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Pediatric Hematology/Oncology Outpatient Care: the Effect of a Standardized Collaborative Medication Reconciliation Process

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**PEDIATRIC HEMATOLOGY/ONCOLOGY OUTPATIENT CARE: THE EFFECT OF A
STANDARDIZED, COLLABORATIVE MEDICATION RECONCILIATION PROCESS**

by

TRACI R. PULLIAM

EVIDENCE-BASED PRACTICE PROJECT REPORT

Submitted to the College of Nursing and Health Professions

of Valparaiso University,

Valparaiso, Indiana

in partial fulfillment of the requirements

For the degree of

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2017

Traci R. Pulliam 5/2/17
Student Date

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Advisor Date



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DEDICATION

I would like to dedicate this project to my family. Thank you for your unconditional love and support throughout this journey. You have empowered me to make my dreams become a reality. Also, thank you to my DNP student colleagues for your support and laughter during this lengthy journey.

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I would like to thank my advisor Dr. Theresa Kessler for her continued guidance and support throughout this journey. Also, thank you to Kim Whalen for her help during my search for evidence. Finally, I would like to thank my project site contact and participants for allowing me the opportunity to implement evidence into practice.

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ABSTRACT

Pediatric patients are at an increased risk for medication errors and can benefit from processes that facilitate and promote medication safety (Stone et al., 2010). Medication reconciliation (Med Rec) is a valuable tool in improving patients' medication safety and reducing adverse drug events (The Joint Commission, 2015). The purpose of this evidence-based practice (EBP) project was to improve the accuracy of the Med Rec process in a Midwestern pediatric hematology/oncology outpatient clinic by developing, promoting, and evaluating a standardized, collaborative Med Rec process. The Stetler EBP model guided the implementation of the intervention, with the goal of integrating current evidence into current practice. Kotter's Model of Change laid the theoretical foundation for successful implementation of a current practice change. This EBP project intervention included a patient and team member component. The patient component consisted of a verbal call reminder to bring medications to the visit, a patient handout emphasizing the importance of medication safety and reconciliation, and patient education regarding Med Rec process. The team member component included education regarding the importance of the Med Rec process and updates regarding Med Rec accuracy. The outcomes measured included the number, type, and severity of medication discrepancies and the number of voluntarily reported medication errors. Data were collected during Phase 1 (pre-intervention) and Phase 2 (post-intervention) by the physicians and the project leader (PL). These data were analyzed using chi-square tests. The intervention led to a significant increase in the number of accurate Med Recs reported by the physicians between Phase 1 ($n = 50, 70\%$) and Phase 2 ($n = 65, 90.8\%$) ($X^2 = 8.167, df = 1, p = .004$). An insignificant decrease in the number of accurate Med Recs was reported by the PL between Phase 1 (73.1%) and 2 (72.5%) ($X^2 = .003, df = 1, p = 0.959$). Physicians reported more incorrectness errors in Phase 1 (73.3%) and Phase 2 (83.3%) than incompleteness errors ($X^2 = .481, df = 1, p = .786$). PL reported more incompleteness errors in Phase 1 (71.4%) and Phase 2 than incorrectness errors (81.8%) ($X^2 = 1.670, df = 2, p = .434$). The majority of Med Rec inaccuracies were classified as minor during

Phase 1 and 2 by the physicians ($X^2 = .827$, $df = 2$, $p = .363$) and the PL ($X^2 = 1.039$, $df = 1$, $p = .308$). No inaccurate Med Rec was classified as severe by physicians or the PL. Finally, there were no voluntary medication errors were reported during the duration of the EBP project. Revision and replication of this EBP project would be helpful in further improving Med Rec accuracy in this setting.

CHAPTER 1

INTRODUCTION

In recent years, the importance of medication safety has been emphasized by healthcare regulatory bodies. Medication safety has also been the focus of several internationally lead initiatives (Agency of Healthcare Research and Quality (AHRQ), 2012; Institute of Healthcare Improvement (IHI), 2016; The Joint Commission, 2015; World Health Organization (WHO), 2015). In 2006, in an effort to improve medication safety, the Joint Commission called for accurate and complete medication reconciliation (Med Rec) across the continuum of care (Varkey, Cunningham, & Bispring, 2007).

The Joint Commission's third National Patient Safety Goal (NPSG), in 2015, was to improve the safety of using medications (The Joint Commission, 2015). This goal emphasized an organization's focus on the reduction of medication discrepancies and errors (The Joint Commission, 2015). Specifically, NPSG.03.06.01 cites the role of Med Rec in improving medication safety (The Joint Commission, 2015). According to the Joint Commission (2015), Med Rec facilitates identifying and resolving medication discrepancies, such as duplications, omissions, and interactions (The Joint Commission, 2015).

According to the IHI (2016), Med Rec can be defined as "a process of identifying the most accurate list of all medications a patient is taking — including name, dosage, frequency, and route — and using this list to provide correct medications for patients anywhere within the health care system (Medication Reconciliation Review section, para. 2)." Med Rec plays a pivotal role in identification and correction of medication discrepancies, leading to improved medication safety (The Joint Commission, 2015). The ultimate goal of Med Rec is to create an all-inclusive medication list that informs both the patient and the healthcare provider (The Joint Commission, 2015). Med Rec is the responsibility of the patient and the entire healthcare team

(Redmond et al., 2013). Developing and agreeing on an accurate medication list is a collaborative effort.

The Med Rec process has three steps: verification, clarification, and reconciliation (Redmond et al., 2013). Verification is the act of generating a list of the patient's current medications, using various sources of information (Redmond et al., 2013). The sources of information can include: the patient, the general practitioner, the electronic health record (EHR), or the pharmacy records (Redmond et al., 2013). Medications include prescription medications, over-the-counter (OTC) medications, vaccines, vitamins, nutritional supplements, and complementary medications (AHRQ, 2015; Barnsteiner, 2008). After the medication list is verified, clarification occurs. Clarification occurs when the medications are checked for appropriateness (Redmond et al., 2013). In this instance, appropriateness means intentional or unintentional changes to the medication list that need to be made (Redmond et al., 2013). The final step in the process is when the medication list is reviewed and any changes are documented (Redmond et al., 2013). Changes can include medication additions, subtractions, or modifications (Redmond et al., 2013). Failure to ensure an accurate medication list may result in medication error, subsequent adverse drug events (ADEs), and ultimately compromised patient safety (Redmond et al., 2013).

Med Rec should be performed at any and all transitions of care (AHRQ, 2012; IHI, 2016; The Joint Commission, 2015). Transitional care can be defined as "changes in the level, location, or providers of care as patients move within the healthcare system (Redmond et al., 2013, p. 3)." Transitions of care can include: admission, discharge, and transfer (AHRQ, 2012). Transitions of care are particularly vulnerable times, in which medication discrepancies and errors occur more frequently (AHRQ, 2012). According to Redmond et al. (2013), more than 40% of medication errors take place at transitions of care as a result of inaccurate Med Rec. In addition, it was found that there was a 30-70% variance in medications prior to and after hospital admission, a transition of care (AHRQ, 2012).

Med Rec is not without its challenges. Challenges include: accuracy of patient information given to the healthcare provider, willingness of the patient to give information, time efficiency, and effectiveness of the electronic or paper documenting system (The Joint Commission, 2015). Coffey, Cornish, Koonthanam, Etchells, and Matlow (2009) cited barriers to Med Rec that included: a multi-step process, the inter-professional nature of the Med Rec, staffing resources, and frequent staff turnover. Despite these barriers healthcare providers are urged to make a good faith effort to complete an accurate and complete Med Rec, at all transitions of care (The Joint Commission, 2015).

The use of Med Rec has been shown to decrease medication errors and subsequent ADEs (IHI, 2016; Redmond et al., 2013). Med Rec has been studied in many clinical practice settings, such as inpatient hospitals and outpatient offices. For example, Varkey et al. (2007) examined improving the Med Rec process, in an adult outpatient primary care setting. The authors found that after a multifaceted intervention the average number of medication discrepancies per patient decreased by more than 50%, from 5.24 to 2.46 discrepancies per patient (Varkey et al., 2007).

In addition to various settings, Med Rec has been examined and shown to be promisingly beneficial in different age groups (Coffey et al., 2009; Gardner & Graner, 2009; Huynh et al., 2016; Nassaralla, Naessens, Chaudhry, Hansen, & Scheitel, 2007; Stone, Boehme, Mundorff, Maloney, & Srivastava, 2010; Terry, Solanki, Sinclair, Marriott, & Wilson, 2010; Varkey et al., 2007, Weingart et al., 2007). One study focused on Med Rec process implementation at one adult hospital and one pediatric hospital (Coffey et al., 2009). Unfortunately, the authors did not provide the pediatric specific data, regarding the reduction in medication discrepancies. However, at the adult hospital, implementation of a Med Rec process decreased the total number of discrepancies identified from 224 to 120 (Coffey et al., 2009).

As discussed previously, both adult and pediatric studies have examined the effect of implementing a Med Rec process. Med Rec can be an extremely important tool in pediatric

patient care. Pediatric medication safety is oftentimes complex for many reasons, including: weight based calculations, various medication formulations, and developmental levels making it difficult for children to communicate adverse reactions (Stone et al., 2010). Healthcare providers must have an accurate weight, convert the weight to kilograms, and then chose the appropriate medication formulation and concentration (McPhillips et al., 2005). These steps make children particularly vulnerable to medication errors. After the medication is prescribed, the caregivers of the child must be educated to ensure proper medication administration at home.

When Kaushal et al. (2007) examined the rates and types of ADEs in six pediatric outpatient offices, they found that the rate of preventable ADEs was 3% in two months (95% CI [3, 4]) and that 14% of the preventable ADEs were serious. Kaushal et al. (2007) also found that 47% of the preventable ADEs were related to parent drug administration. The authors recommended improved communication regarding medications between healthcare providers and parents to reduce ADEs (Kaushal et al., 2007). Furthermore, Walsh et al. (2009) examined medication errors among adults and children with cancer in an outpatient setting. Almost 19% of pediatric visits involving medications were associated with a medication error (95% CI [12.5, 26.9]) (Walsh et al., 2009). This rate was higher than the adult comparison group with only 7.1% of visits associated with a medication error (Walsh et al., 2009).

Cancer care has recently shifted from mostly inpatient care to the majority of care occurring in the outpatient setting. This shift relocates the complex care oncology patients receive to outpatient settings. According to Walsh et al. (2009), “systems to prevent outpatient medication errors are often inadequate because of factors such as lack of recognition of errors, communication problems, and fragmentations of care (p. 891).” Oncology patients receive complex chemotherapy regimens in an outpatient setting. In addition, oftentimes part of their chemotherapy regimen is oral chemotherapy administered at home (Walsh et al., 2009). The complexity of oncology care, coupled with the complexity of pediatric medication administration

places pediatric oncology patients at a significant risk for medication discrepancies and subsequent ADEs (Walsh et al., 2009).

The purpose of this evidence-based practice (EBP) project was to improve the accuracy of the Med Rec process in a pediatric hematology/oncology outpatient clinic by developing, promoting, and evaluating a standardized, collaborative Med Rec process.

Background

As previously mentioned, the Joint Commission's third 2015 NPSG focused on medication safety. Accredited organizations are required to complete Med Rec at transitions of care (The Joint Commission, 2015). In addition to the Joint Commission, the IHI also emphasized the importance of medication safety, more specifically the role of Med Rec in medication safety (IHI, 2016). In 2005, the IHI launched its 100,000 Lives Campaign with the goal of reducing morbidity and mortality in the United States (IHI, 2005). One of the pillars of the 100,000 Lives Campaign was implementing Med Rec, specifically with the goal of preventing ADEs (IHI, 2005).

In addition to the Joint Commission and the IHI, the World Health Organization (WHO) formulated the High 5s Project in 2006. The goal of the High 5s Project was to improve patient safety by implementing standardized operating protocols (SOPs) (WHO, 2013). One of the High 5s SOPs focused on Med Rec at transitions of care (WHO, 2013). The WHO (2015) stated that "each SOP summarizes the problem, the strength of evidence that supports the solution, potential barriers to adoption, potential unintended consequences created by the solution, patient and family roles in the solution, and references and resources (Standard Operating Protocols section, para. 2)."

Finally, the AHRQ and the National Institute for Health and Care Excellence (NICE) developed and updated a guideline in 2015 entitled "Medicines Optimization: The Safe and Effective Use of Medicines to Enable the Best Possible Outcomes (AHRQ, 2015)." The goal of this guideline was to explain the best practice of care for patients who require medications. The

guideline specifically discussed Med Rec at transitions of care. Particularly of relevance to this project, the guideline recommends Med Rec in primary care settings be completed when a patient is discharged from the hospital or another care setting and before any new prescription or medication changes are made (AHRQ, 2015). The AHRQ is also responsible for the development of a toolkit entitled “Medications at Transitions and Clinical Handoffs (MATCH) Toolkit for Medication Reconciliation (AHRQ, 2012).” The toolkit urges healthcare providers to review and re-design the Med Rec process currently in place at their clinical sites, in order to improve patient safety (AHRQ, 2012). The toolkit has seven chapters that detail the process of re-designing an existing Med Rec process (AHRQ, 2012).

Despite the AHRQ, the IHI, the Joint Commission, and the WHO recommending the use of Med Rec, there is currently no specific recommendations from these organizations for Med Rec in the pediatric outpatient setting. Team members at such facilities can certainly use these organizations recommendations to develop a standardized, collaborative Med Rec process that ensures accurate Med Rec and medication safety. Research examining Med Rec in outpatient or ambulatory care settings is invaluable, as well as research examining Med Rec in pediatrics.

Statement of the Problem

This EBP project addressed the medication discrepancies found in completed Med Recs, specifically the Med Recs in a pediatric hematology/oncology outpatient clinic. The impact of a standardized, collaborative Med Rec process was examined. The pediatric and oncological aspects of the population made the population extremely vulnerable to medication errors and subsequent ADEs.

Data from the Literature Supporting Need for the Project

Extensive research has been conducted verifying the role of Med Rec in the reduction of medication errors; however, little literature exists examining the impact of Med Rec in the pediatric outpatient population. In a study using Med Rec in one pediatric and two adult outpatient oncology clinics, 90% of incorrect medications lists were updated when a Med Rec

process was used (Weingart et al., 2007). This result was in contrast to the standard care group, where only 2% of medication lists were corrected ($p < .001$) (Weingart et al., 2007). Standard care involved no formal reconciliation process. In the standard care group, 0.1 medication changes per patient were made, compared to 4.3 medication changes made in the Med Rec group ($p < .001$) (Weingart et al., 2007). The rate of medication changes indicated the medication list was being updated and revised. The Med Rec process included input from the patient, nurse, healthcare provider, and the pharmacist, emphasizing the importance of a collaborative effort to improve medication safety (Weingart et al., 2007).

A review of literature by Huynh et al. (2013) concluded that there was a lack of strong, consistent evidence showing improvement of pediatric patient safety using Med Rec. However, it was obvious that medication discrepancies were a major problem at transitions of care. Four of the ten studies reviewed reported 22 to 73.6% of patients had an unintended medication discrepancy or medication error. One study, included in the review, reported a rate of 1.5 discrepancies per patient. All ten of the studies included some form of a Med Rec intervention (Huynh et al., 2013). The results of this review may indicate that Med Rec at pediatric transitions of care is not as effective as what has been shown in adults. Further research is needed.

Most studies examining Med Rec in the pediatric population have been conducted in the inpatient setting. A study, conducted in a tertiary care children's hospital, examined the effect of an EHR tool that displayed a patient's pre-admission medication list beside the admission medication orders (Hron et al., 2015). The use of this EHR tool led to a statistically significant decrease (53%) in rate of Med Rec errors (MREs) post intervention ($p = .02$; 95% CI [26, 87]). Also, the risk of reported ADEs related to admission Med Rec was significantly lower post-intervention ($R^2 = .24$; $p < .001$; 95% CI [0.11, 0.53]) (Hron et al., 2015).

Huynh et al. (2016) conducted a study in which a clinical pharmacist provided several points of care (a) interviewed the caregiver, (b) called the primary care provider (PCP) to obtain the medication record, (c) recorded the patients medications brought from home, and (d)

examined the initial admission medication orders. This intervention led to the identification of 582 medication discrepancies in 1004 prescriptions (58%). Of those 582 medication discrepancies, 209 were unintentional, 277 were intentional, and 96 were determined to be trivial or related to nutrition. The authors concluded that Med Rec decreased the risk of harm from unintended medication discrepancies. Also, with specific relevance to pediatric patients, parents or caregivers were identified as the most sensitive or accurate source of information (Huynh et al., 2016).

