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A Quality Improvement project to improve medication adherence for older adults in a primary care setting

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Table of Contents

Abstract 4

Introduction and Background 5

Problem Statement..... 7

Review of the Literature 7

Theoretical Framework 12

Project …….....15

Methods/Interventions……..…16

Settings and Resources 17

Description of the group, population or community 17

Organizational analysis of project site 18

Evidence of stakeholder support 18

Facilitators and barriers 18

Goals and Objectives 19

Implementation Plan 20

Cost Analysis/Budget 19

Timeline 21

Ethics and Human Subjects Protection 22

Results……..... 23

Discussion/Interpretations……..…25

Conclusion 28

References 29

Appendix..... 37

I. Appendix A: Jacox Model
II. Appendix B: Theory of Planned behavior
III. Appendix C: Morisky Medication adherence scale MMA-4
IV. Appendix D:PDCA-implementation
V. Appendix E: Project Checklist
VI. Appendix F: Medication Review form: Brown bag review
VII. Appendix G: Office Poster
VIII. Appendix I: Office Poster
IX. AppendixJ: Medication safety handout

Abstract

Background: Problems associated with medication nonadherence have been identified as a complex problem that has a potentially devastating negative impact on a patient's outcome as well as a financial burden on the healthcare system. Complexity of the medication regimen, including polypharmacy in the elder population, can have a tremendous impact on the ability of the patient to be adherent to the plan of care. Implementing patient specific interventions to address adherence levels and improve follow-up and support have shown to improve adherence and improved patient outcomes. **Purpose/Methods:** The purpose of the project was to identify if an increase in medication adherence followed an educational intervention reviewing the importance of medication taking behaviors and the potential impact of nonadherence. The Morisky Adherence Scales MMAS-4 was used to assist in the determination of baseline levels of adherence and whether there was further enhancement or improvement in the level of adherence in the primary care setting following the educational/supportive intervention. **Results:** This intervention resulted in improved levels of adherence, which is consistent with current findings in the literature. **Implications:** The project found that providing further education on prescribed medication regimens for older adults in the primary care setting resulted in an improvement in adherence levels, improved persistence in medication taking behaviors, and a decrease in poor outcomes resulting from nonadherence.

Keywords: medication taking, adherence, persistence, non-compliance and compliance

Introduction and Background

Medication nonadherence has been identified as a complex problem that can have a negative impact on a patient's health outcomes as well as a significant financial burden on the healthcare system (Costa et al., 2015; Granger et al., 2015; Ho, Bryson, & Rumsfeld, 2009; Jimmy & Jose, 2011; Moral et al., 2015). Complexity of the medication regimen, including polypharmacy in the elder population, is just one of the barriers to adherence. Implementing interventions to address this complexity, which includes follow-up and provider support, have shown to improve adherence and enhance patient outcomes (Blanco-Reina, Ariza-Zafra, Oscana-Riola, Leon-Ortiz, & Bellido-Estevez, 2015; Costa et al., 2015; Pasina et al. 2014; Planton & Edlund, 2009).

Adherence to long-term therapy is defined by the World Health Organization (WHO) as "the extent to which a person's behaviour – taking medication, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a health care provider" (World Health Association, 2003, p. 18). It has been estimated that as many as 70% of Americans take at least one prescription and approximately 20% are prescribed five or more medications and the large majority are not taken as prescribed (Kuntz et al., 2014). It has been noted that as many as 20-30% of prescriptions are never filled while almost 50% to 60 % of prescription medications are not taken as directed by the health care provider (Burkholder & Linn, 2016; Viswanathan et al., 2012).

Medication nonadherence has been associated with negative outcomes for patients, including more frequent hospital readmissions and as many as 125,000 deaths annually (Hubbard & McNeill, 2012; Moral et al., 2015, "National Consumers League," 2016). Factors that

influence medication adherence include financial constraints, social factors, limited access to services and the complexity of the drug regimen. Interventions to alleviate these factors can improve overall medication adherence (Costa et al., 2015; Hubbard & McNeill, 2012; Jimmy & Jose, 2011; Viswanathan et al., 2012).

Medication adherence is also complicated by the use of multiple medications to treat chronic conditions (Blanco-Reina, Ariza-Zafra, Oscana-Riola, Leon-Ortiz, & Bellido-Estevez, 2015; Burkholder & Linn, 2016). The pill burden can be intense when multiple conditions are being managed. By utilizing interventions to simplify daily medication regimens, such as using extended release formulations to reduce dosing frequency, have demonstrated a positive impact on improving medication adherence (Pasina et al., 2014).

Medication nonadherence has been discussed in relation to healthcare system-related factors, patient-related factors, therapy-related factors, condition-related factors and social and economic factors (Centers for Disease Control, 2013). When the root cause of the nonadherence is identified, appropriate interventions can be instituted to address the underlying issue (Centers for Disease Control, 2013). Healthcare-system related factors included lack of access to care, fragmentation in continuity of care, and the misunderstanding of patient education. Patient related factors include physical and psychological factors that impede the ability to adhere to the medication regimen. Condition/therapy factors include complexity of the medication regimen, duration of therapy, unpleasant side effects, and silent symptom diseases that can all contribute to levels of nonadherence (Centers for Disease Control, 2013).

A variety of interventions have shown to have a small, but measurable improvement in medication adherence. Different campaigns have been initiated in attempts to improve the outcomes of medication adherence such as *Script your Future* established by the U.S. National

Consumers League and the *Brown Bag Check-up* established by the Institute for Safe Medication Practices on a national/federal level. On the state level programs such as the *Medication Adherence Project* (MAP) program that focused on improving mediation adherence in New York State have been developed (Starr & Sacks, 2010). While no specific intervention or program was identified as superior, increasing monitoring and communication between the patient and the provider have demonstrated the most promising results (Costa et al., 2015; Granger et al., 2015; Hubbard & McNeill, 2012; Moral et al., 2015; Munro, Lewin, Swart, & Volmink, 2007;Viswanathan et al., 2012). The goal of the project was to evaluate the effectiveness of a multifaceted intervention, which included medication reconciliation and patient teaching with increased communication, as determined by a decrease in scores on the Morisky Adherence Scale MMA-4 signifying an improved levels of medication adherence

Problem Statement

Medication nonadherence is associated with increased mortality, morbidity, and health care costs among older adults. Research supports this by identifying that as many as 20-30% of prescriptions are never filled and approximately 50% of medications for chronic diseases are not taken as prescribed. Patients, over the age of 65, are at increased risk of nonadherence due to their increased prevalence of chronic diseases that increase their prescribed pill burden regimen.

