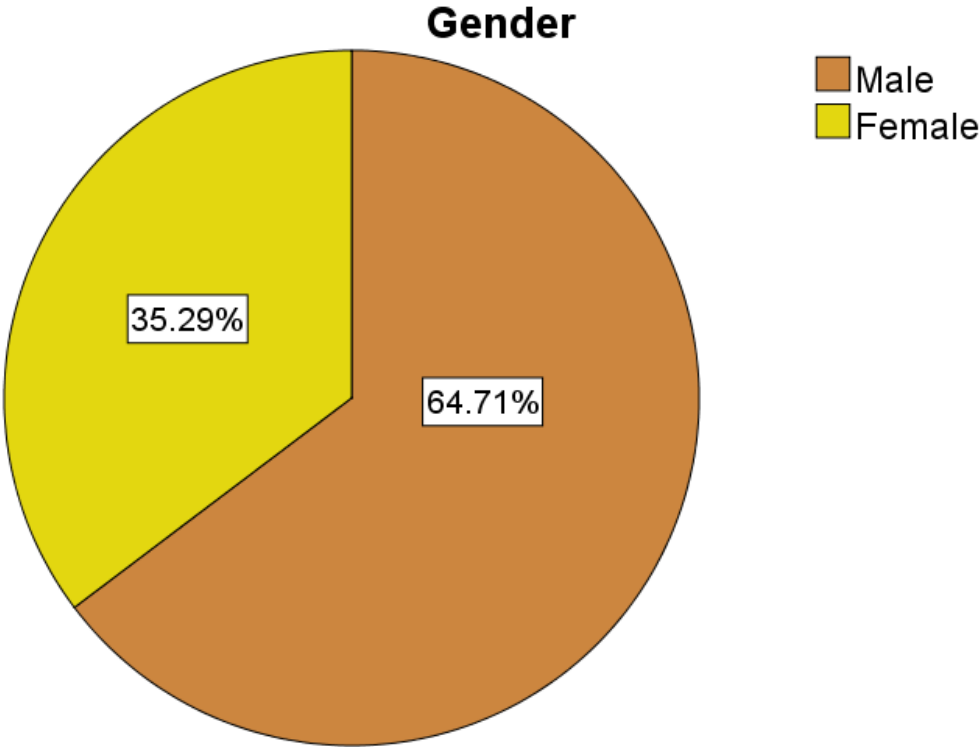


Diagram 4.2

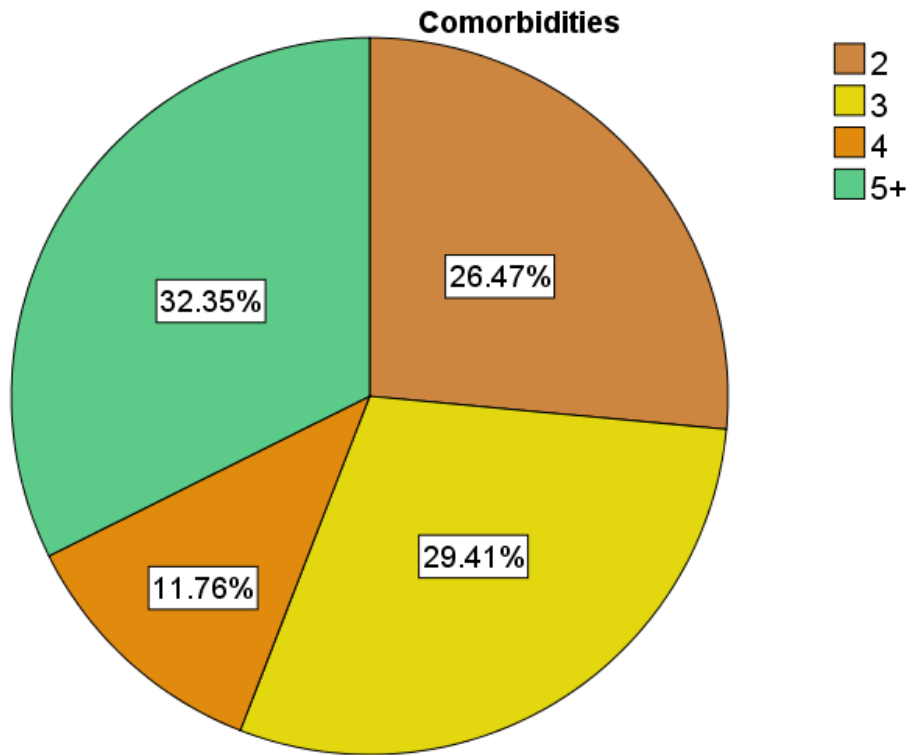


Table 4.1

<i>Age</i>		
N	Valid	34
	Missing	0
Median		79.5000
Range		32.00
Minimum		65.00
Maximum		97.00