With little evidence in the literature focused on pediatric outpatient Med Rec, adult outpatient studies shed light on the improvement of the outpatient Med Rec process. In an adult internal medicine outpatient clinic, individual medication completeness improved from 9.7% to 70.7% ($p < .001$) after implementing an intervention that standardized the entire patient visit process (Nassaralla et al., 2007). The entire medication list completeness improved from 7.7% to 18.5%. The standardized visit process included (a) the patients being reminded to bring an updated list of medications or the medication containers to their appointment; (b) the patients recording the medications on a form when they arrived to their appointment; (c) a licensed practical nurse (LPN) recording the medications in the EHR; (d) the physician continuing, adding, deleting, or modifying the medications in the EHR; and (e) the transcriptionist checking for differences between the physicians dictation and the patients documented medication list in the EHR (Nassaralla et al., 2007).

In a similar study conducted at four adult ambulatory, primary care, internal medicine clinics, the effect of a three phase intervention on Med Rec accuracy was assessed. The three phases included (a) baseline data collection, (b) a LPN intervention, and (c) a patient awareness intervention. After the interventions, a statistically significant increase in the number of complete medications (76.5% to 88.3%) and complete medication lists (20.4% to 50.4%) occurred ($p < .03$). Also, accuracy significantly improved from the pre-intervention phase to the patient intervention phase from 11.5% to 29% ($p = .014$) (Nassaralla et al., 2009).

In the literature, there currently is very little data focused on the pediatric outpatient population and the Med Rec process. There are data from pediatric inpatient population studies that support the use of accurate Med Rec's. These data from the pediatric inpatient studies emphasize the uniqueness of the pediatric population and emphasize the importance of improving medication safety. As previously discussed, pediatric patients are at an increased risk for medication errors given the steps involved in prescribing and administering medications (McPhillips et al., 2005; Stone et al., 2010). When examining the applicability of the pediatric inpatient Med Rec studies to the pediatric outpatient setting problems arise. The pediatric inpatient setting Med Rec process, interventions, and outcomes differ from the Med Rec process in the pediatric outpatient setting. For example, the outcome of many pediatric inpatient Med Rec studies is often based on a comparison between the patient's home medication list and the admission medication orders. In the outpatient setting, there are no admission medication orders that can be compared to the patient's home medication list to determine Med Rec accuracy. On the contrary in the outpatient setting, there is one list of the patient's home medications that is reviewed and updated. Although the adult outpatient studies focus on a different population, the setting in which they take place has similar processes, interventions, and measureable outcomes when compared to a pediatric outpatient setting. Given the lack of existing pediatric outpatient data, the adult outpatient studies can serve as a framework for improving the Med Rec process in a pediatric outpatient setting. It is imperative that the unique aspects and needs of the pediatric population not be disregarded when examining the adult outpatient studies for ways in which to improve patient medication safety.

Data from the Clinical Agency Supporting Need for the Project

In a pediatric hematology/oncology outpatient clinic, the project leader (PL) observed a large number of medication discrepancies occurring at all three stages of the Med Rec process: verification, clarification, and reconciliation. The clinic director and pediatric hematology/oncology physicians were approached and also cited frustrations with the accuracy

and effectiveness of the Med Rec process. As stated by one physician, “there is room for improvement in our medication reconciliation process.” The director also evidenced a need for improvement in an email communication stating “I know we continue to struggle with that [medication reconciliation].”

Prior to this project, the Med Rec process at the agency had no accuracy assessment in place. When asked about the frequency of medication discrepancies one physician stated “I find errors every day.” The topic of Med Rec was discussed in depth with the clinic director and various team members. All were receptive to making an EBP change in an attempt to improve the Med Rec process and ultimately medication safety.

Purpose of the Evidence-Based Practice Project

Compelling Clinical Question

The purpose of this EBP project was to reduce the number of medication discrepancies using a standardized, collaborative Med Rec process. The clinical question this EBP project addressed was: Will a standardized, collaborative Med Rec process that is communicated to all team members and patients, decrease the number of medication discrepancies?

PICOT Question

A PICOT question was developed and was related to the clinical question. The question included the patient population (P), intervention of interest (I), comparison of interest (C) outcome of interest (O), and the time (T). The PICOT question was as follows: In the pediatric hematology/oncology outpatient population, how will the implementation of a standardized, collaborative Med Rec process affect the number of medication discrepancies over the course of two months, when compared to the current Med Rec practice?

Significance of the EBP Project

The goal of this EBP project was to reduce the number of medication discrepancies and improve the current Med Rec process. The measureable outcome was the number of medication discrepancies found prior to and after the intervention implementation. The severity

and type of medication discrepancies were also recorded, in an effort to predict the potential outcome of the discrepancy. The project site had a Med Rec process in place prior to this EBP project, which fulfills the Joint Commission's NPSG.03.06.01, that a Med Rec process must be in place to be accredited (The Joint Commission, 2015). However, according to the PL's observation and various sources in the pediatric hematology/oncology outpatient clinic the Med Rec process was not accurate. Ultimately, the accuracy of the Med Rec affects the patient's medication understanding and home medication administration.

The final goal of this EBP project was to decrease the number of ADEs reported in the project sites computer system, related to medication errors. At the time of the EBP project, team members were reminded to report ADEs in the electronic incident reporting system. With the implementation of a standardized Med Rec process, it was hoped and predicted that there would be a consistent or decrease in the number of ADEs reported in the incident reporting system.

It was of utmost importance to keep the patient at the center of the care provided and ultimately improve their medication safety. It was important to enlist and motivate all the team members at the project site to ensure a collaborative effort. The ultimate goal was to produce significant results that would lead to a permanent policy change, within the pediatric hematology/oncology outpatient clinic.

CHAPTER 2

THEORETICAL FRAMEWORK, EBP MODEL, AND REVIEW OF LITERATURE

The goal of this EBP project was to use current evidence found in the literature to change and improve a clinical problem. It is important to discuss the theoretical framework that guided the EBP change in the clinical setting and the EBP model used to guide the implementation of this project. The theoretical framework that was used to guide this EBP project was Kotter's Model of Change. In addition to Kotter's Model of Change, the Stetler EBP Model was used to guide the implementation of best practice in the clinical setting.

Theoretical Framework

Overview of Theoretical Framework

The theoretical framework for this EBP project was Kotter's Model of Change. Kotter's Model of Change laid a foundation to successfully implement an EBP project and change current practice. Kotter used Lewin's Stages of Change as a building block in developing his change model (Ritter, 2011). The eight stages of Kotter's change model are: (1) establish a sense of urgency, (2) create a powerful guiding coalition, (3) develop a vision, (4) communicate the vision, (5) empower others to act on the vision, (6) plan for and create short-term wins, (7) consolidate improvements and produce more change, and (8) institutionalize new approaches (Ritter, 2011). Kotter's first four steps look at changing the current practice or status quo, similar to Lewin's unfreezing stage. Steps five through seven introduce the change, similar to Lewin's change stage. Finally, step eight seeks to make the changes standard practice, similar to Lewin's refreezing stage (Ritter, 2011).

The goal of the first stage of the Kotter Model of Change is to establish a sense of urgency. The sense of urgency is focused on changing a current clinical problem. One strategy to establishing urgency is to collect data on the problem that can be used as a tool to communicate the scope of the problem (Young, 2015). Establishing a sense of urgency can

reduce resistance to change and energize team members to be active participants in the change (Fehr, 2016).

The second stage of Kotter's Model is to create a powerful guiding coalition. The guiding coalition is made up of key stakeholders that can help plan and implement the change (Fehr, 2016). It is important that this coalition have similar thoughts and ideas, regarding the future of the change. A direct result of forming a coalition is collaboration and cooperation (Young, 2015).

After a coalition is formed, it is important to develop a vision, Kotter's third stage. The coalition works together to formulate a vision and strategy to implement the change (Young, 2015). The ultimate goal of this step is the development of a vision and strategy that is clearly articulated (Fehr, 2016).

The fourth stage of Kotter's Model is communicating the vision. According to Fehr (2016), in this stage the vision must be communicated clearly, many times, and in different forms. Ensuring clear communication can reduce confusion, misunderstandings, and ultimately resistance to change (Young, 2015).

The fifth stage of Kotter's Model is empowering others to act on the vision. The first four steps alone do not cause change to occur. The fifth stage, however, is when the change begins to be enacted. For this stage to be successful, all team members feeling and believing in the proposed change is essential. The belief in the change will foster a sense of responsibility and accountability for the success or failure of the new practice (Young, 2015). This step also involves removing barriers to the change, including systems or structures that may impede the change process (Ritter, 2011).

Once team members are empowered, the likelihood the change will be a success increases. In order to facilitate continued investment in the change, the sixth stage focuses on planning for and creating short-term wins. When a team member models or embraces the change, a "short-term win" is created (Young, 2015, p. 456). During this stage, team members

are recognized for embracing and accepting the change. This recognition can further team member's investment in the change (Young, 2015).

Once the change has begun to be accepted and celebrated, it is important to consolidate improvements and produce more change, which is the seventh stage in Kotter's Model. At this time, reevaluation of goal and strategies occurs (Fehr, 2016). It is imperative to make certain that the change is achieving the desired results. Each team member that accepts and adheres to the change is important. The advancement to the eighth, and final stage, is quickened if more team members buy into the new practice (Young, 2015).

The eighth, and final stage, of Kotter's Model is institutionalizing new approaches. The combined effort of all empowered team members can facilitate an anchoring of the change into accepted and current practice (Young, 2015). As the change is seen as a success and benefits are shown, the process will hopefully no longer be seen as new and difficult. The change will become current best practice.

There are many aspects of change that were considered when implementing this EBP project. Improving the Med Rec process, in the pediatric outpatient hematology/oncology outpatient clinic, was not without its challenges. These challenges can be considered individual or organizational level challenges. Individual barriers can include: fear of the unknown, reduction in the need for personal fulfillment, real or perceived stress, loss of status or personal power, and loss of equilibrium (Ritter, 2011, p. 375). Organizational barriers can include: lack of a change agent, inadequate financial and/or capacity, poor leadership and resistance to change by senior management, lack of the necessary technology, time restraints, or poor market conditions (Ritter, 2011, p. 375). Kotter's Model of Change facilitated the triumph over numerous barriers, such as the ones listed above.

Application of Theoretical Framework to EBP Project

Stage 1-- Establish a sense of urgency. Prior to implementing the change, baseline data were collected. These data were used as a tool to communicate and exhibit the clinical

problem to team members. The PL collecting and presenting the data to the team members produced a sense of urgency. Urgency regarding changing the current practice needed to be formulated, in order to ensure decreased resistance and increased buy into the new practice.

Stage 2-- Create a powerful guiding coalition. By communicating and developing the sense of urgency, a coalition was formed. The coalition was a multidisciplinary team of individuals, who shared a common goal and vision. The multidisciplinary team included: unit assistants, medical assistants (MAs), registered nurses, and physicians.

Stage 3-- Develop a vision. The coalition, at the project site, developed and strategized ways to implement the evidence into practice. The goal and vision of the proposed change was an improvement in the Med Rec process. It was the hope of the coalition that the change would lead to improved patient safety. Through collaboration and cooperation, a vision of improved patient care was realized.

Stage 4-- Communicate the vision. Communicating the vision clearly was of utmost importance. Resistance may have occurred, if the vision was unclear or confusing to team members. Communicating the vision of this EBP project occurred in different forms, such as verbally, visually via PowerPoint®, and via email.

Stage 5-- Empower others to act on the vision. The goal of this EBP project was to create a sustainable process that continued long after the implementation phase. With this goal in mind, it was extremely important to empower the team members, at the project site to believe in and act on the vision. This stage was undoubtedly the most challenging stage of the project change. Barriers to change were recognized and an attempt was made to overcome them by strategically examining the clinical problem. By presenting the baseline data and current literature, team members felt a sense of investment in changing the current process. This sense of investment lead to the team members working together to improve current practice.

Stage 6-- Plan for and create short-term wins. As discussed in Young (2015), recognizing and rewarding change agents at the clinical site was helpful in facilitating continued

support of the proposed change. Encouragement was provided both in person and via email. Team members were kept up to date throughout the project. This was beneficial and encouraged those resistant to change to actively participate in the change.

Stage 7-- Consolidate improvements and produce more change. As the project proceeded and a few team members took an active role, the change began to not feel so new and uncomfortable. On the contrary, the change briefly became part of the standard of care. To facilitate team members taking an active role the PL was available to remind and encourage team members. Also, the PL advocated for the team members and patients during the project.

Stage 8-- Institutionalize new approaches. As mentioned previously, one goal of this EBP project was to develop a process that is beneficial, to both team members and patients, and is sustainable. The sustainability continues to be derived from the empowered team members, who invested in the change process.

Strengths and Limitations of Theoretical Framework for EBP Project

Kotter's Change Model was useful when implementing an organizational change. Kotter's Model was easy to follow and simplistic, yet it was also thorough, when it came to the entirety of the change process. The additional detail and steps that Kotter's Model offered, in comparison to Lewin's Model of Change, was helpful to the novice PL. Also, the thoroughness was appreciated in a climate, such as the project site, where change was resisted and difficult to implement.

Kotter's Change Model contains eight stages, which could be viewed as laborious and overwhelming to those implementing a process change. The model was described in a linear, step-by-step approach, and this was possibly more simplistic than making changes in a real environment. Changing a policy, practice, or process was complex and was affected by many circumstances. Finally, Kotter's Model of Change could be considered a top-down approach. A top-down approach, in some environments, may not be the most effective at changing a process (Young, 2015).

Evidence-based Practice Model

Overview of EBP Model

The Stetler Model of Evidence Based Practice was used to guide the implementation of this EBP project. The Stetler Model was first published in 1976 and has been revised three times since then (Dang et al., 2015). The model gives step-by-step, detailed directions for incorporating research into practice. The practitioner-oriented model encourages the assessment and use of research in the clinical practice setting, with the goal of providing safe and effective care (Dang et al., 2015 & Young, 2015).

The Stetler Model has five phases: (1) preparation, (2) validation, (3) comparative evaluation/decision making, (4) translation/application, and (5) evaluation (Dang et al., 2015 & Young, 2015). In the first phase, preparation, a problem is identified; the context of the problem is reviewed; and searching for evidence occurs. In the validation phase, the body of evidence is systematically searched. The second stage also includes choosing and summarizing the evidence. If sufficient evidence is found, in the validation phase, the EBP project progresses to the third phase, comparative evaluation/decision making. The third phase involves organizing and condensing the evidence. At the end of this phase, the data can be classified into three categories: (a) do not use, (b) use, or (c) consider for later use. The fourth phase involves the actual change in practice, or translation/application. The evidence is converted into the recommended intervention of change. The application is planned and the implementation strategy is put into action. Evaluation is the fifth, and final stage, of the Stetler Model. The evaluation stage involves evaluating the plan and determining if the goals were met (Dang et al., 2015 & Young, 2015).

Application of EBP Model to EBP Project

Phase 1-- preparation. According to many nationally recognized organizations, such as the Joint Commission and the WHO, Med Rec can reduce ADEs (WHO, 2013; The Joint Commission, 2015). It is recommended that Med Rec be done thoroughly and accurately to

ensure the best possible medication history (BPMH) be formulated. This BPMH should be formulated collaboratively, with the patient and the healthcare providers, at each encounter. During this phase of the Stetler Model, the current state of the Med Rec process was assessed, at the project site. It was found that multiple team members had concerns about (a) the accuracy of the medication information provided by the caregiver, (b) the medication history entered by the nurse, and (c) the reconciliation process as a whole. The accuracy of the Med Rec process was the identified problem. The context of the problem was reviewed to further determine the specific areas of the process that need improvement. A multiple database search found literature dedicated to the Med Rec process.

Phase 2-- validation. After multiple databases were searched and literature was found, the literature underwent systematic critiquing to evaluate the literatures strength and relevance. Evidence was rated using the Melnyk and Fineout-Overholt (2015) levels of evidence rating system. If the evidence was found to be relevant and applicable to the EBP project, it was further critiqued using the Johns Hopkins Research or Non-Research Appraisal Tool (Dearholt & Dang, 2012).

Phase 3--decision making. After the research was narrowed and critiqued to include literature relevant to the EBP project, the literature was organized. Common themes were found and the evidence was placed into one of three categories. The Stetler Model recommended categories were (a) do not use, (b) use, or (c) consider for later use. The current Med Rec process was reviewed and a PICOT question was developed.

Phase 4-- application. The application phase began after the project intervention was developed, based on the relevant evidence. Also, institutional review board (IRB) approval from both Valparaiso University and the project site was obtained, to properly protect the projects participants. The project advisor guided this process, as well as the site contact liaison. Once IRB approval was granted, the EBP project implementation was completed. The barriers to implementation were assessed both prior to, during, and after implementation.

Phase 5-- evaluation. The evaluation stage involved examining the implementation and determining if the goals of the EBP project were met. The outcomes measured during the application phase were the number, type, and severity of the medication discrepancies and the total number of medication errors voluntarily reported. The first two outcomes would have ideally been collected using the EHR, however this was not possible. After detailed discussions with the information technology (IT) department it was determined that collecting the data from the EHR was not possible. In this case, the EHR did not provide the PL the ability to see who made Med Rec changes, what changes were made, and when the changes were made. Therefore, the data were collected by the physicians, at the project site, who conduct the last step in the Med Rec process and the PL. The physician's evaluation served as an assessment of the information the MA or nurse entered into the EHR. The PL evaluation served as an assessment of the final Med Rec process product, ideally an accurate patient medication list. The third and final outcome was collected using the computer system, where medication errors are voluntarily reported. The number of reported medication errors during baseline data collection was compared to the number of reported medication errors post-intervention.