Review of the Literature

A comprehensive search of medication adherence and elders, was conducted utilizing the following Databases: PubMed of the National Library of Medicine, Cinahl Complete Current Index to Nursing and Allied Health Literature, and Google Scholar. The MeSH (medical subject heading) utilized when searching in PubMed was Medication Adherence [F01.145.288.500.500; D055118) and identified entry terms of medication compliance, medication nonadherence,

medication non-compliance, medication nonadherence, medication noncompliance and medication persistence. The initial search results identified over 5 thousand articles, many of which were not appropriate for the purpose of this literature review. Limitations to the search criteria were added to narrow the search to within the last 5 years, full-text, and English, which resulted in 300 articles. Finally narrowing the search to focus on older adult patients, those over the age of 65, resulted in approximately 30 articles that met the specific criteria for the project and have been included in this paper.

Scope of the problem

Medication adherence is a common problem that plagues our nation and efforts to combat adherence issues have resulted in the development of current evidence-based practice guidelines (Blanco-Reina, et al, 2015). Current evidence suggests that the more co-morbidities that a patient has and resulting increase number of prescribed medication, the less likely they are to be adherent to the full regimen, especially when medications need to be taken over an extended period of time. (Charlesworth, Smit, Lee, Alramadhad, & Odden, 2015). In particular, patients that suffer from chronic conditions without overt symptoms, that require daily medications, tend to have increased levels of nonadherence and potential catastrophic outcomes due to non-management of their conditions (Jimmy & Jose, 2011). For example, Ho et al (2009) found that of patients being cared for following cardiovascular problems, approximately one-fourth of patients hadn’t filled their cardiac medications by day seven following discharge specifically concerning the aspirin, a Beta-Blocker, and a statin. It was noted at least one of these medication had been self-discontinued at one month post-discharge. The six-month follow-up visit showed even further decline in the level of nonadherence. This research has stimulated the creation of

interventional programs on the local, state, and national levels in an effort to address the growing concern of medication nonadherence.

Assessing and managing medication adherence

Different methods can be used to measure levels of adherence including both direct and indirect observational methods (Jimmy & Jose, 2011). Jimmy and Jose (2011) described different methods to influence and improve medication adherence including prescribing considerations as well as increased frequency of communication and follow-up with the patients. Both Pasina et al (2014) and Jimmy and Jose (2011) found that while no specific form of monitoring was proven superior, both studies identified that adherence became an issue with increasing complexity of the regimen, multiple times per day dosing, and the lack of understanding in the mechanism of action for the medications prescribed.

Interventions shown to be effective in improving medication adherence have included creating partnerships between the patient and provider that have impacted medications and symptoms on a daily basis (Granger et al., 2015). There is strong evidence to suggest that when patients are empowered to self-manage their medication therapy, significant cost savings to the patient and the health system as a whole may result (Varming, Hansen, Andresdottir, Husted, & Willaing, 2015; Viswanathan et al., 2012). The benefits do not only impact the health system, but also can provide health benefits and reduce dependence on the healthcare system with decreased morbidity and mortality and associated costs of care (Costa et al., 2015). Despite projections that higher levels of adherence would improve outcomes such as mortality and morbidity as well as quality of life, Viswanathan and colleagues (2012) found that there was little evidence that supported this claim.

Viswanathan and colleagues (2012) studied the effects of specific interventions to improve adherence to self-administered medications for chronic diseases. This group of researchers examined the effectiveness of interventions intended for patients, providers and systems as a whole as well as the effectiveness of policy interventions on adherence rates Researchers found that changes to policy on a state and national level have been associated with increased adherence involving facets of patient, provider, and system levels (Viswanathan et al., 2012).

Moral and colleagues (2015) reported similar findings to those of Viswanathan et al. (2012), which indicated that the use of a combination of interventions provided the chance at improving levels of medication adherence. Moral et al (2015) utilized a format of motivational interviewing (MI) where the patient was provided with more than just medical advice, which was used for the control group, but added further interventions in an effort to motivate patients to change their health behaviors and improve overall health. There were three follow-up visits that resulted in increased levels of adherence in all participants but an additional 7.6% increase adherence level was noted in the group who were exposed to MI (Moral et al., 2015).

Costa et al (2015) examined the literature to identify interventions/tools that have been demonstrated to improve medication adherence. In their review of literature, they identified aspects of behavioral, educational, integrated care, self-management, and risk communication interventions that correlated with higher levels of compliance with the medication regimen (Costa et al., 2015). The authors could not identify any one specific intervention/tool that consistently improved medication compliance over-time and suggested that further research was needed (Costa et al., 2015).

Hubbard and McNeill (2012), also examined the challenges and potential solutions related to the issue of medication adherence. These authors identified current practices and different models that have been documented in the literature in an effort to increase medication adherence and decrease costly hospital readmissions. Hubbard & McNeill (2012) found that performing a comprehensive medication reconciliation and medication management process were important aspects of assessing adherence as well as the teaching of self-management techniques. The authors also noted that for the discharged patient to remain at home, in a stable condition, the components of medication education and adherence needed to be established by first performing a comprehensive medication reconciliation in order to anticipate potential problems the patient may experience once at home and correct any issues proactively (Hubbard & McNeill 2012).

The studies included in this review vary in strength of type and consistency based on the Jacox Model (see Appendix B). Although the studies included all focused on medication adherence, there were differences in measures and interventions that did not elucidate a specific "gold standard" intervention that resulted in improved levels of adherence. Three reviews of literature looked at the current practices being used and how a variety of interventions were needed to improve adherence levels and medication taking behaviors. Four randomized interventional studies and six intervention specific studies focused on how the studied intervention changed levels of adherence, and one Evidence Based practice report was utilized for developing the process of this quality improvement project. Overall the evidence provided guidance to different methodologies to improve medication adherence across clinical conditions. The studies varied from low cost, lower intensity studies to intensive intervention and case

management along with increased collaborative care across the continuum with the goal of higher levels of medication adherence.