Table 4.2

Comorbidities

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	9	26.5	26.5	26.5%
	3	10	29.4	29.4	55.9%
	4	4	11.8	11.8	67.6%
	5	11	32.4	32.4	100%
Total		34	100	100.0	

Table 4.3

Number of Medications Pre-Application of Beers Criteria

N	Valid	34
	Missing	0
Mean		9.8235
Std. Deviation		5.46321
Range		21.00

Table 4.4

Number of Medications Post-Application of Beers Criteria

N	Valid	34
	Missing	0
Mean		9.7353
Std. Deviation		5.33319
Range		20.00

Table 4.5

Difference in the Number of Medications Pre- & Post-Application of Beers Criteria

95% Confidence Interval of the Difference							
Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (1-Tailed)
.08824	.28790	0.4937	0.0047	Inf	1.787	33	.041

Table 4.6

Number of Possible Inappropriate Medications Identified Post-Beers Criteria

t	df	Sig. (1-tailed)	Mean Difference	95% Confidence Interval of the Difference	
				Lower	Upper
4.680	33	.000	.67647	.4318	Inf

Table 4.7

Number of Possible Inappropriate Medication Identified

N	Valid	34
	Missing	0
Mean		.6765
Std. Deviation		.84282
Std. Error Mean		.14454
Range		20.00

Table 4.8

Number of Possible Medications Discontinued Post- Beers Criteria

t	df	Sig. (1-tailed)	Mean Difference	95% Confidence Interval of the Difference	
				Lower	Upper
1.000	33	.162	.02941	0.0047	Inf

Table 4.9

Number of Discontinued Medications Post- Beers Criteria

N	Valid	34
	Missing	0
Mean		.0294
Std. Deviation		.17150
Std Error Mean		.02941
Range		1.00

Table 4.10

Number of Medications with Decreased Dosages

t	df	Sig. (1-tailed)	Mean Difference	95% Confidence Interval of the Difference	
				Lower	Upper
1.436	33	.080	.05882	-.0105	Inf

Table 4.11

Number of Medications with Decreased Dosages

N	Valid	34
	Missing	0
Mean		.0588
Std. Deviation		.23883
Std Error Mean		.04096
Range		1.00

Table 4.12

Number of Duplicate Therapies Identified After Brown Bag Event

t	df	Sig. (1-tailed)	Mean Difference	95% Confidence Interval of the Difference	
				Lower	Upper
1.436	33	.160	.05882	-.0105	Inf

Table 4.13

Number of Duplicate Therapies Identified After Brown Bag Event

N	Valid	34
	Missing	0
Mean		.0588
Std. Deviation		.23883
Std Error Mean		.04096
Range		1.00

CHAPTER 5

DISCUSSION

The findings of this EBP project provides insight to improving prescribing safety through the usage of the Beers criteria and a medication reconciliation brown bag event. The PICOT question was designed to answer the following question “Would medication reconciliation with the application of the Beers criteria and implementation of a brown bag event identify possible inappropriate prescribed medication, discontinue or decrease dosage of possible inappropriate medication, and identify duplicated medication therapies medications when compared to standard facility medication reconciliation over a period of two months?”. After collection of data and statistical analysis this EBP project confirms validity of the importance of using safe prescribing measures for adults aged 65 years and older whom take multiple medications.

Explanation of Findings

After data collection and analysis was complete results found that there was statistical significance using a paired sample *t*-test comparing the mean number of medications pre-application of the Beers criteria to the mean number of medications post-application of the Beers criteria. These results offer validity that the use of the Beers criteria as a clinical tool for prescribing safety can decrease overall medications which can decrease risk of adverse drug events. The Beers criteria is not meant to be interpreted as hard set guideline, but rather, a recommendation to use with clinical judgement.

With analysis using a single-sample *t*-test, identification of possible inappropriate medication post-application of the Beers criteria was also found to be statistically significant. The statistical significance augments the validity that the use of the Beers criteria is a valuable tool to identify possible inappropriate medications when there is

polypharmacy in older adults. Application of the Beers criteria as a recommendation may indicate to providers the possibility of drug interactions prior to adverse drug events. This is especially true with providers who do not have EHR with built in technological safeguards. Although the Beers criteria is meant as a guide, this EBP project has shown that there is statistical evidence to support application in a primary care office with sound clinical judgement.