The goal of the EBP project intervention was to decrease the number of the medication discrepancies, decrease the severity of discrepancies, and decrease the number of medication errors. The Stetler Model guided the implementation of the intervention, with the goal of integrating the current evidence into current practice. The sustainability of the change in practice depended on the success of the EBP project intervention and outcome evaluation.

Strengths and Limitations of EBP Model for EBP Project

Strengths of the Stetler Model include a step-by-step approach to implementing evidence into practice. The step-by-step approach was extremely helpful to a novice EBP PL. The Stetler Model can be easily applied to a variety of practice areas and clinical problems. The visual flowchart and graph, that details the steps of EBP implementation, were helpful. The steps laid the foundation for successful EBP implementation. The foundation and focus of the

Stetler Model is critical thinking and using research findings to guide care, which was the ultimate goal of this EBP project.

The Stetler Model's limitations are few, but could include the number of steps and also the complexity of each step. Although the visual representation of the model is helpful, the steps could be seen as overwhelming and laborious. Finally, the model flows in a linear pattern, and as discussed with the Kotter Model of Change, EBP implementation is complex. EBP change is set up for success if a theoretical framework and EBP model are used to facilitate the change.

Literature Search

Sources Examined for Relevant Evidence

A thorough literature search was conducted to examine the evidence related to the identified clinical problem. The following databases were searched: Cumulative Index for Nursing and Allied Health (CINAHL), MEDLINE (via EBSCO), Nursing & Allied Health Database, Cochrane Library, Joanna Briggs Institute EBP Database (JBI), and the National Guideline Clearinghouse. The evidence was further narrowed using the limiters: English language, publication years 2006-2016, and scholarly (peer-reviewed) journals. A variety of search terms were trialed during the literature search and the final search terms included: "medic* reconcil*" AND (outpatient* OR "ambulatory care" OR "primary care" OR pediatric* OR infant* OR toddler* OR child* OR adolescen*). A list of the databases, search terms, search results, and applicable articles can be found in Table 2.1.

The search term "medic* reconcil*" was used to include articles that used the term "medication reconciliation" and also those that used the term "medicines reconcile." The search terms "outpatient* OR "ambulatory care" OR "primary care" were used to focus the search on settings similar to the project site, an outpatient clinic. The goal of using these search terms was to eliminate inpatient studies. The search terms "pediatric* OR infant* OR toddler* OR child* OR adolescen*" allowed for the inclusion of studies with a population similar to the project site,

Table 2.1

Literature Search Results

Database	Search Terms	Article Found	Limiters	Results	Articles Used
CINAHL	“medic* reconcil*” AND (outpatient* OR “ambulatory care” OR “primary care” OR pediatric* OR infant* OR toddler* OR child* OR adolescen*)	154	<ul style="list-style-type: none"> English language Publication years 2006-2016 Scholarly (peer-reviewed) journals 	139	6
MEDLINE (EBSCO)	“medic* reconcil*” AND (outpatient* OR “ambulatory care” OR “primary care” OR pediatric* OR infant* OR toddler* OR child* OR adolescen*)	344	<ul style="list-style-type: none"> English language Publication years 2006-2016 	326	2
Nursing & Allied Health Database	“medic* reconcil*” AND (outpatient* OR “ambulatory care” OR “primary care” OR pediatric* OR infant* OR toddler* OR child* OR adolescen*)	16,096	<ul style="list-style-type: none"> English language Publication years 2006-2016 Scholarly (peer-reviewed) journals Search terms in abstract only 	63	0
Cochrane	medication reconciliation	4	<ul style="list-style-type: none"> Publication years 2006-2016 	4	0
JBI	medication reconciliation	33	<ul style="list-style-type: none"> Publication years 2006-2016 	33	0
National Guideline Clearinghouse	medication reconciliation	19	<ul style="list-style-type: none"> Not applicable 	19	1

pediatrics. It is important to note that when the PL limited the search to studies involving Med Rec, the outpatient setting, and the pediatric population there were insufficient results. An example of the search that was found to be too narrow was “medic* reconcil*” AND (outpatient* OR “ambulatory care” OR “primary care”) AND (pediatric* OR infant* OR child* OR toddler* OR adolescen*). Therefore, the search was broadened to include articles that focused on the applicable setting and/or the applicable population.

After the initial database searches were completed, the results were reviewed for applicable articles. First, article titles were reviewed for applicability to the EBP project. Secondly, abstracts were reviewed. If the article abstract was unavailable, the full text version was found and reviewed for possible inclusion. Inclusion criteria included: Med Rec process specific, outpatient and/or pediatric focused, and interventions that included both the patient and the multidisciplinary healthcare team. Exclusion criteria included: adult inpatient focused and Med Rec completion as the only outcome. Furthermore, if an article abstract was deemed appropriate, the PL reviewed the full text of the article. Finally, the reference lists of applicable articles were reviewed in an effort to identify additional sources.

Eight articles were found to be applicable to the EBP project and met the inclusion criteria. Six articles were originally found in CINHALL and two in MEDLINE. No articles were originally found in Nursing & Allied Health Database, JBI, Cochrane, or in article reference lists. In addition to the eight articles, one clinical practice guideline (CPG) was found. The nine pieces of evidence were assigned levels of evidence and critically appraised to ensure that the literature review produced the best evidence regarding the topic, setting, and population.

Levels of Evidence

The Stetler Model of EBP, specifically the third phase, was applied and articles were deemed usable, not usable, or possibly usable. Articles deemed usable were then thoroughly reviewed and assigned a level of evidence based on the Melnyk and Fineout-Overholt (2015) hierarchy of evidence. The Melnyk and Fineout-Overholt (2015) hierarchy of evidence consists

of seven levels, from I to VII. Level I evidence is from systematic reviews (SRs) or meta-synthesis of all relevant randomized controlled trials (RCTs). Level II evidence is obtained from well-designed RCTs. To be deemed Level III evidence, the study must be a well-designed controlled trial without randomization. Level IV is evidence from well-designed case-control and cohort studies. Evidence is deemed to be Level V if it is from SRs of descriptive and qualitative studies. Level VI is evidence from single descriptive or qualitative studies. Finally, Level VII is evidence from the opinions of authorities and/or reports of expert committees. Level I is the highest level of evidence and Level VII is the lowest level of evidence (Melnik & Fineout-Overholt, 2015).

The CPG in this review is based on SRs of RCT's, single RCT's, or observational studies when no RCTs were available, and is therefore Level I evidence (AHRQ, 2015). Six articles were found to be Level III, as they are quasi-experimental studies (Hron et al., 2015; Nassaralla et al., 2007; Nassaralla et al., 2009; Stock, Scott, & Gurtel, 2009; Varkey et al., 2007; Weingart et al., 2007). One article was deemed to be Level IV evidence, as it is a prospective cohort study (Huynh et al., 2016). Finally, one piece of Level VII evidence was obtained and is a review of literature (Huynh et al., 2013).

Appraisal of Relevant Evidence

The Johns Hopkins Research or Non-Research Appraisal Tool was used to determine the quality of the research evidence (Dearholt & Dang, 2012). This research tool contains a series of questions that guide the assessment of study quality. High quality is a consistent study with generalizable results. The sample size must be sufficient for the study design and adequate control must be demonstrated with definitive conclusions. Finally, a high quality study must have consistent recommendations, based on a comprehensive literature review that includes a thorough reference to scientific evidence. A study is considered good quality if there are: (a) reasonably consistent results, (b) sufficient sample size for the study design, (c) some control, (d) fairly definitive conclusions, (e) reasonably consistent recommendations, based on a fairly

comprehensive literature review, that includes some reference to scientific evidence. Low quality studies are studies with little evidence, inconsistent results, insufficient sample size for the study design, or if conclusions cannot be drawn (Dearholt & Dang, 2012).

The Johns Hopkins Non-Research Appraisal Tool was used to determine the quality of the non-research evidence, specifically the CPG and the review of literature (AHRQ, 2015; Huynh et al., 2013). The tool contains a series of questions that guide the quality assessment; either high, good, or low quality (Dearholt & Dang, 2012). For a CPG to be considered high quality, it must be: (a) sponsored by a professional, public, private organization, or government agency, (b) document a systematic literature search strategy, (c) have consistent results, and (d) be developed or revised within the last five years (Dearholt & Dang, 2012). To be considered good quality, the CPG must be: (a) sponsored by a professional, public, private organization, or government agency, (b) document a reasonably thorough systematic literature search strategy, (c) have reasonably consistent results, and (d) be developed or revised within the last five years (Dearholt & Dang, 2012). Finally, to be considered low quality, the CPG must not: (a) be sponsored by an official organization, (b) document a systematic literature search strategy, (c) have consistent results, and (d) be developed or revised within the last five years (Dearholt & Dang, 2012).

The guidelines for the quality of a review of literature differ, from the quality guidelines for a CPG. To be considered high quality, a review of literature must have definitive conclusions and scientific rationale (Dearholt & Dang, 2012). For a review of literature to be considered good quality, fairly definitive conclusions must be drawn and logical argument for opinions must be provided (Dearholt & Dang, 2012). Finally, low quality reviews do not provide conclusions (Dearholt & Dang, 2012). All evidence was kept regardless of the level or quality rating, as to represent the evidence that is currently available. Table 2.2 summarizes the evidence and provides both the level and quality rating for each piece of evidence.

Table 2.2

Methods Summary

Authors Year Published	Design Sample	Outcome	Intervention	Results/Findings	Level Quality
Hron et al. 2015	Quasi-experimental Quality Improvement Time-series Tertiary care children's hospital- all patients admitted for one year	Rate of non-intercepted admission MREs, identified by a voluntary reporting system Severity of MREs: 0-5 scale 0= intercepted potential ADE's (before reaching patient) 1= non-intercepted potential ADE (reached patient, no condition change) 2= minor ADE 3= moderate ADE 4= major ADE 5= catastrophic ADE	EHR tool that displayed the pre-admission medication list beside the admission medication orders Med Rec compliance was reported to inpatient units	Med Rec tool was used in <3% of patients pre-intervention and in 83.8% of patients post-intervention MRE's: Pre-intervention: 4.1 errors per 1,000 admissions Post-intervention: 2.0 errors per 1,000 admissions Statistically significant decrease (53%) in rate of MRE's post intervention ($p = .02$; 95% CI [26, 87]) Risk of reported ADEs related to admission Med Rec was significantly lower post intervention ($R^2 = .24$; $p < .001$; 95% CI [0.11, 0.53]) Severity: Intercepted potential ADEs (35% of total errors) Pre-intervention: 1.7 per 1,000 admissions Post-intervention: 1.4 per 1,000 admissions	Level: III Quality: High

				<p>Non-intercepted potential ADEs (42% of total errors) Pre-intervention: 2.3 per 1,000 admissions Post-intervention: 1.5 per 1,000 admissions</p> <p>Minor ADEs (22% of total errors) Pre-intervention: 1.7 per 1,000 admissions Post-intervention: 0.4 per 1,000 admissions</p> <p>Moderate ADEs (1% of total errors) 0.1 errors both pre and post-intervention</p> <p>No major or catastrophic ADE's pre or post-intervention</p>	
Huynh et al. 2013	<p>Review of Literature, without meta-analysis</p> <p>Literature search of PubMed, OVID EMBASE, ISI Web of Science, ISI Biosis, CINHAL, and OVID International Pharmaceutical Abstracts</p> <p>Inclusion criteria: ≤ 18 years of age upon admission to</p>	<p>Medication discrepancy at pediatric transitions of care</p> <p>Clinical significance of discrepancy</p> <p>Type of discrepancy</p> <p>Intervention used specified</p>	<p>Pharmacy computer system that generates a complete and accurate Med Rec form to serve as a transfer order</p> <p>BPMH form that physicians were expected to complete, nurses completed Med Rec if <4 medications, if >4 medications pharmacist</p>	<p>No uniform outcome was used to measure effect of Med Rec in the pediatric population</p> <p>There is little information or data on using Med Rec in the pediatric population</p> <p>Using Med Rec in pediatrics, to improve medication safety, is challenging</p> <p>Further research is needed to fully understand the most beneficial Med Rec process in pediatrics</p>	<p>Level: VII</p> <p>Quality: High</p>

	<p>hospital, transfer, or discharge, and reported Med Rec intervention</p> <p>Exclusion criteria: mixed pediatric and adult data that could not be stratified, outside pediatric age limit, not original research, did not clearly define discrepancies or intervention</p> <p>10 sources 6 prospective observational studies, 4 retrospective observational studies</p> <p>7 full articles, 3 non-peer reviewed, conference abstracts</p>		<p>completed Med Rec</p> <p>Student pharmacist formulated BPMH</p> <p>BPMH list compiled using five sources on admission</p> <p>Pharmacist compiled independent medication history upon admission and transfer</p> <p>Best possible medication discharge plan was used at patient's discharge</p> <p>Introduction of pharmacist in a pediatric ER</p> <p>4 stage Med Rec by pharmacist</p>		
<p>Huynh et al. 2016</p>	<p>Prospective Cohort</p>	<p>Medication discrepancies= difference between pre-admission</p>	<p>Clinical pharmacist</p> <ol style="list-style-type: none"> 1. Interviewed caregiver 2. Called PCP to obtain 	<p>Overall, 1004 individual prescriptions: 582 medication discrepancies/1004 prescriptions (58%), affecting 203 patients (83%)</p>	<p>Level: IV</p> <p>Quality: High</p>

	<p>4 pediatric hospitals in the United Kingdom</p> <p>Inclusion criteria: one long term medication prescribed</p> <p>Exclusion criteria: no long term medications prescribed, ≥ 19 years of age, caregiver not present, drug list not available, or admitted outside of routine hours</p> <p>$n = 244$</p>	<p>medication list when compared to initial admission medication orders</p> <p>Intentional vs. unintentional discrepancies</p> <p>Severity of unintentional discrepancies: Class 1: potentially minor Class 2: potentially moderate Class 3: potentially severe</p> <p>Time needed to complete Med Rec was recorded</p>	<p>medication record</p> <p>3. Recorded patients medications brought from home</p> <p>4. Examined initial admission medication orders</p> <p>No previous Med Rec process was in place</p>	<p>209/582 unintentional discrepancies, affecting 109/244 patients (45%) 277/582 (48%) intentional discrepancies 96/582 (16%) discrepancies were determined to be trivial or related to nutrition</p> <p>Severity: Class 1: 22% of unintentional medication discrepancies Class 2: 50% of unintentional medication discrepancies Class 3: 28% of unintentional medication discrepancies</p> <p>Total time needed to complete the Med Rec: 6-144 minutes ($Mdn = 24$, $IQR = 17-40$)</p> <p>Parents/caregivers were the most accurate source (81% correct) compared to the pharmacist completed regimen</p> <p>Medications were present at 38.5% of admissions</p>	
<p>Nassaralla et al. 2007</p>	<p>Quasi-experimental Before and after</p> <p>Adult primary care, internal medicine clinic</p>	<p>Completeness of Med Rec in EHR ("complete"= name, dose, frequency, and route documented)</p>	<p>Reviewed process and shared data with team members</p> <p>2 steps: 1. Educated all team members</p>	<p>Significant increase in documentation of dose and route Pre-intervention: 27.4% missing dose, 85.8% missing route Post-intervention: 21.7% missing dose, 16.8% missing route ($p < .03$) Sustainability: 12.9% missing dose, 13.1% missing route ($p < .001$)</p>	<p>Level: III</p> <p>Quality: Good</p>