The Institute for Safe Medication Practices introduced the use of a *Brown-Bag Check-up* as a process to perform medication reconciliation and thereby assess adherence. In addition to this tool, the *Medication Adherence Program*, created by the States of New York and Ohio found that a more interactive relationship between patient and provider demonstrated improvement in levels of adherence ("Institute for Safe Medication Practices," 2015; "Ohio Patient Safety Institute," 2015, Starr & Sacks, 2010). Posters, one of the tools provided by the *Medication Adherence Program*, outlining concerns about adherence/medication taking behaviors were identified as a positive way to bring more attention to barriers to adherence that may further complicate to the issue of nonadherence (Starr & Sacks, 2010). These two programs found that by increasing communication and providing specific education regarding medication concerns resulted in a higher level of adherence.

In summary, researchers have reported that medication adherence levels tend to be lower in patients with chronic conditions that require multiple medications. In addition, studies support the relationship between medication adherence and patient outcomes. Interventions to improve adherence behaviors, including structured educational interventions, medication reconciliation and increased provider contact, have been shown to have a positive impact on a patient's quality of life over time.

Theoretical Framework

The *Theory of Planned Behavior* (TBP) provides the basis for the framework of this quality improvement project (see appendix B). The Theory of Planned Behavior includes aspects of the cognitive process that controls behavior and can often assist in the ability to predict

behavior change in management of health (Ajzen, 1991). An important concept of the TBP involves addressing if a patient is motivated and has the intention to make positive changes to their health with an understanding of the ramifications of, in this case nonadherence to a prescribed medication regimen, and can potentially improve patient outcomes as a result of increased levels of medication adherence. For the purpose of this quality improvement project the TBP was used to look at the outcomes of adherence levels to assess if there was measurable improvement demonstrated by the application of the Morisky Adherence Scales MMAS-4 (appendix A).

This theory has been widely used in explaining health change beliefs and behaviors and was used for the purpose of this quality improvement project on medication adherence (Ajzen, 1991; Jannuzzi et al., 2014; Wu, Corley, Lennie, & Moser, 2011) First, the process of assessing the patient's beliefs surrounding medication taking and adherence behaviors can give a clinical view of why a patient is adherent or not as it is related to their medication taking behaviors (Manning & Bettencourt, 2011; Wu, Corley, Lennie, & Moser, 2012). By addressing what are the motivating factors and what are the barriers to behaviors surrounding adherence, one can identify what changes can be made and interventions initiated that can help support taking the medication as prescribed. This process allows for the prescribing medications to be more patient-centered and tailored to meet the needs of the specific patient with the best possible outcomes achieved (Jannuzzi et al., 2014, Manning & Bettencourt, 2011; Wu et al., 2011).

Wu et al, 2011, investigated the application of the TBP to guide their interventions for patients with cardiac heart failure, and identified better overall outcomes for the patients in their study when motivational factors were addressed prior to interventions. TBP had a positive impact on the study participants by showing a reduction in cardiac events and better symptom

management for patients with heart failure. Manning and Bettencourt (2011) found similar evidence that the use of TBP assisted in the support of behavior changes associated with medication adherence in breast cancer survivors and its importance of increasing adherence in face of depression. Jannuzzi et al, (2014) also utilized TBP to assess adherence to oral diabetic treatments. Similar to results from Wu et al (2012), and Manning and Bettencourt (2011), the use of motivation to change their behaviors due to beliefs regarding risk to benefit in taking the medication was identified. The authors, noted above, found that when treating the complex issue of adherence it was necessary to identify the behavioral, control, and self-care beliefs when trying to address the basis of the issue (Jannuzzi, Matheur-Rodriguez, Cornelio, Sao-Jaoa, & Jayme-Gallani, 2014; Manning & Bettencourt, 2011; Wu et al., 2011).

The majority of studies using the TPB had homogenous patient populations with similar medical problems. In this QI project, the theory was be applied in an effort to address motivational factors for patients receiving care in a primary care office suffering from an array of co-morbidities. The TBP was applied to address and/or to assist in positive behavior changes and increased levels of adherence to the therapeutic regimen with the overall goal of improved health outcomes. TBP was integrated on an individual basis, including patient specific factors, to assess the specific patient motivational factors and current adherence levels and to help identify where further support and teaching may be necessary. By doing a complete medication reconciliation utilizing a brown-bag check-up, it further identified barriers to adherence and offered an opportunity to enlist other resources to support the patient in making positive changes in their health.

Based on the theoretical framework, the hypothesis established for this quality improvement project was to initiate multi-faceted, patient-centered interventions surrounding

medication taking behaviors and increased patient/provider communication would result in improved levels of adherence measured by the Morisky Adherence Scales MMAS-4.

Project Design and Methods

The PLAN-DO-CHECK-ACT (PDCA) cycle method was used to execute this QI Project (Allen, 2013) (figure 1). The PDCA process included planning how the changes are to be made, implementing changes and collecting data, and studying the effects of the change and evaluating if further modification would be needed. The TBP guided the implementation process by first assessing the individual's motivation for improving health outcomes and establishing what was identified as most important as part of the planning phase of the cycle.

This project included:

1. Calling and reminding patients to bring all medications, including herbal and over-the-counter preparations to the office visit.
2. Conducting a medication reconciliation using the "brown-bag" method. (Appendix F)
3. Evaluating baseline level of medication adherence using the Morisky Adherence Scale MMAS-4 (Appendix A) and educating patient to hazards of nonadherence.
4. Evaluating post intervention levels of medication adherence using the Morisky Adherence Scale MMAS-4 at 4 weeks.

Patients were informed of the QI project during the fall of 2016 when they went to the office for medical visits or for flu vaccinations. Patients who were scheduled for their annual exams in the fall were also asked to participate. It was requested that they bring in all of their medications to their appointment if they wished to participate in the project and they were

reminded when they received their appointment reminder phone calls. Inclusion criteria for the project included patients who were over the age of 60 and took more than two prescribed mediations on a daily basis. Exclusion criteria included patients who did not manage their own medication regimen, those with dementia that interfered with their ability to participate, patients who lived in a care facility or any patient that did not wish to participate in the project.