Evaluation of Applicability of Theoretical and EBP Frameworks

Both theoretical and EBP framework were carefully selected to fit this EBP projects needs. These frameworks were utilized as guides in the primary practice setting and provided a unique approach to the application of evidence-based practice. The Humanistic Nursing Practice Theory allowed each patient encounter to be holistic in nature, individualized to each situation, and used personal experience to guide education related to patients' medication regimens. The Stetler Model was chosen because it is grounded in critical thinking and is enhanced by professionals with clinical scholarship. Utilization of the Stetler Model was easily integrated into a practitioner's daily routine practice.

Theoretical Framework

Using Paterson and Zderads' Humanistic Nursing Practice Theory allowed for the existential experience between the APN and the patient. Within the primary care setting the APN was asked to interpret unique perspective and responses, other's knowable responses, and reciprocal call and response as the EBP project was applied to each individual patient situation. This framework was congruent with the knowledge that every patient experience is unique, and the result of the intersubjective transaction is experiential knowledge that is lasting. This framework allowed for each patient encounter to be holistically centered and time to be

scheduled to discuss medication regimens with the patient with education sharing tailored to each patients' individualized needs. Applying this theoretical framework allowed each patient experience to be a unique nursing event while maintaining the objectives of this EBP project and allowing the experience to guide needed education.

EBP Framework

The Stetler Model was easily applied within the primary care setting and each of the progressive phases was used. The progressive phases of activity included (I) preparation, (II) validation, (III) evaluating/decision making, (IV) translation/application, and (V) evaluation. The progressive phases of the Stetler Model guided the dissemination of evidence to incorporate current guidelines into the in-office interventions applied. The preparation phase was utilized by defining the project topic as polypharmacy. From discussion with the site facilitator the PICOT format was developed. Evaluation and decision making were completed after synthesizing the body of evidence and deciding the need for medication review interventions applicable to the primary care office setting. The validation phase led to the assessment of evidence, which was summarized, and the focus of polypharmacy was affirmed. In the translation/application phase findings within the evidence led to changes that could be sustained in the primary care office settings and the interventions were planned in collaboration with the project site facilitator. The final phase of evaluation was completed after evaluating the degree of implementation and whether the Beers criteria properly identified possible inappropriate medications, guided discontinuation or decreases dosages of medications, and whether the brown bag medication reconciliation event identified duplicate medication.

Strengths and Limitations of the EBP Project

This EBP project was evaluated for strengths and weaknesses to provide insightful analysis of the project implementation and to determine areas of needed improvement.

Determining the strengths and weaknesses can contribute to offering insight for future EBP projects and research pertaining to polypharmacy and older adults. This will be especially helpful for prescribing providers and may be beneficial to inexperienced prescribers.

Strengths

This EBP project was successfully implemented as a result of collaboration between the office staff, project site facilitator, and project manager. A strength considered during implementation of the EBP project was the importance of the office staff. The office staff allowed for seamless in-office implementation by assisting with access to daily patient schedules and being enthusiastic about the development of a sustainable medication reconciliation change in their office setting. Also, the project site facilitator was open to suggestions regarding the Beers criteria, medication reconciliation, and sustainable practice change for prescribing safety in the older adult population. Another strength considered for this project was that medication education was provided holistically, and appropriately, with each individualized patient based on their medication regimen and educational needs. Also, this EBP project was implemented efficiently meeting current standards and maintaining patient privacy.

Limitations

There were several limitations observed after project completion. One limitation would be to recognize the small sample size. Although a power analysis was performed and the total number of participants were found to be statistically significant, using a larger sample size in

numerous primary care settings would have been beneficial to determining statistical significance. Also, another limitation observed is the restriction of only using one prescribing provider. The Beers criteria is meant as a guideline and is at the discretion of the prescriber. Having more than one prescriber as input would be beneficial to establish trends with provider prescribing in relation to the Beers criteria. Also, another limitation to the sample population was that the sample population was 100% Caucasian and was not diverse in nature. Although it is uncertain if this would affect the outcomes, a more diverse sample population could be beneficial as a representative of the whole population. The last limitation observed would be the amount of time spent on the EBP project implementation. Ideally, a longer amount of time, such as 6 months to 1 year, would provide more data to determine statistical significance.