	<p>Pre-intervention: <i>n</i> = 65</p> <p>Post-intervention: <i>n</i> = 100</p> <p>Sustainability phase: <i>n</i> = 65</p>	<p>Correctness of Med Rec in EHR (“correct”= no discrepancies in the name, dose frequency, or route, between the med list in EHR and the medications the patient was taking at home)</p> <p>Phone call to collect information from patient</p> <p>Accurate = complete and correct Med Rec</p>	<p>what constitutes a complete and correct medication list, shared results of pre-intervention data with nurses and physicians, same Med Rec review process for all patients (LPN obtained and documented medication history in EHR)</p> <p>2.Revamped entire visit, educated each team member on role in improving completeness and correctness, patient reminded to bring medications or updated list to visit, when patient arrived they were given a form to record medications if they did not bring containers or list, LPN recorded all four components of each</p>	<p>Correctness: Pre-intervention: 59/86 (69%) of patients agreed to participate Post-intervention: 61/100 (61%) of patients agreed to participate</p> <p>No significant improvement of correctness (<i>p</i> = 0.442): Pre-intervention: 14/59 (23.7%) Post-intervention: 11/61 (18%)</p>	
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			medication, physician reconciled and updated the list, transcriptionist checked for discrepancies between the dictation and the med list in the EHR		
Nassaralla et al. 2009	<p>Quasi-experimental Before and after</p> <p>4 adult ambulatory primary care internal medicine clinics</p> <p>Pre-intervention: <i>n</i> = 108</p> <p>LPN intervention: <i>n</i> = 102</p> <p>Patient intervention: <i>n</i> = 115</p>	<p>Completeness of Med Rec in EHR ("complete"= name, dose, frequency, and route documented)</p> <p>Correctness of Med Rec in EHR ("correct"= no discrepancies in the name, dose frequency, or route, between the medication list in EHR and medications the patient was taking at home)</p> <p>Phone call to collect information from patient</p>	<p>3 phases:</p> <p>1. Baseline data</p> <p>2. LPN intervention: (a) education including the complete and correct Med Rec process, (b) performance updates including number and type of discrepancies</p> <p>3. Patient awareness: (a) called day before visit (b) highlighted paragraph in reminder letter than was focused on bringing</p>	<p>Statistically significant increase in the number of complete individual medications and lists (<i>p</i> < . 03):</p> <p>Complete medication list: Pre-intervention: 22/108 (20.4%) LPN-intervention: 46/102 (45.1%) Patient-intervention: 58/115 (50.4%)</p> <p>Complete medications: Pre-intervention: 605/791 (76.5%) LPN-intervention: 643/759 (84.7%) Patient-intervention: 781/885 (88.3%)</p> <p>Correctness: Participation Pre-intervention: 61/108 (56%) of patients in correctness assessment LPN-intervention: 52/102 (51%) of patients in correctness assessment Patient-intervention: 69/115 (60%) of patients in correctness assessment</p> <p>There was a decrease in correctness from 19/61 (31.2%) in</p>	<p>Level: III</p> <p>Quality: High</p>

		Accurate= complete and correct	<p>medications to appointment</p> <p>(c) brochure in waiting room</p> <p>(d) LPN educated patient on importance of Med Rec</p> <p>(e) given copy of brochure</p> <p>(f) reconciled medications</p> <p>(g) printed copy and gave to patient</p>	<p>the pre-intervention phase to 12/52 (23.1%) in the LPN intervention phase ($p < .34$)</p> <p>Patient-intervention increased correctness from 12/52 (23.1%) in the LPN intervention phase to 26/69 (37.7%) in the patient intervention phase ($p = .087$)</p> <p>Accuracy significantly improved from pre-intervention phase to the patient intervention phase from 11.5% to 29% ($p = .014$)</p> <p>Percentage of patients that brought their medications increased from 13.9% in the pre-intervention phase to 33% in the patient intervention phase ($p < .001$)</p>	
<p>National Institute for Health and Care Excellence (NICE)</p> <p>2015</p>	<p>SR of SRs of RCTs, single RCTs, or observational studies (when RCTs were not available)</p> <p>Individuals using medications</p>	Improved medication safety	Med Rec completed by a trained professional	<p>Med Rec should be completed at all transitions of care</p> <p>In the hospital setting, Med Rec should be documented within 24 hours of admission and when the person moves from one setting to another, for example transfers between units</p> <p>In primary care, Med Rec should be completed on every patient discharged from the hospital or seeking care from another facility</p>	<p>Level I</p> <p>Quality: High</p>

				<p>Trained professionals were defined as a pharmacist, pharmacy technician, nurse, or physician</p> <p>It is important to involve patients and their families in the Med Rec process</p> <p>Med Rec should be performed using a designated process, in which the medications are recorded in an EHR or on paper</p>	
<p>Stock et al. 2009</p>	<p>Quasi-experimental Before and after</p> <p>11 primary care clinics</p>	<p>Number of inaccurate EHR medication lists</p>	<p>5 components:</p> <ol style="list-style-type: none"> 1. Asked patient to bring medications to visit during appointment reminder call 2. Clinic personnel reviewed medications with the patient at start of visit 3. Medication list was reconciled with EHR and changes were documented 4. New prescriptions were checked for interaction/conflict, 	<p>Baseline: 20% of the reviewed charts has discrepancies between the EHR and the patient's medication list. Post-intervention: 50% of the reviewed charts has discrepancies between the EHR and the patient's medication list</p> <p>Number of discrepancies per medication list was reduced significantly (no statistical data provided)</p>	<p>Level: III</p> <p>Quality: Poor</p>

			with an updated, reconciled medication list		
			5. A printed paper copy of the reconciled medication list was given to the patient		
Varkey et al. 2007	<p>Quality Improvement Quasi-experimental Before and after</p> <p>104 primary care patients</p> <p>Phase I (pre-intervention): <i>n</i> = 54</p> <p>Phase II (post-intervention): <i>n</i> = 50</p>	<p>Number of medication discrepancies between what the patient was taking and what the EHR stated the patient was taking</p> <p>Severity of discrepancies: Minor- incomplete information in medication order, unavailable or inappropriate dosage form, non-formulary drug, or unusable abbreviation Significant- high dosage (1.5-4 time normal) of drug with low therapeutic index, drug dosage too</p>	<p>Phase I: (pre-intervention, standard care) Medication history was documented in the EHR by the provider</p> <p>Phase II: 2 levels</p> <p>1. Patient level: (a) reminder letter to bring medication bottles to next visit was mailed to the patient (b) the patient verified and corrected the medication list in the EHR</p> <p>2. Provider level: (a) education including significance and</p>	<p>Patients brought their medication bottles or an updated list: Phase I: 3/54 (5%) of patients Phase II: 26/50 (52%) of patients</p> <p>Visits with some EHR medication discrepancy (<i>p</i> = .0134): Phase I: 53/54 (98.2%) Phase II: 42/50 (84%)</p> <p>Medication lists with discrepancy (when prescription medications only considered) (<i>p</i> = .005): Phase I: 48/54 (88.9%) Phase II: 33/50 (66%)</p> <p>Total individual prescription medications with discrepancies: Phase I: 177/200 (88.5%) Phase II: 79/161 (49.1%) Incorrect or missing route was the most common missing information</p> <p>Average number of discrepancies among herbal and OTC medications:</p>	<p>Level: III</p> <p>Quality: Good</p>

		<p>low for patient's condition, incorrect dual drug therapy for single condition, inappropriate dosage interval, or omission from medication order Serious- route of administration could lead to toxicity, low dosage of drug for serious disease, drug could worsen patient's condition, misspelling that could lead to dispensing incorrect drug Potentially lethal-high potential for life-threatening adverse reactions, potentially lifesaving drug at a dosage that is too low, high dosage of drug with low therapeutic index</p>	<p>method of the Med Rec (b) audit feedback weekly via email with examples of errors and individual data compared to others</p>	<p>Phase I: 112/147 (76.2%) Phase II: 34/101 (33.7%) Severity: Minor Phase I: 75% Phase II: 82.9% Significant Phase I: 24% Phase II: 17% Serious Phase I: 0.3% No lethal discrepancies in Phase I or Phase II</p>	
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<p>Weingart et al. 2007</p>	<p>Quasi-experimental Before and after Quality Improvement</p> <p>2 adult outpatient oncology clinics</p> <p>1 pediatric outpatient oncology clinic, data cannot be stratified</p> <p>Standard care group: <i>n</i> = 54</p> <p>Intervention group: <i>n</i> = 50</p>	<p>Number of medication lists reconciled</p> <p>Errors and omissions per patient and per prescription</p> <p>Pharmacist time required to collect Med Rec lists and correct EHR's</p>	<p>Copy of medication list and a one page cover letter</p> <p>Standard care group: list was collected prior to appointment</p> <p>Intervention group: (a) took updated list into appointment (b) brochure sent about medication safety (c) printed copy from EHR given to patient at visit (d) asked patient to update, including OTC, vitamins, and supplements (e) physician reviewed the list with the patient (f) the physician or pharmacist updated the EHR (g) printed updated med list given to patient</p>	<p>The number of medication lists reconciled per month increased >400% from 300-400 per month in the pre-intervention phase to 1500-2000 per month in the post-intervention phase</p> <p>53,040 changes to 168,475 listed drugs (31 changes per 100 medications) (81% of patients list included at least one error or omission)</p> <p>257 hours/year (0.6 full-time equivalents of a pharmacist's time)</p> <p>Medication list that had at least one patient identified correction (<i>p</i> < .001): Standard care group: 1/47 (2%) Intervention group: 38/42 (90%)</p> <p>Number of physician made changes per patient (<i>p</i> < .001): Standard care group: 0.1 changes per patient Intervention group: 4.3 changed per patient</p>	<p>Level III</p> <p>Quality: Good</p>
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Note. MRE= medication reconciliation errors, ADE= adverse drug event, EHR= electronic health record, Med Rec= medication reconciliation, BPMH= best possible medication history, ER= emergency room, PCP= primary care provider, LPN= licensed practical nurse, SR= systematic reviews, RCT= randomized controlled trials, OTC= over-the-counter.

Construction of Evidence-based Practice

The literature was examined and only literature relevant to the topic was included. The inclusion and exclusion criteria guided the systematic literature review. Articles that were deemed applicable were then leveled and appraised to ensure that the best Med Rec practice was identified. A single article was found that examined Med Rec in the pediatric outpatient oncology setting (Weingart et al., 2007). The CPG found addressed Med Rec in any setting and was included as a baseline recommendation. The remaining literature was divided into three main groups: pediatric inpatient studies, adult outpatient studies, and adult inpatient studies. The pediatric inpatient and adult outpatient studies became the focus of the literature review, as their setting or population were similar to the project site. Adult inpatient studies were not included because the setting and the population differed from the project site's setting and population. Also, the Med Rec process and outcomes were not applicable to this project.

Pediatric and adult outpatient oncology study and CPG. As discussed previously, a minimal amount of literature, examining the implementation or improvement of the Med Rec process, in the pediatric outpatient setting was discovered. The CPG, along with the study that examined improving the Med Rec process, in both a pediatric and an adult outpatient oncology setting are discussed (AHRQ, 2015; Weingart et al., 2007).

Level I evidence. In 2015, the National Institute for Health and Care Excellence (NICE) developed a CPG entitled "Medicines Optimization: The Safe and Effective Use of Medicines to Enable the Best Possible Outcomes." The guideline is based on a systematic review of SRs of RCTs, single RCTs, or observational studies (when RCTs were not available). The guideline is applicable to "all children, young people, and adults using medications," with a goal of improving medication safety (AHRQ, 2015, p. 1). The guideline recommends that Med Rec be completed by a trained professional, at all transition of care. A trained professional was defined as a pharmacist, pharmacy technician, nurse, or physician. The CPG formulated many conclusions, the conclusions applicable to the project have been reviewed. The guideline emphasizes the

importance of involving patients and their families in the Med Rec process. Also, the CPG recommends Med Rec be performed using a designated process, in which medications are recorded in an EHR or on paper (AHRQ, 2015).

Level III evidence. A quasi-experimental, before and after, study was conducted at one pediatric outpatient oncology clinic and two adult outpatient oncology clinics (Weingart et al., 2007). Unfortunately, the data could not be stratified from the information provided. The standard care group ($n = 54$) received a copy of their medication list and were asked to revise the medication list. The list was then collected prior to the physician aspect of the appointment. In contrast, the intervention group ($n = 50$) was sent a brochure about medication safety. Upon arriving to their visit, the patient was given a printed medication list from the EHR and asked to update the list. The patient was instructed to include: OTC medications, vitamins, and supplements. During the visit, the physician reviewed the list with the patient, and the physician or pharmacist updated the EHR. Finally, the updated medication list was printed and given to the patient, prior to the end of the visit (Weingart et al., 2007).

The number of medication lists that were reconciled, along with the errors and omissions per patient and per prescription were recorded. The number of medication lists reconciled increased greater than 400% from 300-400 per month in the pre-intervention phase to 1,500-2,000 per month in the post-intervention phase. There were 53,040 changes to 168,475 listed drugs (31 changes per 100 medications) and 81% of patients' lists included at least one error or omission. Two-hundred and fifty seven hours per year (0.6 full-time equivalents of a pharmacist's time) was needed to collect the Med Rec lists and correct the EHR. The number of medication lists, that had at least one patient identified correction, increased from 2% (one of 47) in the standard care group to 90% (38 of 42) in the post-intervention group ($p < .001$). The number of 'physician made' changes per patient increased from 0.1 changes per patient in the standard group to 4.3 changes per patient in the intervention group ($p < .001$) (Weingart et al., 2007).

Pediatric inpatient studies. The evidence, included in this review of literature, that focused on the pediatric inpatient population are of particular importance. Specifically, they discuss the need for Med Rec in pediatrics. Med Rec should be viewed as a way to decrease the incidence of medication errors. Pediatric patients are at an increased risk for medication errors; and therefore, techniques for possible reduction in errors should be taken seriously. The pediatric inpatient evidence focused on both the completion of the Med Rec process and the accuracy of the Med Rec. One Level III study, one Level IV study, and one Level VII review of literature were included and are discussed at this time.

Level III evidence. Hron et al. (2015) conducted a study that sought to “measure the impact of electronic medication reconciliation implementation on reports of admission medication reconciliation errors (MREs)” (p. 314). The quasi-experimental, quality improvement, time series was conducted at a tertiary care children’s hospital and included all patients admitted in one year. The outcome of measure was the rate of non-intercepted admission MREs identified, by a voluntary reporting system. The severity of the MREs was ranked on a zero to five scale: zero was assigned to any intercepted potential ADE that did not reach the patient; one was assigned to any non-intercepted potential ADE that reached the patient and no condition change occurred; two was any minor ADE; three was any moderate ADE; four was any major ADE; and five was any catastrophic ADE. The intervention implemented was an EHR tool that displayed the pre-admission medication list beside the admission medication orders. Also, Med Rec compliance was reported to the inpatient units (Hron et al., 2015).

The Med Rec tool compliance was found to be <3% pre-intervention and 83.8% post-intervention. Pre-intervention there were 4.1 Med Rec errors per 1,000 admissions and post-intervention there were 2.0 errors per 1,000 admissions. There was also a statistically significant decrease (53%) in rate of MRE’s post intervention ($p = .02$; 95% CI [26, 87]). The risk of reported ADEs related to admission Med Rec was significantly lower post intervention ($R^2 = .24$; $p < .001$; 95% CI [0.11, 0.53]). Pre-intervention there were 1.7 intercepted potential ADEs, per

1,000 admissions and 1.4 post-intervention. There were 2.3 non-intercepted potential ADEs, per 1,000 admissions pre-intervention and 1.5 post-intervention. Minor ADEs were reported as 1.7, per 1,000 admissions pre-intervention and 0.4 post-intervention. Moderate ADEs were 0.1, per 1,000 admissions both pre- and post-intervention. During the study period there were no major or catastrophic ADE's pre- or post-intervention. Overall, the Med Rec process produced a statistically significant decrease in the reported number of non-intercepted admission MREs, after an electronic Med Rec process was implemented (Hron et al., 2015).

Level IV evidence. A prospective cohort study, by Huynh et al. (2016), conducted in four pediatric hospitals in the United Kingdom, examined the incidence of unintended medication discrepancies, in pediatric inpatients. The authors included patients ($n = 244$) if they were prescribed one long term medication. They excluded patients if they were: ≥ 19 years of age, had no caregiver present, no drug list was available, or if they were admitted outside of routine hours. Medication discrepancies, defined as a difference between the patients pre-admission medication list when compared to initial admission medication orders, were totaled and classified as intentional or unintentional. The severity of unintentional discrepancies was further classified as: class 1 potentially minor, class 2 potentially moderate, and class 3 potentially severe. Finally, the time to obtain information was recorded. In this study, a clinical pharmacist: (1) interviewed the caregiver, (2) called the PCP to obtain the patients medication record, (3) recorded the patients medications brought from home, and (4) examined the initial admission medication orders. There was no previous Med Rec process in place at this site (Huynh et al., 2016).

Overall, there were 1,004 individual prescriptions and 582 medication discrepancies (58%) that affected 203 patients (83%). Two hundred and nine of those discrepancies were unintentional and affected 109 patients (45%). Two hundred and seventy-seven of the discrepancies were intentional, and 96 were determined to be trivial or related to nutrition.

Twenty-two percent of the unintentional medication discrepancies were class 1; 50% were class

2; and 28% were class 3. The total time to collect the information ranged from six to 144 minutes (*Mdn* = 24, *IQR* 17-40) (Huynh et al., 2016).

The authors found that the parents/caregivers were the most accurate source, with 81% correct when compared to the pharmacist completed regimen. The PCP was 70% correct, followed by the medications present at the visit with 56% correct. The medications were brought with the patients at 38.5% of admissions. The authors postulated that Med Rec decreased the risk of harm from unintended medication discrepancies. Parents were found to be the most sensitive/accurate source of information, followed by the PCP, and then the medications present (Huynh et al., 2016).