Methods/Intervention

A multifaceted intervention consisted of educational posters in the waiting room and exam room that reinforced the need for adherence, implementing a brown-bag Check-up, collecting data using the Morisky Adherence Scale MMAS-4, identifying any barriers to adherence and further education regarding importance of adherence as identified in the intervention. The Morisky Adherence Scale MMAS-4 was administered with further questioning as to the specific number of times a week there was an issue with adherence identified. Individualized patient education was performed and tailored to meet the individual patient questions and concerns identified. Handouts, regarding increasing communication with the pharmacist and provider and medication wallet cards, were also provided which focused on encouraging dialog and questions regarding old or new medications and any potential problems that may stem from them. Finally, follow-up phone calls were implemented to address if the interventions, as noted above, provided a measurable improvement in levels of medication adherence.

A t-test was used to compare the differences in the MMAS-4 scores at base line and post intervention at the 4-week interval. (Statistical Package for the Social Sciences (SPSS) version 23, 2015). A significance level of .05 was selected as a baseline for establishing statistical

significance. Scores were collected prior to intervention and 4 weeks following the intervention by telephone interview.

Analysis

Setting and Resources

The project was conducted in a primary care office that serves adults of varying ages and backgrounds. The office, located in Western Massachusetts, has one physician and one nurse practitioner that manage the care of the patients. Resources for the project, including posters, and handouts and the DNP student's time were the responsibility of the student.

The office is small and has only four exam rooms. The front office staff is comprised of one person whose job includes signing people in, collecting their insurance information and co-pays as well as doing filing and any other needed clerical jobs to keep the office running smoothly. There are also two medical assistants who work daily and have a number of responsibilities including obtaining vital signs and other medical and clerical duties. They currently do not utilize an electronic medical record, but are able to remain efficient and patient-centered using the traditional paper charting system.

Description of the Population

The patients have been noted to have profound differences in fiscal resources; some of the patients are wealthy and others are struggling financially. The majority of patients are covered by either Medicare or Medicaid, which in turn covers the cost of care. Other patients have traditional medical insurance with varying levels of co-pays required. This was an important aspect to investigate when identifying resource allocation and medications within the fiscal means of the patient. Co-pays for medications vary depending on insurance carrier. This was an important aspect to review, prior to initiating any new prescription, if the medication was

covered under the carrier or if another option was necessary/available or required prior authorization.

Organizational Analysis of Project Site

Stakeholder's Support

Initial discussion and presentation of project ideas were reviewed with the stakeholders at the site prior to the initiation of the stakeholder agreement. A stakeholder agreement was established between the practice physician and NP with the College of Nursing for University of Massachusetts Amherst and the DNP student.

Facilitators and Barriers

Facilitators to the project were the care team at the primary care office. The MD and NP helped to identify patients who would benefit from the project and helped to facilitate the recruitment of patients to participate. Barriers to the project were tool utilized for data collection, time constraints and space. The Morisky Adherence Scale MMAS-4 is limited in the differentiation of the specifics of how problematic the issue of nonadherence is. The scale only addresses if the patient does or does not forget to take their medications. Further assessment into a positive response is necessary to fully address the breadth of the problem. For many of the patients the time utilized to obtain the initial data and teaching about medication/communication/interactions took significantly longer than anticipated to meet the project objectives. The patients were very open and had many questions that increased the amount of time needed. Patients needed to vacate the rooms as to not "hold up" other patients in the waiting room so they were moved to another room when available. Follow-up calls, initially thought to be a rather quick reassessment of adherence, at times required further discussion with the providers at the practice and increased the time set aside to collect the data.

Further barriers to the project were noted when the patients forgot to bring their medication bottles, although they would remember to bring their medication lists to the project setting. It was difficult to obtain follow-up data from some patients who were still working, as their availability to receive follow-up phone calls was limited due to scheduling conflicts, despite multiple attempts by the DNP student.

Goals and Objectives

The overall goal of the QI project was to identify if there was an increase in medication adherence following a multifaceted intervention at the primary care office.

- Project goals: Identify if the education and support provided in the office results in improvement of adherence and persistence over time, based on results of the four week interval of the MMAS-4, in older adult patients in primary care.
- Patient goals: Patient demonstrated higher levels of adherence evidenced by the Morisky scale for adherence levels.
- System/practice goals: Identify if there were increased adherence levels following intervention in the office setting.

Implementation Plan

The process of implementation of the project followed the PLAN-DO-CHECK-ACT (PDCA) cycle method (Figure 1) for evaluating a test of change and quality improvement (Allen, 2013). This cyclical process involves first addressing what the goals or expected outcomes of the project were. “Planning” involved reviewing the literature to identify current evidence based practice interventions that have demonstrated positive impacts to adherence levels. The “Do” is interventions, as outlined previously included implementing the brown-bag check-up, informational posters, and assessment of barriers and adherence levels that were utilized to

improve adherence levels over time. The “Check” aspect of the process involved reviewing of the data and identifying if following the intensive review of medications via the brown-bag check-up, education with resources, resulted in increased levels of adherence. The “Act” part of the process was identified after reviewing the data collected during the process and involved making any changes necessary to increase the projected success for the future.

To address adherence following the multifaceted intervention and education provided in the office, the Morisky Medication scale as well as questions outlined from the brown-bag check-up were used to further identify levels of adherence. The information collected included questions to obtain both quantitative and qualitative data including the Morisky Medication Adherence Scale MMAS-4 and questions regarding how often they had been taking their medications as prescribed and if there were improvements identified following the intervention (Basco & Smith, 2009; Granger et al., 2015; Morisky, Ang, Krousel-Wood, & Ward, 2008). Further questions were utilized from New York’s medication adherence program that assessed for levels of adherence and considered any follow-up questions the patient may have. Qualitative data were reviewed to identify any emergence of common themes from the data. Patients, who had questions that feel outside the scope of the project, were referred back to the provider for further assistance.