Implications for the Future

With 90% of older adults taking medications on a regular basis, it is imperative to consider all strategies that can prevent adverse drug events when prescribing for patients with polypharmacy. By the year 2020 adults over the age of 65 will represent 20% of the U.S. population and will consume 50% of health care costs (Skinner, 2015). Currently, there is a lack of clear direction to solve the dilemma of polypharmacy when managing older adults with multiple chronic health conditions. This EBP project offers future insight by adding statistical relevance for the use of screening tools, such as the Beers criteria, and medication reviews to increase polypharmacy prescribing safety and ultimately decrease the risk of adverse drug events in the older adult population.

Practice

The implementation of this EBP project expanded on current established guidelines and recommendations of prescribing safety measures regarding polypharmacy in older adults. The

in-office interventions were based on current standards provided within a private primary practice setting. Within the private primary practice setting easily applicable safe polypharmacy prescribing measures were developed to maintain sustainability by utilizing current in-office protocols and incorporating the project evidence for medication reconciliation. Evidence-based interventions that promoted education and patient participation in their health care planning were developed based on each patient's individual needs. Completion of this EBP project validated the need for prescribing safety, especially in facilities that do not have EHR and technological safeguards to assist with safe polypharmacy prescribing. Incorporation of the Beers criteria and brown bag medication reconciliation event improves prescribing safety by decreasing the risk of adverse drug event in the older adult population. Utilization of the Beers criteria and brown bag medication reconciliation events during every office visit will add additional safeguards when prescribing.

Theory

This EBP project reflect the both the use of Humanistic Nursing Practice Theory and the Stetler Model. The Humanistic Nursing Practice Theory was utilized with every patient. Each patients' medication regimen was unique to that individual and their health history. Medication education was determined from each individual medication regimen and the patients understanding of their medications. The overall concept of the Humanistic Nursing Practice Theory is that each patient experience is approached as an existential experience and that nursing is a responsible searching, transactional relationship in which meaningful needs are conceptualized based on the nurse's awareness of self and others (Paterson & Zderad, 1988). The brown bag medication reconciliation event is considered a generative experience with one experience opening the door for the next. The generative experience is also congruent with the Humanistic Nursing Practice Theory. The nurse's genuine presence was exemplified with each

patient interaction. The outcomes of this EBP project also support the use of the Stetler Model. During implementation in the private primary practice setting the six assumptions of the practitioner-oriented Stetler Model were maintained and utilized. The five phases were also followed fluidly to adhere to the project's objectives. Each of the progressive phases were used within the models' construct and integrated with the use of the Beers criteria and brown bag medication reconciliation event. This EBP model emphasizes critical thinking as a key role and was utilized during the determination of patient medication regimen education.

Research

Statistical data obtained about the outcomes offers validity and insight on the improvement of safe polypharmacy prescribing in the older adult population. There were significant differences noted pre- and post-application of the Beers criteria regarding the decrease of medication prescribed. There was also significant difference found regarding identifying possible inappropriate prescribed medication. The outcomes generated from this EBP project adds to the scientific component of EBP research by confirming the importance of using a multi-modal approach in the primary care setting. A multi-model approach in a primary care setting without EHR may include the Beers criteria, brown bag medication event, educational programs, and deprescribing. Although there is a large majority of primary care settings that have existing EHR systems and use CDS within EHR, it is also important to consider additional interventions such as screening tools and patient centered education. With older adults making up about 14.5% of the U.S. population it is important to focus on research that is aimed at safe polypharmacy prescribing measures (Kim & Luck Parish, 2017). Medication regimens are essential for treating a multitude of chronic medical conditions and future research is important to maintain prescribing safety within the growing older adult population.

Education

Prescribing safety can be taught as part of educational curriculum in academia, at organizational levels, and in the healthcare workforce in the form of continuing education. Teaching providers the importance of safe prescribing measures is crucial to providing safe high-quality healthcare. Adverse drug events have the potential to contribute to patient decline in health, possible addiction, and premature death (Tija et al., 2013). It is important to stay educated on possible adverse drug events, screening tools, and improve patient understanding of their medication regimens to manage polypharmacy and multiple comorbidities and chronic health conditions. Early introduction to prescribing safety tools may help reduce potentially inappropriate medication prescribing.