Level VII evidence. A review of literature, without meta-analysis, conducted by Huynh et al. (2013), focused on the rate of medication discrepancies in pediatric patients at transitions of care and specifically what Med Rec interventions were being used. The authors searched numerous databases including: PubMed, OVID EMBASE, ISI Web of Science, ISI Biosis, CINHAL, and OVID International Pharmaceutical Abstracts. Inclusion criteria included: ≤ 18 years of age upon admission to the hospital, transfer, or discharge, and a reported Med Rec intervention. Exclusion criteria included: mixed pediatric and adult data that could not be stratified, outside the pediatric age limit, not original research, and studies that did not clearly define discrepancies or interventions (Huynh et al., 2013).

In total, ten articles were included in the review: six prospective observational studies and four retrospective observational studies. There were seven full articles and three non-peer reviewed articles. The outcomes of focus were medication discrepancies, at pediatric transitions of care, and the clinical significance of the identified discrepancies. The majority of measurements occurred upon inpatient hospital admission. The slight variance in the outcome measurement limits the generalizability to other populations (Huynh et al., 2013).

The review of literature uncovered a variety of interventions that were used in an effort to increase Med Rec accuracy. The variety of interventions did not lead to definitive conclusions,

regarding the best practice to increase Med Rec accuracy. The authors concluded that there was limited high quality evidence related to Med Rec, at pediatric transitions of care. Further research is needed to fully understand the most beneficial Med Rec process in pediatrics (Huynh et al., 2013).

Adult outpatient studies. Four of the sources, included in this review of literature, all Level III, focused on Med Rec in the adult outpatient setting. Common themes were found in these adult outpatient studies. Themes included (a) a Med Rec process that is complete, correct, and accurate, (b) the importance of a multidisciplinary approach, and (c) an intervention that included both patient and provider.

Level III evidence. Nassaralla et al. (2007) conducted a quasi-experimental, before and after, study in an adult primary care, internal medicine clinic. Pre-intervention there were 65 participants, post-intervention there were 100 participants, and during the sustainability phase there were 65 participants. The outcome of measure was the completeness of Med Rec in the EHR. Completeness was defined as a medication having the name, dose, frequency, and route of administration documented in the EHR. Also, the correctness of the Med Rec in EHR was assessed. Correctness occurred when there were no discrepancies in the name, dose, frequency, or route of administration between the medication list in EHR and the medications the patient was taking at home. The correctness was evaluated by contacting the patients via phone and verifying the current medication regimen. Finally, a Med Rec was deemed accurate if it was both complete and correct (Nassaralla et al., 2007).

Prior to the intervention, the authors reviewed the Med Rec process and shared the collected baseline data, with team members. The intervention consisted of two steps. In the first step, all the team members were educated, regarding what constitutes a complete and correct medication list. The results of the pre-intervention data were shared with the nurses and physicians. The same rooming process was used for all patients. The rooming process consisted of the LPN obtaining and documenting the medication history in the EHR. The second

step was to revamp the entire patient visit. First, team members were educated on their role in the Med Rec process. The patients were reminded to bring their medications or an updated list to their visit. When the patient arrived they were given a form to their record medications, if they had not brought their medication containers or a list. The LPN recorded all four components of each medication. Then the physician reconciled and updated the list. Finally, the transcriptionist checked for discrepancies between the dictation and the EHR medication list (Nassaralla et al., 2007).

The authors found a significant increase in the documentation of the dose and route. In the pre-intervention phase, 27.4% of medications charted were missing a dose, post-intervention that percentage had decreased to 21.7 ($p < .03$). During, the sustainability phase the percentage of medications without a dose charted was 12.9%, this was a statistically significant improvement from the post-intervention phase ($p < .001$). In the pre-intervention phase 69% (59 of 86) of the patients agreed to participate in the correctness interview. Post-intervention 61% (61 of 100) agreed to participate. There was no significant improvement of medication list correctness found pre-intervention (23.7%), when compared to the post-intervention phase (18%) ($p = .442$) (Nassaralla et al., 2007).

The second Level III evidence was a quasi-experimental, before and after, study (Nassaralla et al., 2009). The setting was four adult ambulatory, primary care, internal medicine clinics. The intervention consisted of three phases: pre-intervention/baseline data collection ($n = 108$), an LPN intervention phase ($n = 102$), and a patient awareness intervention phase ($n = 115$). The completeness, correctness, and accuracy of the medication list, where the outcomes examined. Completeness was defined as a medication having the name, dose, frequency, and route of administration documented in the EHR. Correctness occurred when there were no discrepancies in the name, dose, frequency, or route of administration between the medication list in EHR and the medications the patient was taking at home. The correctness was evaluated

by contacting the patients via phone and verifying the current medication regimen. Finally, a Med Rec was deemed accurate if it was both complete and correct (Nassaralla et al., 2009).

First, the authors collected pre-intervention, baseline data on 108 patients. The data included the completeness, the correctness, and accuracy of the medication list. The authors then provided an LPN intervention. The LPN intervention consisted of education including the complete and correct Med Rec process and performance updates including the number and type of discrepancies. The patient awareness intervention consisted of: (a) calling the patient the day before a their visit and reminding them to bring their medications with them, (b) highlighting the paragraph in the reminder letter that focused on bringing medications to the appointment, (c) a brochure in waiting room that emphasized medication safety importance, (d) the LPN educated the patient on the importance of Med Rec (e) a copy of the brochure was given to the patient (f) the medications were reconciled, and (g) a printed copy was given to the patient (Nassaralla et al., 2009).

There was a statistically significant increase in the number of medications and lists that were completed ($p < .03$). Pre-intervention 20.4% of medication lists were complete, after the LPN intervention 45.1% of lists were complete, and after the patient awareness intervention 50.4% of lists were complete. Pre-intervention 76.5% of medications documented were complete, after the LPN intervention 84.7% of medications documented were complete, and after the patient awareness intervention 88.3% of medications documented were complete. The participation in the assessment of correctness was 56% pre-intervention, 51% after the LPN intervention, and 60% after the patient awareness intervention. From the pre-intervention to LPN intervention statistically significant improvement was not shown. Actually, there was a decrease in correctness from 31.2% in the pre-intervention phase to 23.1% in the LPN intervention phase ($p < .34$). The authors speculated that this is a result of the small number of participants that agreed to participate in the correctness assessment, or possibly a result of the

pressure LPNs felt to complete the medication list, disregarding the correctness (Nassaralla et al., 2009).

The patient participation component increased correctness from 23.1% in the LPN intervention phase to 37.7% in the patient intervention phase ($p = .087$). Accuracy was significantly improved from the pre-intervention phase to the patient intervention phase from 11.5% to 29% ($p = .014$). The percentage of patients that brought their medications increased from 13.9 % to 33% in the pre-intervention phase to the patient intervention phase ($p < .001$). Overall, the increased team member and patient participation lead to an increase in the completeness of medications documentation and medication lists (Nassaralla et al., 2009).

A quasi-experimental, before and after, study took place in 11 primary care clinics (Stock et al., 2009). The number of inaccurate EHR medication lists and medication accuracy were measured. There were five components to the Med Rec implementation. The first step was asking the patient to bring their medications to their visit. This reminder occurred during the appointment reminder call. Secondly, the clinic personnel reviewed the patient's medications at the start of the visit. Next, the medication list was reconciled in the EHR and changes were documented. The fourth step was that new prescriptions were checked for interaction or conflict with the updated reconciled medication list. Finally, a printed paper copy of the reconciled medication list was given to the patient (Stock et al., 2009).

Despite the five components of the Med Rec process being implemented, the authors noted that "it was not stipulated that the implementation needed to be the same at each practice setting, thereby allowing practices to design a process that took into account their personnel and resources without affecting the agreed-on outcome of more accurate medication lists" (Stock et al., 2009, p. 276). Stock et al. (2009) concluded that the Med Rec process showed a "substantial increase in the number of accurate medication lists, with fewer discrepancies between what the patient is taking and what is recorded in the EMR" (p. 271). Prior to the intervention 20% of the reviewed charts has discrepancies between the EHR and the patient's

medication list. Post-intervention 50% of the reviewed charts has discrepancies between the EHR and the patient's medication list. No additional data could be extrapolated from the article (Stock et al., 2009).

The fourth Level III source of evidence focused on Med Rec in the adult outpatient setting. The authors conducted a quasi-experimental, before and after study, that involved 104 primary care patients (Varkey et al., 2007). The study was divided into Phase I (pre-intervention, $n = 54$) and Phase II (post-intervention, $n = 50$). The number of medication discrepancies between what the patient was taking and what the EHR stated the patient was taking were recorded. The severity of the discrepancies were classified as minor, significant, serious, or potentially lethal. During Phase I, standard care was provided to the patients, in which the medication history was documented in the EHR by the provider. In Phase II, there was a patient level intervention and a provider level intervention. The patient level intervention included: (a) a mailed, reminder letter to bring medication bottles to the next visit and (b) verification and correction of the medication list in the EHR by the patient. The provider level intervention included: (a) education including the significance and method of Med Rec and (b) audit feedback weekly via email, with examples of errors and individual data compared to others (Varkey et al., 2007).

Five percent of patients (3 of 54) brought their medication bottles in Phase I, as compared to 52% (26 of 50) in Phase II. In Phase I, 98.2% (53 of 54) of visits had some EHR medication discrepancy and in Phase II 84% (42 of 50) had a discrepancy ($p = .0134$). When only prescription medications were considered, the medication lists with discrepancies were 88.9% (48 of 54) in Phase 1 and 66% (33 of 50) in Phase II ($p = .005$). The number of discrepancies per patient decreased from 5.24 in Phase I to 2.46 in Phase II. The total individual prescription medications with discrepancies was 88.5% (177 of 200) in Phase I and 49.1% (79 of 161) in Phase II. Incorrect or missing route was the most common missing information. The average number of discrepancies among herbal and OTC medications was 76.2% (112 of 147)

in Phase I and 33.7% (34 of 101) in Phase II. Seventy-five percent of the discrepancies were minor in Phase I and 82.9% were in Phase II. The percentage of significant discrepancies decreased from 24% in Phase I to 17% in Phase II. In Phase I, there was one serious discrepancy and no lethal discrepancies in either phase (Varkey et al., 2007). According to Varkey et al. (2007), "a multifaceted intervention including various members of the health care provider team and the patient is crucial to enhancing medication reconciliation in the outpatient setting" (p. 291).

Synthesis of Critically Appraised Literature

The synthesized literature provided common themes, in regards to the Med Rec process, measureable outcomes, and interventions. All the evidence emphasized the importance of having a standardized Med Rec process that is clear and communicated to all team members and patients. The outcome used most frequently in the literature was the assessment of the number of medication discrepancies (Hron et al., 2015; Huynh et al., 2013; Huynh et al., 2016; Stock et al., 2009; Varkey et al., 2007; Weingart et al., 2007). Although, the evidence by Nassaralla et al. (2007) and Nassaralla et al. (2009) used different terminology (completeness, correctness, and accuracy) the idea of monitoring the number of discrepancies was still present. Another common theme in the literature related to the number of medication discrepancies was the assignment of severity (Hron et al., 2015; Huynh et al., 2013; Huynh et al., 2016; Varkey et al., 2007). Classifying the severity was in an effort to assess the possible adverse outcome had the discrepancy not been identified.

In addition to there being common measurable outcomes, there were common interventions mentioned. In three of the four adult outpatient studies, the intervention had two components: a patient component and a provider component (Nassaralla et al., 2007; Nassaralla et al., 2009; Varkey et al., 2007). The patient component generally consisted of: (a) a reminder to bring their medications to the visit, (b) a brochure or letter emphasizing the importance of medication safety and reconciliation, and (c) education about the Med Rec

process. The provider component generally consisted of: (a) education regarding the importance of the Med Rec process, (b) specific role assignment in the process, and (c) individual updates of Med Rec compliance and accuracy (Nassaralla et al., 2007; Nassaralla et al., 2009; Varkey et al., 2007). The one source that focused on both the pediatric and adult outpatient population had a similar intervention (Weingart et al., 2007).

Many healthcare organizations, in both the inpatient and outpatient setting, are seeking ways to implement best practice and ensure patient medication safety. From the literature, one realizes that Med Rec has a large impact on medication safety. With the improvement of an existing Med Rec process, medication safety can improve. Clear delineation of the Med Rec process is the first goal in providing evidence-based care. Measuring and monitoring the number of medication discrepancies will give the team members a sense of whether the Med Rec process intervention is, in fact, meeting goals. The severity of the discrepancies sheds light into the potential ADE's that occurred or could have occurred. Finally, an intervention that includes both patients and healthcare providers is supported and recommended repeatedly in the literature.

Best Practice Model Recommendation

After appraisal and synthesis of the current literature, the importance of not only measuring medication discrepancies, but preventing them became clear. The literature guided the PL to the overall outcomes to be measured and intervention themes. Although, the reviewed studies were not conducted in both the correct setting and population, the information and recommendations can be tailored to the pediatric hematology/oncology outpatient population. The outcome chosen for this EBP project, measurement of medication discrepancies and their severity, was commonly used in the evidence. The intervention chosen for this EBP project was based on the adult outpatient settings. These studies had current Med Rec processes in place, as did the project site, and the process was more similar to the project site than the pediatric inpatient evidence. The intervention was both patient and team member focused. It was

anticipated that implementing an intervention, which involved a standardized process, and patient and team member education would decrease the number and severity of medication discrepancies. Also, a decrease in the number of medication errors reported was anticipated.

The Kotter Model of Change was useful in implementing the change, or intervention. The model was helpful in laying the foundation and framework, in a setting in which change was greatly resisted. Kotter's Model of Change emphasizes all team members working together to better the clinical environment, this is similar to the literatures emphasis on the multidisciplinary approach to Med Rec and the positive impact and role patients play in the process. The Stetler EBP Model was appropriate in aiding the implementation of evidence into clinical practice, with the goal of improving care provided to patients.

In order to assess the current climate and belief regarding the Med Rec process, a survey was conducted prior to implementation of the intervention and at the conclusion of the EBP project. The survey was designed by the PL and completed by team members. Baseline data from the EHR was collected by the physicians and PL. The number, type, and severity of the medication discrepancies and the number of reported medication errors was collected. These data were then collected again after the intervention took place. The definitions of completeness, correctness, and accuracy found in the literature (Nassaralla et al., 2007; Nassaralla et al., 2009) were used to evaluate individual medications and the overall medication list. The severity of the discrepancies was measured using the class 1, 2, and 3 scale (Huynh et al., 2013; Huynh et al., 2016). The outcomes would have ideally been collected using the EHR; however, this was not be possible. Collecting the data from the EHR was not possible because the EHR did not provide the ability to see who made changes to the medication list, what changes were made, and when the changes were made. Discussions with the IT department were helpful in answering this question. Therefore, the data were collected by the physicians at the project site, who conducted the last step in the Med Rec process, and also by the PL. The PL was responsible for educating the physicians on appropriate data collection technique. The

medication error information was collected using the sites computer system, where medication errors are voluntarily reported.

The literature, conducted in the adult outpatient setting, was the basis for the proposed intervention (Nassaralla et al., 2007; Nassaralla et al., 2009; Varkey et al., 2007; Weingart et al., 2007). The project intervention included two components: a patient component and a team member component. The patient component consisted of a verbal call reminder to bring medications during the visit. This reminder was given by the unit assistants who makes the reminder phone calls. Also, a handout, created by the PL, emphasizing the importance of medication safety and reconciliation was provided to the patients during their office visit. Patient education regarding their role in the Med Rec process and their intricate involvement in Med Rec was reviewed by the MA or nurse, during their visit. At the project site, the team member component included unit assistants, MAs, and registered nurses. The team member component included education regarding the importance of the Med Rec process and the specific role assignment in the process. Also, updates regarding the Med Rec completeness, correctness, and accuracy were distributed to team members during the post-intervention phase, via email.

How the Best Practice Model will Answer the Clinical Question

The reviewed and synthesized literature offered an answer to the clinical question: Will a standardized, collaborative Med Rec process that is communicated to all team members and patients decrease the number of medication discrepancies? The implementation of the evidence based intervention was guided by the Kotter Model of Change and the Stetler EBP Model. To assess the impact of the proposed intervention, the number, type, and severity of medication discrepancies and the total number of medication errors reported was examined. The results of this project determined if the intervention, both patient and team member, reduced the number, type, and severity of medication discrepancies and medication errors. It was hoped that a reduction in medication discrepancies would ultimately improve patient medication safety, in a pediatric outpatient hematology/oncology clinic.

CHAPTER 3

IMPLEMENTATION OF PRACTICE CHANGE

After identification of a clinical problem and synthesis of the literature, planning implementation of a practice change was of utmost importance. As discussed previously, in Stetler's EBP Model the first three stages lead up to the fourth stage: application/translation. Stetler's Model emphasized the importance of planning prior to implementing the best evidence based practice. The ultimate goal of implementing this EBP project was to improve pediatric hematology/oncology medication safety, by implementing the best Med Rec process.

In order to protect participants and ensure their ethical treatment, IRB approval from both Valparaiso University and the clinical agency was obtained. Throughout the EBP project time frame, the PL monitored the practice change. The PL monitored the Med Rec process and also ensured participant safety and confidentiality were maintained. Chapter 3 details the methods that were used to implement this EBP project. The specific items discussed include: participants and setting, outcomes, intervention, planning, data, and protection of human subjects.