Cost-Benefit Analysis

A cost-benefit analysis was conducted and addressed the feasibility of the program that was proposed and implemented. Specifically it identified the responsible party for funding of the specific aspects of the project, which depended on the size, type, and breadth of the agency administering the project (Issel, 2014). The location utilized for this project was a small primary care practice where the direct costs including handouts, tools, posters, and other resources were

the responsibility of the DNP candidate. Indirect costs, such as lighting, heat, and reminding patients to bring all medications to the appointment was covered by the practice.

The direct patient costs were not identified, as there were no associated costs to project participation. The potential benefit of increased adherence levels and potential preventing long-term consequences associated with failure to manage conditions were something that could not be specifically measured for the purpose of the project. If a diabetic patient maintained normal glycemic control, the long-term benefits on the renal system and decreased expenditures associated with complications may have been diminished during the course of the QI project but the collection of this type of data did not occur in the breadth of the project.

Timeline

Following the approval of the proposal, in November 2016, the QI project proceeded as noted in the table below.

Table 2

Project Timeline

Task	November	December	January	February	March
Recruitment of eligible participants	X				
Educational Intervention/initial assessment	X	X	X		
Identification of interacting medications	X	X	X		

utilizing the MedScape application					
Post-test and Analysis of outcomes 4 weeks			X	X	
Provide results to providers					X

Ethics and Human Subjects Protection

Ethical considerations were important aspects of this and any quality improvement or research project to protect the participants. “The US Department of Health and Human Services, Part 46, Protection of Human Subjects, has designated certain populations as particularly vulnerable . . . including children, prisoners, pregnant women, mentally disabled persons, and economically or educationally disadvantaged persons” (Roush, 2015, p. 48). This was an issue noted as all patients had the ability to participate and there were no control groups that did not receive the benefit of the intervention. The project provided additional education and follow-up phone calls which did not place the patient at risk for harm from participation in the project. The participant’s privacy was protected via guidelines of the health Insurance Portability and Accountability act of 1996 (HIPPA) which “requires appropriate safeguards to protect the privacy of personal health information, and sets limits and conditions on the uses and disclosures that may be made of such information without patient authorization” ("US Department of Health and Human Services," n.d., p. 1). The patient data collected during the project, in addition to

adherence levels, included age, gender, and a phone number for the purpose of follow-up calls. Verbal consent was obtained from each project participant prior to the initiation of the interventions and data collection.

The University Of Massachusetts Institutional Review Board reviewed the project and declared it "exempt" as it did not involve research and was performed solely for the purpose of quality improvement and patient education.

Results

Project participants

A total of 23 patients were contacted regarding participation and told about the purpose and goals of the project, namely improving communication and improving medication adherence levels. The majority of patients, 20/23, who were contacted, agreed to participate. Two patients declined participation due to time constraints and family obligations and one participant didn't complete the 4-week follow-up due to hospitalization. The male (N=8) age range was 61-79 with a median age of 72.5; the female (N=12) age range was 60-76 with a median age of 67. The male participants averaged 4.3 prescribed medications where the female participants averaged 5.5. Additionally male participants averaged 1.5 OTC medications and the female participants took an average of 2.6 additional medications that could potentially interact with the current medication regimen.

Statistical Analysis: Quantitative data

The Statistical Package for the Social Sciences (SPSS) t-test was used to evaluate if there was a statistical differences between the means of two change scores at initial meeting and four weeks following the interventions. A significance level of .05 was selected for the purpose of the project. A 0-4 scale of adherence, established by Morisky Adherence Scale MMAS-4, was

collected at two time points with the mean x1=1.2-initial level of adherence and mean x2=.85 follow-up average level of adherence. Based on this result, it demonstrated improvement on the level of adherence from 1.2 to .85. The follow-up standard deviation (SD) was smaller as the variance of scores demonstrated more consisted adherence to medication taking behaviors. A statistically significant improvement in adherence was identified following the intervention with the mean pre-intervention=1.2 and post-intervention .85, p=0.002. (See table below).

Table 3

Statistical Data

Collection point	N	Mean	ST deviation	Sig	t value
Initial	20	1.20	.769		
4 week	20	.85	.587		
Comparison Initial & 4 Week	20	.350	.587	.002	2.67

Qualitative results:

Anecdotal patient comments were collected during patient discussion in the context of the educational intervention. These comments were analyzed to identify themes related to barriers to patient adherence to the prescribed medication regimen. Comments were further analyzed to explain the potential reasons for improvement in levels of adherence.

Themes that supported barriers to medication adherence included:

1. Not focusing on the importance of regular medication taking behaviors to support health maintenance.
2. Finances were noted as a second issue.

Themes that may explain the improvement in medication adherence include:

1. The patient "tried" hard to remember to take their medications for the purpose of the project.
2. Pillboxes, phone reminders, and other organizational tools were effective in helping patients remembering to take medications as prescribed.
3. Awareness of purpose of the project, and anticipating the follow-up phone call resulted in an increased level care applied to medication taking.

In the initial assessment for adherence, the vast majority of patients verbalized that they occasionally did forget to take their medications. Of the patient participants, irrespective of male or female, the average frequency they forgot to take their medications was 1.5 times at the initial data collection point. Table of Raw data can be found in Appendix

Discussion

This quality improvement project findings are consistent with current literature that suggest that increasing communication with the provider resulted in improved levels of medication adherence. Communication, and partnering with the patient population, has been shown to be an essential aspect to improve adherence levels and prevent potentially untoward effects due to decreased medication adherence levels (Blanco-Reina et al., 2015; Costa et al., 2015; Ho et al., 2009; Pasina et al., 2014; Wu et al., 2011). By recognizing the patient specific barriers to adherence, interventions can then be tailored to meet the patient specific needs. Increased frequency of communication, understanding reasons for nonadherence and implementing patient centered interventions are essential components of addressing the complex issue of medication nonadherence (Burkholder & Linn, 2016; Costa et al., 2015; Ho et al., 2009; Pasina et al., 2014; Wu et al., 2011).

Many of the patients were, in fact, found to be adherent to their daily medication regimen. They actively focused on the need to manage their conditions by making necessary life style modifications as well as focusing on their personal level of medication adherence. For those patients identified as not being completely adherent, this project demonstrated that by tailoring the intervention to meet the patient specific needs and increasing communication, a significant improvement could be realized. Patient centered interventions were implemented. Very simple, yet effective, interventions were employed to assist each patient in an effort to increase their adherence levels. Support and education was provided to all project participants.