Conclusion

Data has shown that prescriptions for the elderly account for 25-40% of all prescriptions written in the U.S. (Skinner, 2015). Effective polypharmacy interventions are needed in the primary practice setting to increase prescribing safety and lower the risk of adverse drug events in the older adult population. This EBP project focused on interventions for patients 65 years and older within in a private practice setting with no EHR. The implementation of this project included 34 patients whom were 65 years and older and prescribed more than 5 or more medications. Application of the Beers criteria in conjunction with a brown bag medication reconciliation event was initiated using the Stetler Model and Paterson and Zderad's Humanistic Nursing Theory as guidance. Paired samples *t*-test was used to analyze the number of medications pre- and post-implementation of the Beers criteria and findings showed statistical significance in the reduction of medication between pre- and post-Beers criteria application of ($t(33) = 1.787, p < .05$). A single-sample *t*-test was used to determine statistical significance of

the identification of possible inappropriate medications, number of discontinued medications, and decrease in medication dosages. There was statistical significance found with the identification of possible inappropriate medications ($t(33) = 4.68, p = <.05$). There was no statistical significance found with the number of discontinued medications and decrease in medication dosages. Statistical significance of duplicate medication was determined by using a single-sample *t*-test and results indicated no statistical significance. Results demonstrated that there is statistical evidence to encourage application of the Beers criteria for safe prescribing in older adults. Although the brown bag medication reconciliation event did not yield statistical significance, medication reconciliation at every patient visit is standard of care. It has been documented that the larger number of medications used by older adults can lead to increase risk of adverse drug events, poor patient compliance, and economic burden (Skinner, 2015). Managing older adult patients with polypharmacy can be very complex and demanding and there is a definite need for future safe prescribing measures to ensure patient safety.

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BIOGRAPHICAL MATERIAL

Ms. Garza graduated from Indiana University Northwest with a Bachelor of Science in Nursing in 2010. Since 2010, she has obtained her registered nurse licensure and additional certifications in Advanced Life Support, Pediatric Advanced Life Support, Neonatal Resuscitation, Trauma Nursing Core Course, Emergency Nursing Pediatric Course, neonatal S.T.A.B.L.E Program certification, and Sexual Assault Nurse Examiner certification. Kristen enrolled in Valparaiso University for a Doctor of Nursing Practice in 2015 to develop her professional career as an advanced practice nurse. Currently, she is working as emergency department registered nurse at a local hospital in which she assumes a department charge nurse position, precepts newly employed nurses, mentors nursing students, and manages quality assurance at her location. She is also a member of the International Association of Forensic Nurses and student member of the American Association of Nurse Practitioners. With completion of her DNP, she is wanting to enter the family practice setting where she feels she can best serve her community.

ACRONYM LIST

APRN: Advanced Practice Registered Nurse

CASP: Critical Appraisal Skills Programme

CDS: Computerized Decision Support

CINAHL: Cumulative Index of Nursing and Allied Health Literature

EHR: Electronic Health Record

IRB: Institutional Review Board

JBI: Johanna Briggs Institute

NHI: National Institute of Health

OTC: Over the Counter

PIM: Potentially Inappropriate Medication

SMC: Structured Medication Counseling

SPSS: Statistical Package for Social Sciences

VU: Valparaiso University

APPENDICESAppendix A

Informed Consent Form for Participation in a Student Mediated Medication Reconciliation

Kristen Garza RN, BSN, SANE, DNP Student

Valparaiso University

This Informed Consent Form is for men and women over the age of 65 whom take more than 5 prescribed medications and who are invited to participate in an evidence-based project regarding polypharmacy in the older adult population. The title of the evidence-based project is "Application of the Beers Criteria and a Brown Bag Event to Reduce Medication Related Events in Older Adults".

I am a Valparaiso University Doctoral Nurse Practitioner student who is conducting an evidence-based practice project with the purpose of increasing patient medication safety by using of a medication reconciliation event called a "brown bag event". During the brown bag event all home medications will be brought to your scheduled appointment and compared to the medication list kept on record. Education about prescribed medication can be given if needed. The Brown bag event will be used to look for duplicate medication therapy from all providers prescribing medication.

Date _____

____ I **Consent** to be included in the evidence-based practice project medication reconciliation event.

____ I **Do Not Consent** to be included in the evidence-based practice project medication reconciliation event.

X _____ Signature

Appendix C

Application of Beers Criteria and a Brown Bag Event to Increase Prescribing Safety in Older Adults

Date : _____

Assigned Patient ID#: _____

Male / Female

Age: _____

Race: Caucasian / Hispanic / African American / Non-Hispanic / Other

Number of Comorbidities: 0 1 2 3 4 5+

of Medication Prior to Beers Criteria _____

of Medication After Beers Criteria _____

of Medication Dosages Decreased _____

of Duplicate Medications Identified after Brown Bag Event _____