Participants and Setting

This EBP project took place in a pediatric hematology/oncology outpatient clinic in the Midwest. The pediatric hematology/oncology outpatient clinic provides services Monday through Friday and offers access an on-call physician 24 hours a day, seven days a week. The clinic, on average, has 2,500 patient visits per year. The Med Rec process occurs at every patient visit in which a physician evaluates the patient. The process spans from the patient's arrival to the clinic, to the conclusion of the visit. The patient and the following team members are included in the Med Rec process: unit assistants, MAs, registered nurses, and physicians. The goal was to standardize the Med Rec process and improve Med Rec accuracy. The improvement in accuracy required a combined effort, from all patients and all team members. It was the PL's

hope that all team members would be available for the team component of the intervention and would be included in the Med Rec process improvement. However, the physicians were not present for the team member component of the intervention. The lead physician was educated by the PL regarding the change in process and then the lead physician educated the other physicians. It was also the PL's hope that all patients would realize the benefit of their involvement in the Med Rec process.

Outcomes

There were several outcomes assessed during the project implementation. In order to assess the current climate and beliefs regarding the Med Rec process, a survey was conducted prior to implementation of the intervention. A survey was also used to assess the climate and beliefs regarding the Med Rec process at the conclusion of the project (see Appendices A and B). The surveys were designed by the PL.

Baseline data from the EHR were collected to examine the number, type, and severity of medication discrepancies. These baseline data collections occurred for three weeks prior to the intervention and were collected by both the physician and the PL. The number, type, and severity of medication discrepancies were collected again by the physicians and the PL after the intervention took place (see Appendices C and D). The definitions of completeness, correctness, and accuracy found in the literature (Nassaralla et al., 2007; Nassaralla et al., 2009) were used to evaluate individual medications and the overall medication list. In order for the PL to collect correctness data the patients/caregivers were contacted via telephone to assess whether what was documented in the EHR was in fact what the patient was taking at home. Correctness data were collected on half of the patients the physicians collected medication discrepancy data on. Random sampling was used to select the patients. The severity of the discrepancies were measured using the class 1, 2, and 3 scale found in the literature. Class 1 was defined as a potentially minor error. Class 2 was defined as a potentially

moderate error. Class 3 was defined as a potentially severe error (Huynh et al., 2013; Huynh et al., 2016).

Finally, the number of voluntarily reported medication errors was assessed. The medication error reports were collected from the computer incident report system. The number of reports pre and post-intervention were compared, as well as examination of the medication error reports, during the same time the previous year.

Intervention

The overall goal of this EBP project was to improve medication safety in a pediatric outpatient setting. This medication safety improvement was facilitated by enhancement of the Med Rec process. The intervention was based on synthesis of the literature. The intervention had two components: a patient/caregiver component and a team member component. The patient/caregiver component included three elements: (1) prompting caregivers during the visit reminder call to bring the patient's medications to the visit, (2) a handout given to the patient during their visit that emphasized the patient's role in the Med Rec process (see Appendix E), and (3) individual education regarding the Med Rec process during the patient's visit.

The team member component included: (1) education regarding Med Rec, (2) development of a standardized Med Rec process, and (3) medication discrepancy feedback via email. Team members attended an educational meeting, in which a PowerPoint® was presented (see Appendix F). The information was presented during a monthly team member meeting. The PL introduced the project topic and details to the team members. The PowerPoint® included: background Med Rec information, data from the literature, project intervention information, and baseline data collected from the clinic. A short Med Rec informational handout was given to team members as a reminder (see Appendix G). The baseline data included the number, type, and severity of the medication discrepancies and the anonymous survey results. During this meeting, the current Med Rec process was reviewed. A new standardized process was outlined and agreed upon by all team members.

Planning

There were two phases of this EBP project. The first phase consisted of baseline data collection, prior to the intervention. During Phase 1, the pre-intervention survey was distributed and completed by team members (see Appendix A). Also, pre-intervention data were collected. This data included the number of medication discrepancies. The discrepancies were classified by type and severity. The physicians collected completeness, correctness, and accuracy data from the EHR. The PL collected demographic, completeness, correctness, and accuracy data from the EHR and telephone conversation. Data from the Physician Medication Reconciliation Tracking Form was coded by the PL, in an effort to promote patient information protection (see Appendix H). Phase 1 data collection lasted three weeks. One and half weeks were allowed to analyze the data and add the data to the educational PowerPoint®.

Phase 2 began immediately following the intervention. The intervention began with the educational meeting, facilitated by the PL. During Phase 2, the team members completed a data collection form on all patients (see Appendix I). This form served as a reminder and a means to monitor key components of the Med Rec process. Phase 2 data were collected for three weeks. Similar to Phase 1, data included the number of medication discrepancies. The discrepancies were further classified by type and severity. Phase 2 data were collected by the clinic team members, physicians, and PL. The PL was frequently available to educate and encourage process compliance. At the half way mark of Phase 2, an email was sent from the PL to the team members detailing the overall number, type, and severity of the medication discrepancies found by the physicians and PL. The email also included words of encouragement and acknowledgement of the difficulty of change. This email update was in an effort to improve team member involvement and the consistent use of the standardized process.

At the completion of Phase 2, a post-intervention survey, designed by the PL, was completed by all team members (see Appendix B). This was in an effort to assess team member's perception of the revised Med Rec process. Also, at the end of Phase 2, the PL

collected the voluntary medication error reports that were completed during the length of the project. The length of Phase 1 and 2 combined was eight weeks.

Data

The survey, used during Phase 1 and Phase 2, collected minimal demographic data from the team members, including age, race, gender, level of education, current employment status, and years of practice in the project setting (see Appendices A and B). The survey assessed the team member's beliefs surrounding the efficiency and accuracy of the current Med Rec process. Based on the results of the survey, a collaborative effort was made to standardize the Med Rec process. The standardized process included role delegation for each process step.

During Phase 2, team members were required to complete a form tracking the important components of the standardized Med Rec process (see Appendix I). This form served as a reminder to team members of the new standardized Med Rec process.

During Phase 1 and 2 the number, type, and severity of the medication discrepancies were collected by the physicians and the PL. Medication discrepancy included completeness, correctness, and accuracy. A medication in the EHR was considered complete if the name, dose, frequency, and route of administration were specified. A medication was considered correct if there were no discrepancies between the medication list in the EHR and the medications the patient was taking at home. Medication discrepancy data were collected by the physicians on the patients seen in the clinic. The PL also verified the patient medication list using the EHR and calling the patient to verify correctness. Half of the patients that the physicians collected discrepancy data on were called in an effort to collect correctness data. The data collection forms used by the physicians and the PL were coded to ensure patient confidentiality (see Appendices C and D).

Finally, the PL assessed the number of medication errors reported during duration of the project. The medication error reports completed during the project time were compared to the same time frame the year before.

Measures

The reliability and validity of the data measures used in an EBP project are important to discuss. Measures are considered reliable when consistent measurements are obtained over time (Dougherty, 2015). Validity addresses whether the measurement measures what it is supposed to measure (Brewer & Alexandrov, 2015). Internal and external validity are two types of validity. Internal validity can be defined as “the degree to which it can be inferred that the experimental intervention (independent variable), rather than uncontrolled, extraneous factors, is responsible for observed effects” (Polit & Beck, 2012, p. 731). External validity can be defined as “the degree to which study results can be generalized to setting or sample other than the one studied” (Polit & Beck, 2012, p. 727).

The outcomes that were measured in this EBP project have been used in many studies, examining the accuracy of Med Rec. These outcomes were selected by the PL in an effort to obtain similar information as past studies supporting internal validity. The same process was used to collect the number, type, and severity of medication discrepancies, in both Phase 1 and Phase 2. The data collection was done by one person, the PL, in order to support reliability.

EHR data and telephone calling were chosen as the data sources, opposed to the PL directly observing the completion of the Med Rec process. The use of EHR data were in an effort to decrease the impact that the presence of the PL might have had on the process. This increased the reliability and validity of the data collection.

Collection

All data were collected and organized by the PL. The surveys completed by team members, both at the beginning of Phase 1 and at the completion of Phase 2, were anonymous. Team members were instructed to place the completed survey in a locked box at the nurse’s station, in the pediatric hematology/oncology outpatient clinic. Surveys were reviewed for commonalities. Themes from Phase 1 surveys were presented, anonymously, in the

PowerPoint®, during the team member meeting (see Appendix F). This was in an effort to analyze the current Med Rec process and formulate an improved standardized process.

A portion of Phase 1 data, or pre-intervention data, was collected by the PL from the patients EHR. All electronic data were accessed using a password protected account. The data were coded to ensure patient privacy (see Appendix H). Coded data were kept separately from data containing patient information, both in locked boxes.

In Phase 2, the data collection form completed by the team members was collected in a locked box, located at the nurse's station in the clinic (see Appendix I). The data collection forms were collected, by the PL, from the box once a week. The forms were then placed in an envelope for transport to a work station on the unit, in an effort to keep patient information confidential. The forms were coded and patient labels were removed at this time (see Appendix H). The coded data were kept separately from the code sheet, both in locked boxes. Similar to Phase 1, the EHR was accessed to collect demographics and medication discrepancy data, using a password protected account. Study data will be destroyed at the conclusion of the EBP project and after dissemination of the project results.

Management and Analysis

Data collected during the project was analyzed by the PL using Statistical Package for the Social Sciences (SPSS) 22, a computer program for statistical analysis. Phase 1 and 2 data, specifically the number, type, and severity of the medication discrepancies, were compared using descriptive statistics. The mean and standard deviation of the number of discrepancies was examined. An update on the number, type, and severity of medication discrepancies was sent to team members, via email. The overall trends in medication discrepancies were analyzed. Retrospectively, the number of medication error reports was examined. The number of reports during Phase 1 and 2 were compared, as well as examination of the medication error reports, during the same time the previous year.

Protection of Human Subjects

Prior to planning and implementing this EBP project, the PL completed a web based ethics training, through the National Institute of Health (see Appendix J). This training certified the PL to uphold ethical consideration, during the entirety of this EBP project. Approval from both Valparaiso University's and the agency's IRB was received. Once approval was obtained, the PL contacted the project site's contact person and set up a calendar for project implementation.

The surveys completed at the end of Phase 1 and 2 were anonymous, to protect team member's privacy. Completed surveys were placed in a locked box at the nurse's station, prior to collection. The Physician Medication Reconciliation Tracking Form and the Medication Reconciliation Process Data Collection Form both included patient identification information at the top (see Appendices C and I). These forms were completed by team members, and upon completion, were placed in a locked box. The collected forms were collected and coded by the PL. Once the forms were coded the patient identification information was removed from the form, to protect patient information. Coded data were kept separate from the master code sheet, both in locked boxes. All data collection materials will be destroyed after project conclusion and results dissemination.

CHAPTER 4

FINDINGS

The purpose of this EBP project was to improve the accuracy of the Med Rec process in a pediatric hematology/oncology outpatient clinic by developing, promoting, and evaluating a standardized, collaborative Med Rec process. A detailed literature search was conducted in an effort to implement an evidence-based intervention that would improve outcomes. The clinical question this EBP project addressed was: Will a standardized, collaborative Med Rec process that is communicated to all team members and patients, decrease the number of medication discrepancies? The evidence-based intervention included a patient/caregiver component and a team member component. The outcomes measured during Phase 1 and 2 included the number, type, and severity of medication discrepancies and the number of medication errors reported via a voluntary computer system. Also, a survey assessing the climate of the Med Rec process was completed by team members and collected by the PL during Phase 1 and 2. Data were collected during Phase 2 that assessed the implemented Med Rec process compliance. Participant characteristics and descriptive statistics were calculated using SPSS 22.

Participants

The participant analysis is comprised of the team members who completed the Phase 1 and 2 survey and patients seen in the clinic during Phase 1 and 2. During both Phase 1 and 2, the number of visits, or number of Med Rec process completions, was recorded because one patient could have presented for numerous visits. The number of medications the patient was taking including OTC, herbal supplements, vitamins, and prescriptions was recorded for each visit as well. The sample size and characteristics will be further discussed at this time.

Size

Demographic data were collected on team members who completed a survey, both prior to the completion of Phase 1 and 2. A total of nine team members completed the survey at the

conclusion of Phase 1 and a total of five team members completed the survey at the conclusion of Phase 2. Demographic survey data collected included age, gender, ethnicity, highest level of education, current employment status, current position, and length of employment in the project setting. Med Rec accuracy information was collected during Phase 1 and 2 by both the physicians and PL. Demographic data were collected by the PL on patients during Phase 1 ($n = 78$) and Phase 2 ($n = 94$). There were 172 patient participants in this EBP project. Patient demographic data collected included age, gender, and diagnosis. Diagnosis was divided into two categories, oncology related or hematology related. During the duration of the project, both Phase 1 and 2, there were 229 visits in which the Med Rec process was completed and reviewed by the physician. Phase 1 included 99 visits and Phase 2 included 130 visits. Half of the visits during Phase 1 ($n = 50$) and Phase 2 ($n = 65$) were randomly selected by the PL for PL Med Rec accuracy data collection.

Characteristics

Team members. The average age of team members during Phase 1 was 49.4 years ($SD = 10.4$) with a range of 33-63 years. All team members that completed the Phase 1 survey were female and Caucasian. Two team members (22.2%) reported their highest level of education being some college, three (33.3%) reported having an associate's degree, three (33.3%) reported having a bachelor's degree, and one (11.1%) participant reported having a medical degree. Employment status varied from full-time ($n = 7$, 77.8%), part-time ($n = 1$, 11.1%), to as needed ($n = 1$, 11.1%). One physician (11.1%), six nurses (66.7%), and two unit assistants (22.2%) completed the Phase 1 survey. The average length of team member employment at the clinical site was 12.2 years ($SD = 10.0$) with a range of 1.5-24 years.

The average age of team members during Phase 2 was 53.4 years ($SD = 11.9$), with a range of 33-63 years. All team members that completed the Phase 2 survey were female and Caucasian. Highest level of education included: one team member (20%) reported some college, three (60%) reported having an associate's degree, and one (20%) reported having a

bachelor's degree. All team members who completed the Phase 2 survey reported working full-time. Four nurses (80%) and one unit assistant (20%) completed the Phase 2 survey. The average team member length of employment at the clinical site was 16.9 years ($SD = 10.5$) with a range of 1.5-24 years.

There was no significant difference in team member age between Phase 1 and 2 ($t(14) = -.644$, $df = 11$, $p = .533$). There was no significant difference in team member's highest level of education between Phase 1 and 2 ($X^2 = 1.296$, $df = 3$, $p = .730$). There was no significant difference in team member's employment status between Phase 1 and 2 ($X^2 = 1.296$, $df = 2$, $p = .523$). There was no significant difference in employee's position between Phase 1 and 2 ($X^2 = 0.643$, $df = 3$, $p = .725$). There was no significant difference in team members age between Phase 1 and 2 ($t(14) = -.772$, $df = 11$, $p = .456$).

Patients. In Phase 1, the average age of patients ($n = 78$) was 9.4 years ($SD = 6.0$). In Phase 1, 32 (41%) patients were female and 46 (59%) were male. Fifty patients (64.1%) had oncology related diagnoses and 28 patients (35.9%) had hematology related diagnoses.

In Phase 2 the average age of patients ($n = 94$) was 9.6 years ($SD = 6.2$). In Phase 2, 39 (41.5%) patients were female and 55 (58.5%) were male. Sixty two patients (66%) had oncology related diagnoses and 32 patients (34%) had hematology related diagnoses.

There was no significant difference in age between Phase 1 and 2 patients ($t(172) = -.220$, $df = 170$, $p = .826$). There was no significant difference in gender between Phase 1 and 2 patients ($X^2 = .004$, $df = 1$, $p = .951$). There was no significant difference in diagnosis between Phase 1 and 2 patients ($X^2 = .065$, $df = 1$, $p = .799$).

Visits. The average number of medications reconciled per visit during Phase 1 ($n = 99$) was 4.9 medications ($SD = 3.6$), with a range of 0-13 medications. The average number of medications reconciled per visit during Phase 2 ($n = 130$) was 4.8 medications ($SD = 3.8$), with a range of 0-14 medications. There was no significant difference in the number of medications reconciled during Phase 1 and 2 patient visits ($t(229) = .163$, $df = 227$, $p = .871$).

When considering only the patient visits reviewed by both the physician and the PL, the average number of medications reconciled per visit during Phase 1 ($n = 50$) was 5.1 medications ($SD = 3.7$), with a range of 1-13 medications. The average number of medications reconciled per visit during Phase 2 ($n = 65$) was 4.8 medications ($SD = 3.8$), with a range of 0-14 medications. There was no significant difference in the number of medications reconciled during Phase 1 and Phase 2 patient visits ($t(115) = .431$, $df = 113$, $p = .680$).