For one patient participant, she was given a pill box that helped to organize her weekly medications so that she wouldn't forget if she took them or not. Prior she would flip her bottles upside down as a visual reminder that she had taken her medications. She would often forget if she flipped them upright in the morning or not, often contributing to her inadvertent nonadherence due to fear of double dosing.

A second patient was also given a pillbox to overcome the barrier of significantly decreased visual acuity, which made it difficult to discern the writing on the bottles. Her larger sized box had sections for twice a day, her daily dosing regimen, so that she wouldn't inadvertently take a wrong medication due to lack of visualization of the pill shape/color or writing on a bottle.

A third patient had reminders set in his I-phone to help him remember is evening medication, which was frequently forgotten at dinnertime where another patient moved the location that they stored their medication so that they had more frequent visual access to the medication bottles for a reminder.

A fifth patient was educated as to the “silent harm” that was occurring to her body when she didn’t take her insulin and her blood sugars were consistently over 250. Dialysis, limb loss, blindness all consequences of poorly controlled diabetes were reviewed with the patient. This patient was the most non-adherent and the youngest, 60, in the group. Reinforcing the hazards of hyperglycemia led her to work more closely with her endocrinologist and improve taking her medications as prescribed with an increased regularity.

One aspect, which was not addressed in the process of this project, was the potential for diminished levels of adherence over time. The patients were seen in the office and were aware that they would have a follow-up phone call at 4 weeks and many stated that they were “trying really hard” to remember so that the DNP project would be successful. It would be interesting to track over time to assess if there was continued persistence in their medication taking behaviors once the increased communication ceased. Should this project be conducted again, use of a more specific measurement tool, other than the Morisky Scale to address levels of adherence as well as measure for persistence in medication taking behaviors over time could illicit more insights into the complex problem surrounding medication adherence. Recommendations to further address the problem of medication adherence involve continued partnering and increased communication between patients and their providers. Future examination of this topic through implementation with a larger population would be important to determine whether the results would be similar. As no intervention was identified to eradicate the problem of poor medication adherence, providers need to be vigilant in assessing for current levels. Ongoing support and communication have been shown, as in this project, to improve levels of medication adherence. Limitations to the outcomes of this project are due to the small sample size. It would be important to replicate the project on a larger population to address its efficacy to the population as a whole.

Conclusion

Nonadherence is a serious problem that can potentially lead to increased mortality and morbidity, diminished quality of life and increased healthcare costs for both patients and health care organizations (Charlesworth, Smit, Lee, Alramadhan, & Odden, 2015; Costa et al., 2015; Hubbard & McNeill, 2012; Jimmy & Jose, 2011; Viswanathan et al., 2012). Complexity of the medication regimen, a barrier to adherence particularly in older patients with multiple comorbidities, has shown to be problematic for adherence and interfere with patient outcomes (Blanco-Reina et al., 2015; Costa et al., 2015; Pasina et al., 2014; Planton & Edlund, 2009). By increasing the frequency of communication and educational support has demonstrated to be a significant predictor of patient success (Charlesworth, Smit, Lee, Alramadhan, & Odden, 2015; Costa et al., 2015; Hubbard & McNeill, 2012; Jimmy & Jose, 2011; Viswanathan et al., 2012). Patient-centered interventions that address the common issues associated with poor mediation adherence should be integrated into everyday practice to ensure improvements for all patients in the primary care setting.

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Appendix A

TABLE 1

MORISKY ADHERENCE TEST[19]

1. Have you ever forgotten to take your medicine?
2. At times are you not careful about taking your medicine?
3. When you feel better, do you sometimes stop taking your medicine?
4. At times, if you feel worse when you take your medicine, do you stop taking them?

An affirmative answer to any question suggests the presence of an adherence problem.

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Appendix **B**

Jacox Model for evaluation of research

Types of evidence

- **I.** Meta-analysis of multiple, controlled studies
- **II**. At least one experimental study
- **III**. Quasi-experimental studies such as nonrandomized controlled, single group pre/post test, cohort, time series, or matched-case, controlled studies
- **IV**. Non-experimental studies such as comparative and correlational, descriptive and case studies
- **V**. Case reports, qualitative studies, clinical examples, program evaluation, research utilization, interventions
- **VI**. Panel consensus – practice recommendations based on the opinions of respected authorities or an expert committee