Changes in Outcomes

Reliability

For this EBP project, the PL created the data collection tools. The data collection tools included the Phase 1 and 2 team member survey, the Med Rec tracking forms, and the Med Rec process data collection form. Internal consistency testing, using Cronbach alpha, was not appropriate, although steps were taken to ensure reliability. The data collected was nominal and single items were used to measure distinct concepts. The team members responsible for data collection were educated on proper data recording technique. In an effort to ensure reliability, the physician's and PL used the same data collection forms during Phase 1 and Phase 2 and used the same recording process during each phase.

Statistical Testing and Significance

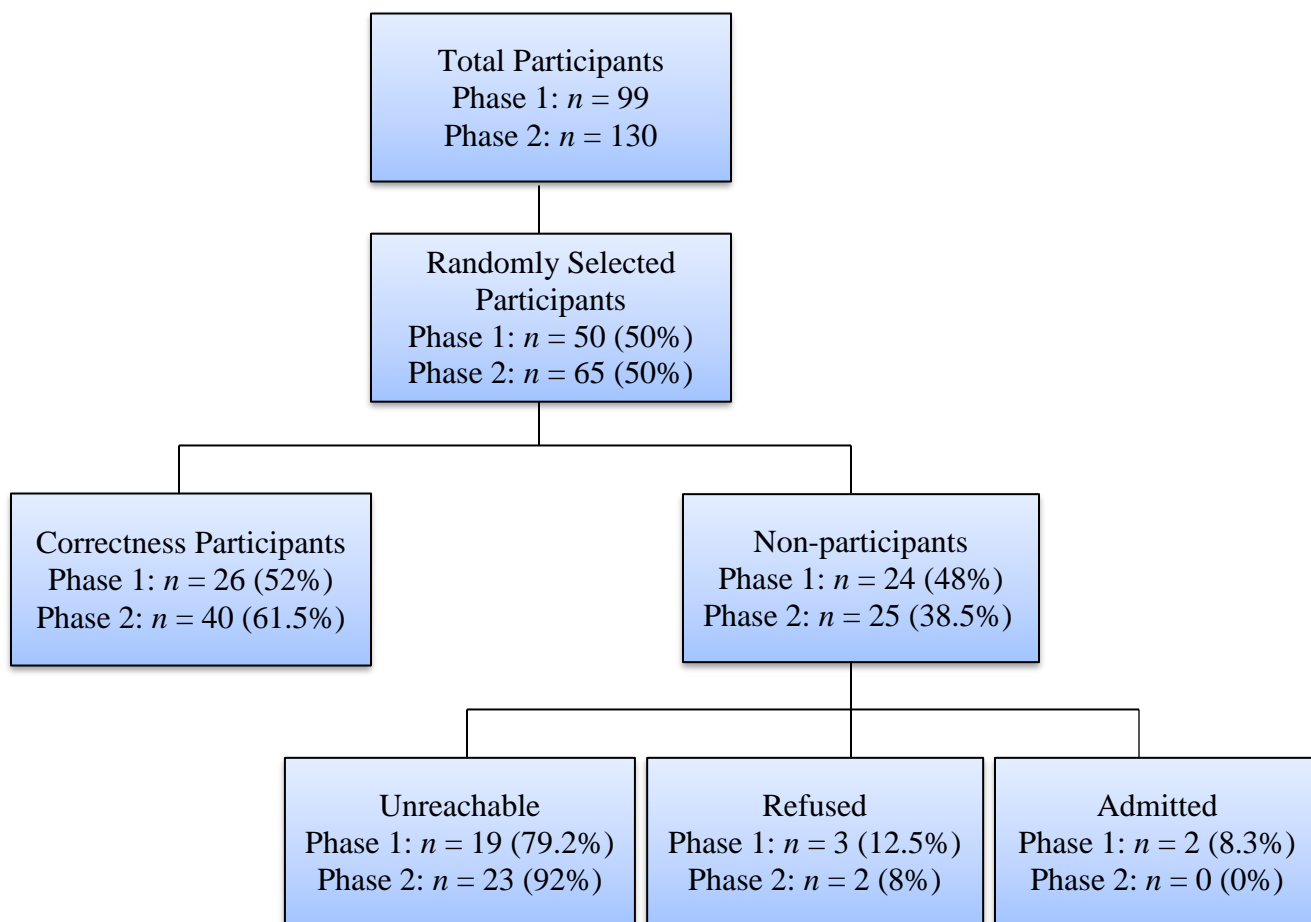
Primary outcomes. Primary outcomes of this EBP project include the number, type, and severity of medication discrepancies. Medication discrepancies were defined using the terms completeness, correctness, and accuracy found in the literature (Nassaralla et al., 2007; Nassaralla et al., 2009). A medication list was considered complete when each medication had a name, dose, frequency, and route of administration documented in the EHR. A medication list was considered correct if there were no discrepancies between the medication list in the EHR and what medications the patient was taking at home. Med Rec accuracy was defined as a medication list being both complete and correct. When a medication discrepancy was found its severity was classified. The severity of the discrepancies were classified using the class 1, 2,

and 3 scale (Huynh et al., 2013; Huynh et al., 2016). Class 1 was assigned to medication discrepancies that were potentially minor. Class 2 was assigned to medication discrepancies that were potentially moderate. Class 3 was assigned to medication discrepancies that were potentially severe. Medication discrepancy data was collected by both the physician and the PL. Also, the number of voluntarily reported medication errors was assessed during the duration of the project and the same time frame the previous year.

Med Rec Discrepancies. The physicians collected Med Rec data on 229 patient visits, Phase 1 ($n = 99$) and 2 ($n = 130$). The PL then randomly selected half of the patients to verify Med Rec data on. An attempt was made to contact the randomly selected patients/caregivers via telephone to verify the correctness of the medication list documented in the EHR. During Phase 1, the PL attempted to complete correctness data on 50 patient visits. The Med Rec correctness was verified for 26 of the 50 patient visits (52%). In Phase 2, the PL attempted to complete correctness data on 65 patient visits. The Med Rec correctness was verified for 40 of the 65 patient visits (61.5%). There was no significant difference in the Med Rec correctness verification by the PL between Phase 1 and 2 ($X^2 = 1.051$, $df = 1$, $p = .305$). There were three reasons correctness was not verified: the caregiver did not answer the telephone call, the caregiver refused to verify the patient's medications with the PL, or the patient was admitted to the hospital. Figure 4.1 provides participant and non-participant information, specifically correctness verification information.

Accuracy. Accuracy data included whether the Med Rec was complete and correct. In Phase 1 the physician collected these data on 99 patient visits. The physician's collected data from only the EHR. The Med Rec was recorded as accurate in 79 of the 99 (79.8%) patient visits. During Phase 2, Med Rec was recorded as accurate in 115 of the 130 (88.5%) patient visits. A chi-square test of independence was calculated comparing the results of all of the physician reported Med Rec accuracy during Phase 1 ($n = 99$) and 2 ($n = 130$). While the accuracy rate improved, no significant relationship was found ($X^2 = 3.258$, $df = 1$, $p = .071$).

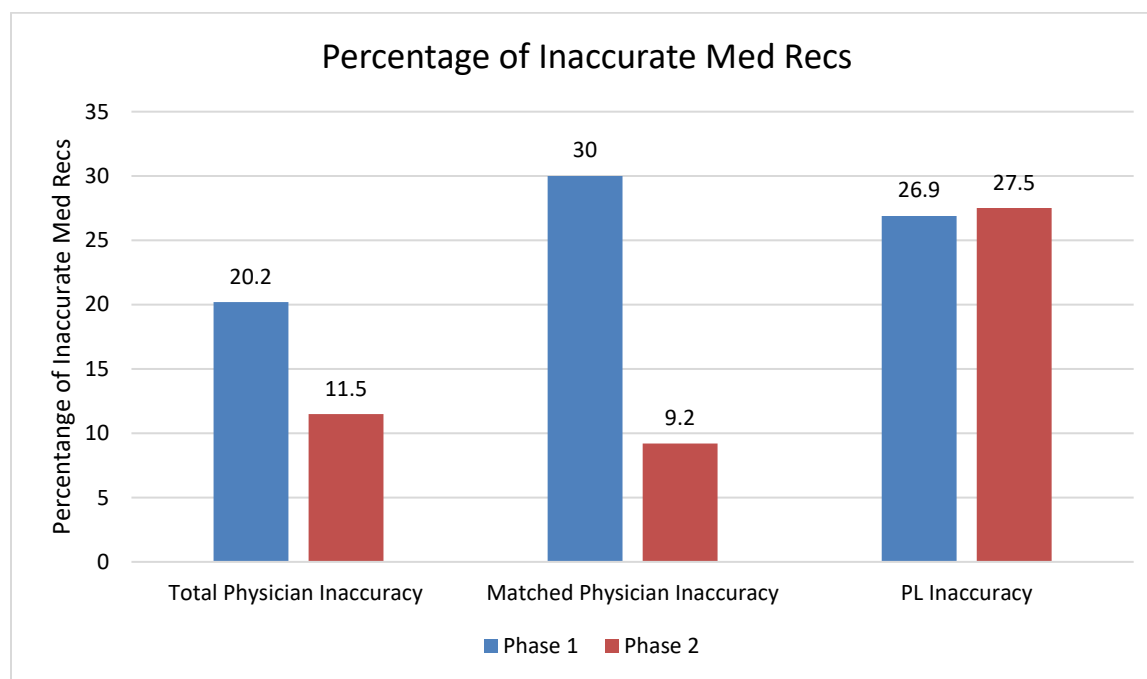
Figure 4.1 Phase 1 and Phase 2 Participant and Non-Participant Flow Chart



The PL randomly selected half of the patient visits that the physicians collected accuracy data for Phase 1 and 2. The PL data were collected from both the EHR and the caregiver (via telephone call). During Phase 1, 19 (73.1%) of the 26 verified Med Recs were found to be accurate. In Phase 2, 29 (72.5 %) of the 40 verified Med Reds were found to be accurate. Overall, there was a slight decrease in the percentage of accurate Med Recs from Phase 1 to Phase 2 from 73.1% to 72.5%. A chi-square test of independence was calculated comparing the results of the PL reported Med Rec accuracy during Phase 1 and 2. No significant relationship was found ($\chi^2 = .003, df = 1, p = .959$).

When examining the patient visits in which the physician and PL both collected data, Phase 1 ($n = 50$) and Phase 2 ($n = 65$), there was a significant decrease in the number of inaccurate Med Recs recorded by the physicians ($X^2 = 8.167, df = 1, p = .004$). In Phase 1, 35 of 50 (70%) Med Recs were reported accurate and in Phase 2 59 of 65 (90.8%) were reported as accurate by the physicians (Figure 4.2).

Figure 4.2 Inaccurate Med Recs



Inaccuracy. The reason for Med Rec inaccuracy was recorded by both the physician and the PL. The Med Rec was considered inaccurate because it was incomplete, incorrect, or both. Incompleteness was defined as at least one medication missing the name, dose, frequency, or route of administration in the EHR. Incorrectness occurred when a discrepancy existed between the patient’s medication list in EHR and what medication(s) the patient was taking at home. In Phase 1 ($n = 99$) the physicians recorded, three (15%) of the 20 inaccurate Med Recs were incomplete, 16 (80%) were incorrect, and one (5%) was both incomplete and incorrect. In Phase 2 ($n = 130$), two (13.3%) of the 15 inaccurate Med Recs were recorded as incomplete, 13 (86.7%) were recorded as incorrect, and none were recorded as both incomplete

and incorrect. There was no significant difference between the physician reported Med Rec inaccuracy reason between Phase 1 and 2 ($X^2 = .813$, $df = 2$, $p = .666$).

In Phase 1 ($n = 50$) the PL recorded, five (71.4%) of the seven inaccurate Med Recs were incomplete, one (14.3%) was incorrect, and one (14.3%) was both incomplete and incorrect. In Phase 2 ($n = 65$), nine (81.8%) of the 11 inaccurate Med Recs were recorded as incomplete, two (18.2%) were recorded as incorrect, and none were recorded as both incomplete and incorrect. There was no significant difference between the PL reported Med Rec inaccuracy reason between Phase 1 and 2 ($X^2 = 1.670$, $df = 2$, $p = .434$).

When examining inaccurate Med Recs in which the physician and PL both collected data, in Phase 1 ($n = 50$) the physicians recorded, three (20%) of the 15 inaccurate Med Recs were incomplete, 11 (73.3%) were incorrect, and one (6.7%) was both incomplete and incorrect. In Phase 2 ($n = 65$), one (16.7%) of the six inaccurate Med Recs were recorded as incomplete, five (83.3%) were recorded as incorrect, and none were recorded as both incomplete and incorrect. There was no significant difference between the physician reported Med Rec inaccuracy reason between Phase 1 and 2 ($X^2 = .481$, $df = 1$, $p = .786$).

Incompleteness. The reason for incomplete Med Recs was further delineated into what element of the medication was missing, specifically the name, dose, frequency, route of administration, or a combination (see Table 4.1). The incomplete combination noted in Phase 1 was missing frequency and route. There was a significant difference between physician incompleteness data between Phase 1 and 2 ($X^2 = 6.000$, $df = 2$, $p = .050$). The PL incomplete combinations in Phase 1 were two missing route and frequency, two missing dose and frequency, and one missing dose, frequency, and route. There was no significant difference between PL incompleteness data between Phase 1 and 2 ($X^2 = 5.278$, $df = 4$, $p = .260$). When examining inaccurate Med Recs in which the physician and PL both collected data, there was no significant difference between physician incompleteness data between Phase 1 and 2 ($X^2 = 5.000$, $df = 2$, $p = .082$).

Table 4.1

Incompleteness Data for Phase 1 and Phase 2

	Total Physician Phase 1 (n = 99)	Total Physician Phase 2 (n = 130)	Matched Physician Phase 1 (n = 50)	Matched Physician Phase 2 (n = 65)	PL Phase 1 (n = 50)	PL Phase 2 (n = 65)
Total Incomplete	4	2	4	1	6	9
Reason (# (%))						
Name	-	-	-	-	-	-
Dose	-	2 (100)	-	1 (100)	2 (33.3)	2 (22.2)
Frequency	3 (75)	-	3 (75)	-	4 (66.7)	2 (22.2)
Route	-	-	-	-	-	-
Combination	1 (25)	-	1 (25)	-	-	5 (55.6)

Note. Combination includes medications missing more than one component, for example both dose and frequency missing.

Incorrectness. The reason for incorrect Med Recs were further delineated into what element of the EHR did not match what the patient was taking at home. Incorrectness options included addition, omission, duplication, incorrect name, incorrect dose, incorrect frequency, incorrect route of administration, or a combination (see Table 4.2). The incorrect combinations in Phase 1 included a medication list with an addition and an incorrect name documented. Phase 2 incorrectness combinations included a medication list with and addition and incorrect dose. There was no significant difference between physician incorrectness data between Phase 1 and 2 ($\chi^2 = 7.014, df = 5, p = .220$).

The PL recorded incorrectness combination in Phase 1 was a medication list that included an addition, omission, and incorrect dose. There was no significant difference between PL incorrectness data between Phase 1 and 2 ($\chi^2 = 2.000, df = 2, p = .368$).

When examining inaccurate Med Recs in which the physician and PL both collected data, in Phase 1 the incorrect combination was the result of an addition and incorrect name.

There was no significant difference between physician incorrectness data between Phase 1 and 2 ($X^2 = 1.747, df = 4, p = .782$).