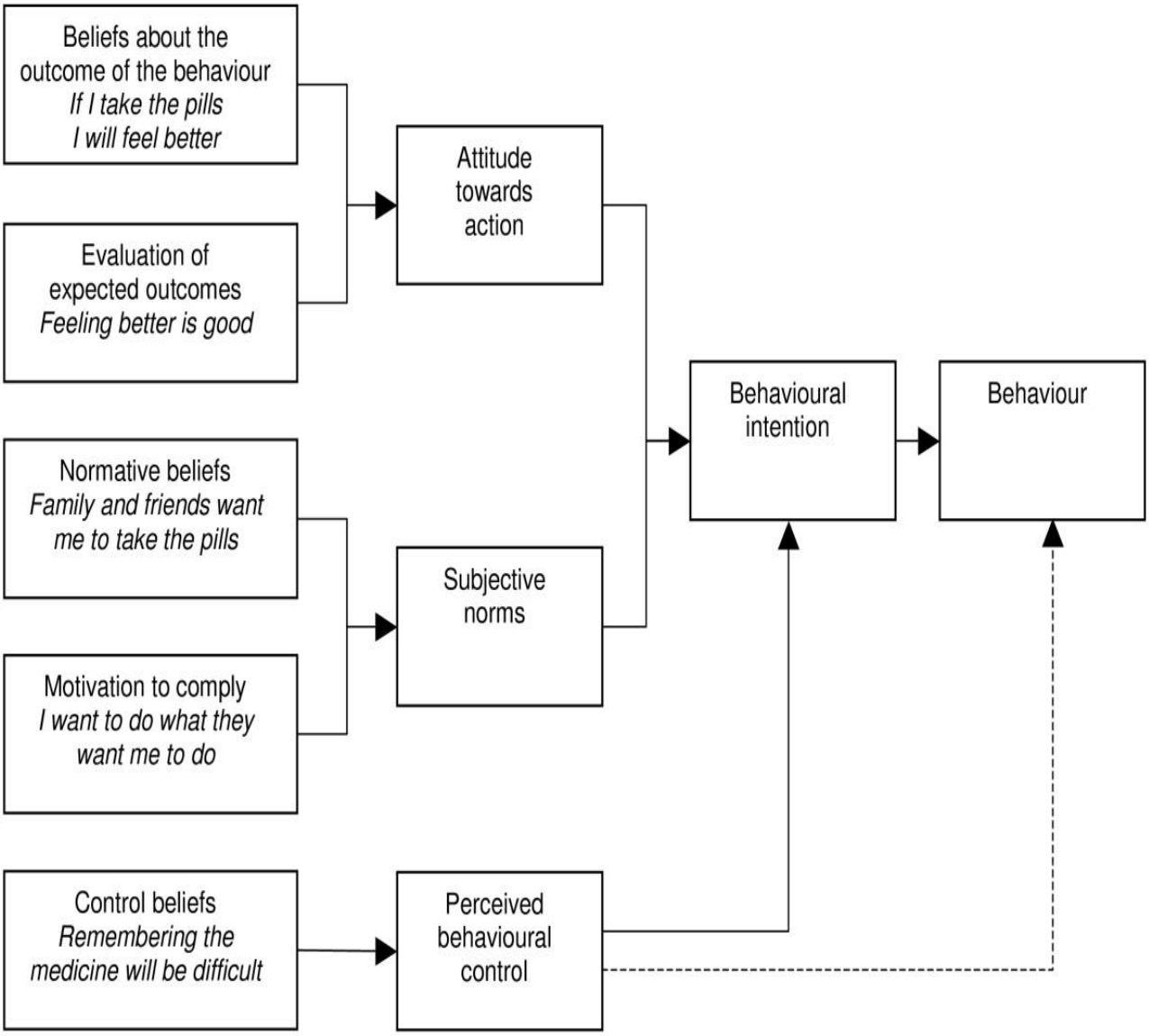
Strength and consistency of evidence (S&C)

- **A.** Evidence of type I or consistent findings from multiple studies of types
- II, III, or IV
- **B**. Evidence of types II, III, or IV and findings are generally consistent
- **C**. Evidence of types II, III, or IV but findings are inconsistent
- **D.** Little or no evidence or there is type V evidence only

Jacox, A., Carr., DB, Payne, R. et al. (1994). *Management of Cancer Pain, Clinical Practice Guideline No 9.* (Appendix of AHCPR Publication No. 94 - 0592). Rockville, MD, Agency for Health Care Policy and Research. U.S. Department of Health and Human Services.

Appendix C

Project Application of Theory of Planned Behavior



Munro, S., Lewin, S., Swart, T., & Volmink, J. (2007). A review of health behaviour theories: how useful are these for developing interventions to promote long-term medication adherence for TB and HIV/AIDS? *BMC Public Health*, 7(104). http://dx.doi.org/10.1186/1471-2458-7-104

Appendix D

Plan-Do-Check-Act

Implementation plan

Excerpted from Nancy R. Tague's The Quality Toolbox, Second Edition, ASQ Quality Press, 2004, pages 390-392.

Appendix E

Project Checklist

Obtain IRB approval	X
Hang educational poster in waiting room and exam room reviewing potential barriers to adherence. (Appendix G&H)	X
Conduct medication reconciliation using “brown-bag” method	X
Administer Morisky Adherence Scale MMA-4- to document baseline adherence level.	X
Educate patient about medication and their comorbidities focusing on hazards of nonadherence.	X
Make follow-up phone calls at 4 weeks	X

Appendix F: Medication Review Form · Brown Bag Program

Date:_____

Patient Name_____ Sex: M F

Telephone Number_____ Age:_____

Special counseling considerations_____

Reported Medicine Allergies_____

Please list ALL medications that you are currently taking (prescriptions, over-the-counter medications, other)

_____ _____

_____ _____

_____ _____

For Pharmacist Use

	Medicine #1	**Medicine #2**	**Medicine #3**	**Medicine #4**	**Medicine #5**
Drug Name					
Dosage					
SIG on Label					
MD Name					
Exp. Date					
Reported Medical Problem					
How long taken?					
Still taken?	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
Date of last MD visit					
Patient knows purpose of drug	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
Compliance w/SIG	Yes / No / Partial	Yes / No / Partial	Yes / No / Partial	Yes / No / Partial	Yes / No / Partial
Side Effects?					
OTCs					
Improper Administration	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
Over/Under Use	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
Expired	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
Follow-Up Needed?	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No

Appendix G

Bring ALL Your Medicines to EVERY Appointment!

This includes:

- Prescription medicines.
- Over-the-counter medicines.
- Herbal medicines.
- Vitamins and supplements.

Your doctor will go over them with you to:

- Review what you are taking.
- Make sure you are taking them correctly.
- See if you can take fewer medicines.

Internet Citation: Medicine Review Poster. Content last reviewed February 2015. Agency for Healthcare Research and Quality, Rockville, MD. http://www.ahrq.gov/professionals/quality-patient-safety/quality-resources/tools/literacy-toolkit/healthlittoolkit2-tool8a.html

Https://www1.nyc.gov/assets/doh/downloads/pdf/csi/csi-map-wall-poster.pdf

Appendix I

Results-Raw Data

Age	Sex	Initial Morisky	Forget 1	4 week	Forget 2	# RX	#OTC	Intervention	Anecdotal Comments
74	F	2	3	2	1	6	6	Moved medicine storage Support & education	I used to forget at least 2-3 times a week (mostly the evening medicine) but I put the medicine by my chair to remind me. I only forgot maybe 1-2 times since we talked.
74	F	1	0	0	0	5	3	Pillbox given Support & education	If I am sick I used to not take my medicine but now I try to remember to even if I don't feel well. The box for my pills is helpful, as I cannot see the reading on the bottles or the pills. The sections for twice a day were helpful.
66	F	1	1	0	0	5	2	Support & education	I usually remember to take them. After my daughter died, I didn't take care of myself, I'm really trying hard to get myself back together. I have been seeing a counselor that I talk to weekly.
72	F	1	1	1	<1	5	1	Support & education	I may have forgotten once since I last saw you but I don't think so. I am a retired nurse so I tend to focus on my medication to manage my health.
74	F	0	0	0	0	5	4	Support & education	I rarely forget, less than once a month but I have been extra careful for your study so it comes out good.
67	F	1	2	1	1	4	0	Pillbox given Support & education	I forget my medications very infrequently and have tried hard to remember. I sometimes forget to take my pill at dinner but remember before I go to bed.
76	F	1	1	1	<1	2	6	Support & education	I've been very good and have taken my medicines as the doctor told me too! I wanted to give you a good report when you called.
60	F	1	1	1	1	12	3	Support & education	I take so many pills that they are a big part of my life! I try very hard to be careful so I don't need anything more. It is very expensive but I'm getting by.
60	F	4	4	2	1	5	2	Support & education	I am doing much better with being careful. I ended up in the ED with high blood sugar and didn't feel

									well at all. I have a new diabetes doctor that is making some changes and I feel I am doing better. My morning blood sugars are less than 150 and my afternoon are less than 200 which is much better than before.
67	F	1	2	1	1	11	2	Support & education	I am really careful or my COPD gets out of control and I can't breath. I was in the hospital and am going to pulmonary rehab and they are making sure I am taking my medicine too. The pillbox is helpful
61	F	1	2	1	1	3	2	Support & education	I occasionally forget the evening dose but the pillbox helps me check before bed. I forget much less often than before. I know you are going to call me.
62	F	1	1	0	0	3	1	Support & education	I am much more careful-had a medical scare and now are much more careful with my medications
Total females		15	18	10	6	66	32		

Age	Sex	Initial Morisky	Forget 1	4 week	Forget 2	# RX	#OTC	Intervention	Anecdotal Comments
61	M	2	3	1	1	2	2	Support & education	Money is tight and I used to "forget" in order to save money on refills. I have been trying to be much more careful because you said I could get sicker if I didn't.
81	M	1	1	1	0	8	1	Pill box Support & education	I very rarely forget to take my medication. I keep them in the same place so I see them every morning and I use a medicine box to make sure I don't forget to take my medicine.
79	M	1	1	0	<1	5	4	Support & education	I have been trying really hard to remember and have done well. My wife is great at reminding me to take my medicine when she takes hers in the morning. It is part of our breakfast routine. She gets the oatmeal and I get our pillboxes.
72	M	1	1	1	<1	5	1	I-phone reminders Support & education	I have forgotten a bit less, I forgot once or twice since we last talked. The alarm in my phone helps
73	M	1	1	1	<1	4	0	Support & education	I'm very careful with my medicines since we talked. I haven't forgotten but took them late a couple times.
77	M	1	1	1	<1	3	0	Support & education	Was doing really well and then my wife was admitted to the hospital and I

									would forget to take my meds with me but would remember when I got home.
66	M	1	2	1	<1	4	2	Support & education	When I get depressed I sometimes don't get out of bed in the morning and take my medicine late, but it has been better since the last visit with the psychiatrist and he changed my medicine some.
63	M	1	2	1	1	3	2	Support & education	I used to forget at least once or twice a week but I have been more careful and have only forgotten once in the past 4 weeks.
Total Males		9	12	7	2	34	12		
Total All Participants		39	48	27	14	166	76		

TO USE MEDICATIONS SAFELY

ASK YOUR DOCTOR

- What is the name of the medicine? Is this the brand or generic name?
- What does the medication do? How will I know when it is working?
- What side effects should I expect? What do I do if they occur?
- When should I start to feel better?
- Does this new medication replace anything else I am taking?
- What do I do if I miss a dose?

ASK YOUR PHARMACIST

- What is the name of the medicine? (If the name is different than what your doctor told you, ask why.)
- How should I take this medicine and for how long?
- Are there any side effects?
- Should I avoid alcohol, certain foods or activities while taking this medicine?
- How will this medicine interact with other medications I am taking, including overthe-counter and herbal medications?
- Could I have some written information about the medicine? Is it available in large print or a language other than English?
- What should I do if I run out of this medication? Can I get a refill? When?

ORGANIZE YOUR MEDICATIONS

Complete the Medical Information Record.

Put a copy of this card where others can find it in case of emergency – in your purse or wallet, on your refrigerator and in the glove compartment of your car.

NOTE: *Include all over-the-counter (nonpresciption) medications, home remedies, herbal medications including tea, vitamins and weight gain or loss products such as shakes, pills or bars. Sometimes they can be dangerous when you take them with other medications.*

- Show your card to your family doctor, your pharmacist and others involved in your care at every visit.
- If you take many different medications or have medications ordered by different doctors, schedule a "brown-bag checkup" – place all your medications and over-thecounter products in a bag and take them to your doctor or pharmacist so he/she can look for any potential problems.
- Store your medications in a dry area that does not have changes in temperature. Do NOT store them in the bathroom, over the stove or in the car.
- Keep your medications out of reach of children and pets.
- Keep your medications in their original bottle/container. EXCEPTION: If your doctor or pharmacist suggests a daily or weekly medication box, ask how to use it. Some medications should not be stored together or need special storage.
- Each time you take your medication, read the label and make sure you are taking it correctly.
- Throw away all products that are outdated or have not been used in a while. Ask your pharmacist how to properly dispose of these medications.
- Never share your medications with others or take another person's medications.

BE YOUR OWN BEST HEALTH CARE CHAMPION

- Talk with your doctor or pharmacist if:
  - you have any questions about your medications,
  - you notice a change in how a medication looks, or
  - you notice a change in instructions for taking a medication.
- Tell your doctor, nurse or pharmacist about allergies or any side effects or reactions you have had before accepting any new medication.
- Get medical help right away if you develop itching or swelling or if you have trouble breathing after taking a new medication.
- Take notes about what you learn at your doctor's office and pharmacy. You may want to take a friend or family member with you to write down information.
- Try to use the same pharmacy or drugstore for all your prescriptions so your pharmacist has a complete record of all your medications and can give you the best advice.
- Always check prescriptions before you leave the store to make sure the medication is for you and is labeled clearly. Make sure refill medications look the same as before.