Table 4.2

Incorrectness Data for Phase 1 and Phase 2

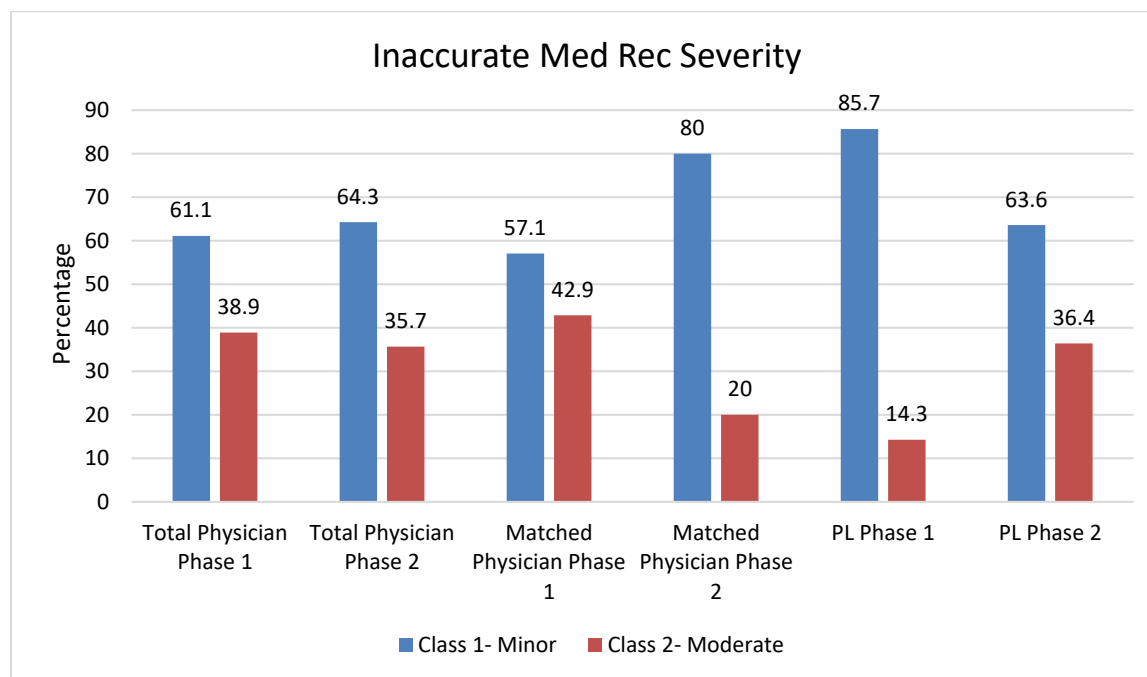
	Total Physician Phase 1 (n = 99)	Total Physician Phase 2 (n = 130)	Matched Physician Phase 1 (n = 50)	Matched Physician Phase 2 (n = 65)	PL Phase 1 (n = 50)	PL Phase 2 (n = 65)
Total Incorrect	17	13	12	5	2	2
Reason (# (%))						
Addition	3 (17.6)	2 (15.4)	1 (8.3)	1 (20)	-	-
Omission	8 (47.1)	10 (76.9)	8 (66.7)	4 (80)	-	-
Duplication	-	-	-	-	-	1 (50)
Incorrect name	-	-	-	-	-	-
Incorrect dose	3 (17.6)	-	1 (8.3)	-	2 (50)	-
Incorrect frequency	2 (11.8)	-	1 (8.3)	-	-	1 (50)
Incorrect route	-	-	-	-	-	-
Combination	1 (5.9)	1 (7.7)	1 (8.3)	-	1 (50)	-

Note. Combination includes and EHR medication list with one than one component not matching what the patient is taking at home, for example a patient with an omitted medication and a medication with an incorrect dose documented.

Severity. When the physicians or PL recorded a Med Rec as inaccurate, a severity was assigned. Class 1 was assigned to medication discrepancies deemed potentially minor. Class 2 was assigned to medication discrepancies deemed potentially moderate. Class 3 was assigned to medication discrepancies deemed potentially severe. Figure 4.3 details total and matched physician and PL severity ratings for Phase 1 and 2. No inaccurate Med Recs were classified by the physicians or PL as severe in Phase 1 or 2. There was no significant difference in total physician Med Rec inaccuracy severity between Phase 1 and 2 ($X^2 = .034, df = 1, p = .854$).

There was no significant difference in PL Med Rec inaccuracy severity between Phase 1 and 2 ($X^2 = 1.039, df = 1, p = .308$). When examining the matched physician inaccurate Med Rec severities there was no significant difference in Med Rec inaccuracy severity between Phase 1 and 2 ($X^2 = .827, df = 1, p = .363$).

Figure 4.3 Inaccurate Med Rec Severity Ratings



Note: No inaccurate Med Recs were given a class 3- severe rating by the physicians or PL.

Reported Medication Errors. There were no voluntary reported medication errors during the duration of this EBP project. There were no voluntary reported medication errors reported during the same time frame the previous year.

Secondary outcomes. Secondary outcomes of this EBP project included data collected by the team members regarding the compliance to the Med Rec process during Phase 2 and team member survey results prior to the end of Phase 1 and 2. The Med Rec process data collected included if the caregiver was reminded to bring the patients medication to the next visit, if the caregiver brought their child’s medications to the appointment, if the patient and caregiver were educated regarding the Med Rec process during the visit, if so by who (role), and if all three steps of the Med Rec process were completed (verification, clarification, and

reconciliation) and by who (role). Patient/caregiver education role options included the MA, nurse, or both the MA and the nurse. The Med Rec step completion role options included the MA, nurse, both the MA and the nurse, or the physician. Med Rec process data were collected on 111 (85%) of the 130 Phase 2 patient visits.

Medication reminder. The caregiver was reminded to bring their child's medications to their child's next visit prior to 91.9% (102 out of 111) of the patient visits during Phase 2. The main reason cited for not reminding caregivers to bring their child's medications to the visit was lack of voicemail to leave a message or incorrect/disconnected phone number provided by caregiver (no statistical data available regarding reasons medication reminder did not occur).

Medications to appointment. Of the 130 patient visits in Phase 2, 106 had data recorded regarding whether the caregiver brought their child's medications. For 55 (51.9%) of the patient visits, caregivers brought the child's medication(s) to the appointment. For 32 (30.2%) of the patient visits, caregivers did not bring their child's medication(s) to the appointment. For 19 (17.9%) of the patients visits, children were recorded as not taking any medications, therefore none were brought to the appointment.

Patient education. First the team members indicated whether the patient/caregiver was educated. If the patient/caregiver was educated, the role of the educator was selected and could include MA, nurse, or both MA and the nurse. Already educated was also an option for the same patients with multiple visits. The team members recorded patient education data on 110 of the 130 patient visits in Phase 2. Sixty-eight (61.6%) of patients/caregivers were educated by the MA, 17 (15.5%) were educated by the nurse, and five (4.5%) were educated by both the MA and nurse. Twenty patients/caregivers (18.2%) were repeat patients and did not receive education the second time they presented for a visit.

Med Rec process. The Med Rec process section of the team member data form detailed if the steps of the Med Rec process (verification, clarification, and reconciliation) were completed and by who. Verification and clarification role completion options included MA, nurse,

or both the MA and nurse. The only reconciliation role option included was physician, as the physician was the only person responsible for the completion of the Med Rec process. Sixty-five percent (58 out of 89) of Med Rec verification was completed by the MA, 20% (18 out of 89) was completed by the nurse, and 15% (13 out of 89) was completed by both the MA and the nurse. Fifty-nine percent (51 out of 87) of Med Rec clarification was reported as completed by the MA, 28% (24 out of 87) was completed by the nurse, and 14% (12 out of 87) of the clarification was completed by both the MA and the nurse. One hundred percent (87 out of 87) Med Recs were reconciled by a physician.

Team member survey. The demographics collected from the team member survey were previously discussed. Common themes were present when the PL reviewed the open-ended questions of the survey. At the conclusion of Phase 1, when asked what aspects of the Med Rec process were working well, team members commonly identified the use of the EHR, especially for repeat patients, as a tool in reducing time. When asked what aspects of the Med Rec process were not working well team members commonly discussed patients not bringing their medications to their visits and team members not thoroughly reviewing the medication list upon patient arrival. Future ideas for improvement commonly included reviewing medications in detail with all patients and nurses completing the Med Rec process with the help of the physician.

Phase 2 survey results also found common themes. All participants reported that the caregivers should continue to be reminded to bring their medications to their next visit, patients/caregivers should continue to be educated regarding Med Rec, and that the Med Rec process and discrepancies should continue to be tracked.

Significance

There were no significant differences in patient age, gender, or diagnosis between Phase 1 ($n = 50$) and 2 ($n = 65$) ($p < .799$). No significant difference in the number of medications per visit between Phase 1 and 2 ($t(229) = .163$, $df = 227$, $p = .871$) was found. The

physician data for all patient visits reported an improvement in the Med Rec accuracy ($X^2 = 3.258$, $df = 1$, $p = .071$). Also, the matched physician patient visits exhibited a significant improvement in the number of inaccurate Med Recs between Phase 1 and 2 ($X^2 = 8.167$, $df = 1$, $p = .004$). There was a slight increase in the number of inaccurate Med Recs the PL recorded between Phase 1 (26.9%) and 2 (27.5%) ($X^2 = .003$, $df = 1$, $p = .959$). Physicians more commonly reported Med Recs were inaccurate related to incorrectness, whereas the PL reported more Med Recs were inaccurate related to incompleteness.

CHAPTER 5

DISCUSSION

This EBP project explored the clinical question: Will a standardized, collaborative Med Rec process that is communicated to all team members and patients, decrease the number of medication discrepancies? The PICOT question developed was: In the pediatric hematology/oncology outpatient population, how will the implementation of a standardized, collaborative Med Rec process affect the number of medication discrepancies over the course of two months, when compared to the current Med Rec practice? The goal of this EBP project was to reduce the number of medication discrepancies and improve the current Med Rec process using current evidence found in the literature. The outcomes measured included the number, type, and severity of medication discrepancies and the number of medication errors reported via a voluntary computer system. Also, a survey assessing the climate of the Med Rec process was completed and Med Rec process compliance was tracked. This chapter discusses the EBP project findings, applicability of the theoretical and EBP frameworks, strengths and limitations of the project, and implications for the future.

Explanation of Findings

Primary outcomes of this EBP project included the number, type, and severity of medication discrepancies. Also, the number of voluntarily reported medication errors was assessed during the duration of the project and the same time frame the previous year. Secondary outcomes of this EBP project included data collected by the team members regarding compliance to the Med Rec process during Phase 2, and team member survey results prior to the end of Phase 1 and 2.

Primary Outcomes

The accuracy of the Med Rec process during both Phase 1 and 2 was compared using chi-square testing. When considering the overall physician Med Rec accuracy during Phase 1

and 2, there was an increase in the number of accurate Med Recs, although not significant ($X^2 = 3.258$, $df = 1$, $p = .071$). When considering the matched physician Med Rec accuracy data during Phase 1 and 2, there was a significant increase in the number of accurate Med Recs ($X^2 = 8.167$, $df = 1$, $p = .004$). The PL randomly selected half of the patient visits in which Med Rec accuracy, specifically the correctness, was verified. Overall, there was a slight decrease in the percentage of accurate Med Recs from Phase 1 to 2 and no significant relationship was found ($X^2 = .003$, $df = 1$, $p = .959$). The PL was the only person responsible for completing the Med Rec accuracy data collection, in which the patient was called to verify data. Multiple physicians were responsible for Med Rec accuracy data, using the EHR and their personal knowledge of the patient's plan of care.

The physicians and PL considered the Med Rec inaccurate if it was incomplete, incorrect, or both. The physicians found a larger number of inaccurate Med Recs related to incorrectness, whereas the PL found a larger number of inaccurate Med Recs related to incompleteness. There was no significant difference between the physician or PL Med Rec inaccuracy reason between Phase 1 and 2 ($p = .434$). One explanation for the difference in correctness between the physician and PL's accuracy is that the physicians may have reviewed the Med Rec, found the incorrectness, fixed the discrepancy, and then the PL verified the correct EHR list with the patient. Also, the PL may have completed a more detailed review of each component of the medication, specifically looking for documentation of each medications name, dose, frequency, and route of administration.

Regardless of the Med Rec reviewer, the most commonly missed component of the medication documentation, causing inaccuracy, was a medication missing the frequency or dose. An example of an incomplete medication documentation related to missing frequency was Tylenol 650 mg PO prn pain. Another example of an incomplete medication documentation related to missing dose was Tylenol PO Q6H prn pain. Both examples represent an inaccurate

Med Rec. The PL found Med Recs that were recorded as accurate by physicians that were in fact not accurate as a result of incompleteness.

The most commonly recorded incorrectness reason by the physicians was omission. It is interesting to note that the PL did not record any instances where the Med Rec was inaccurate related to a medication omission. Perhaps this could be attributed to the fact that the physicians are developing and implementing the plan of care. They could be considered the most knowledgeable person when it comes to knowing what medications the patient is currently taking.

When the physicians or PL recorded a Med Rec as inaccurate, a severity was assigned. Regardless of the reviewer, the most commonly assigned severity was class 1, or minor, followed by class 2, or moderate. No inaccurate Med Recs were classified by the physicians or PL as severe in Phase 1 or 2. The severity rating was subjective and offered insight into the possible ramifications of the inaccurate Med Rec.

There were no voluntary reported medication errors during the duration of this EBP project. There were no voluntary reported medication errors reported during the same time frame the previous year. The team members were encouraged during the education component of the intervention to complete medication error reports when Med Recs were inaccurate and patient safety was compromised.

Secondary Outcomes

Secondary outcomes of this EBP project included data collected by the team members regarding compliance to the Med Rec process during Phase 2 and team member survey results prior to the end of Phase 1 and 2. In regards to the Phase 2 Med Rec Process data collection, the caregiver was reminded to bring their child's medications to the next visit prior to 91.9% of the patient visits. In Phase 2, the large percentage of completed patient/caregiver reminders may be due to the fact that the clinic had a system in place, prior to the implementation of this project, in which the caregivers were called and reminded of their child's appointment. The

caregiver reminder to bring their child's medications was not considered a time consuming task by many team members. Also, the unit assistants responsible for the reminder calls were receptive to improving the patient's safety and encouraging caregiver involvement in the Med Rec process. The reasons cited for not reminding caregivers to bring their child's medications to the visit, lack of voicemail to leave a message or incorrect/disconnected phone number provided by caregiver, were not something that could be controlled by team members in the clinic. Despite the large number of caregivers reminded to bring their child's medications to the visit, a large percentage did not bring their child's medications. Perhaps this is related to the frequency in which pediatric hematology/oncology patients are visiting the outpatient clinic. However, these data provide additional support to augment the process of reminding caregivers to bring medications to each child's visit.

Overall, team members did an excellent job of educating the caregivers and patients, using the handout for Med Rec. All the patients with Med Rec process data collected were educated if it was their first visit. The majority of the education was performed by the MA. During the duration of the project, the MA was responsible for checking the patient in and performing the first two steps of the Med Rec process. This could be the reason why the patient/caregiver was most commonly educated by the MA. This could also be the reason that the first two steps of the Med Rec process were most commonly completed by the MA. The final Med Rec process step, reconciliation, was recorded as 100% completed by the physicians. It is important to mention that, after the project was completed, the Med Rec process changed and now the nurse is responsible for the Med Rec verification and clarification steps of the process. This change was in an effort further improve Med Rec accuracy and ensure that adequately trained team members were completing the Med Rec process. In this setting, the nurses have specialized training and certification in pediatric hematology/oncology care.

Relationship to the Current Literature

This EBP project confirmed literature findings that it is challenging to improve medication safety in pediatrics, using the Med Rec tool (Huynh et al., 2013). In this EBP project setting, the Med Rec inaccuracy rate reported by the physicians in Phase 1 was 20.2% and in Phase 2 the Med Rec inaccuracy rate reported by the physicians was 11.5%. Huynh et al. (2016) cited that 58% of prescriptions contained a medication discrepancy. However, the Huynh et al. (2016) study was conducted in the pediatric inpatient setting and medication discrepancy was defined as a difference in the pre admission medication list and admission medication orders. This definition was not applicable to the pediatric outpatient setting in this project.

Nassaralla et al. (2007) found improvement in correctness between pre- and post-intervention was not significant (23.7% to 18%). Nassaralla et al. (2009) found that the overall number of complete medication lists improved between pre-intervention, LPN-intervention, and patient intervention phases. Also, the overall accuracy improved from pre-intervention (11.5%) to patient intervention (29%) (Nassaralla et al., 2009). These overall accuracy numbers, whether pre-intervention or post-intervention are lower than reported in this EBP project (Phase 1: 79.8% total physician accurate Med Recs and Phase 2: 88.5% total physician accurate Med Recs). In addition, Varkey et al. (2007) reported higher medication discrepancy numbers than reported in this project (Phase I: 98.2% Med Rec with a discrepancy and Phase II: 84% Med Recs with a discrepancy). When comparing the literature with the project site, there appears to be far less of a problem with inaccurate Med Recs. However, given the vulnerability of the patient population at the project site, Med Rec accuracy and patient safety can certainly be improved.

Varkey et al. (2007) found that incorrect or missing route was the most common medication discrepancy. This discrepancy is in contrast to this EBP project which found frequency to be the most commonly undocumented component of the Med Rec. Nassaralla et al. (2007) showed improvement in completeness, specifically the documentation of dose and route, between their pre-intervention, post-intervention, and sustainability phases. Again this is

in contrast to this project finding of missing frequency as the most common incompleteness reason.

With regards to severity ratings, the physicians and PL reported no Med Rec inaccuracies as severe. This finding is in contrast to Huynh et al. (2016), in which the same classification system was used, when 22% of medication discrepancies were found to be class 1 (minor), 50% were found to be class 2 (moderate), and 28% were found to be class 3 (severe). The severity results of this project are similar to Hron et al. (2015) in which no major or catastrophic ADE's were found pre-intervention or post- intervention. Finally, according to Varkey et al. (2007), the most commonly recorded severity was minor, 0.3% of medication discrepancies were serious and no lethal medication discrepancies were recorded.

When examining the percentage of visits in which medications were brought from home, a rate of 51.9% during Phase 2 of this project is more than the reported rate of 38.5% by Huynh et al. (2016) and the 13.9% pre-intervention and 33% post-intervention reported by Nassaralla et al. (2009). When compared with this project, Varkey et al. (2007) reported a similar number of visits with medications present in Phase II (52%).

Correctness during Phase 1 (52%) and Phase 2 (61.5%) of this EBP project was similar to what Nassaralla et al. (2007) reported, pre-intervention (69%) and post-intervention (61%). Also, Nassaralla et al. (2009) reported correctness participation similar to this EBP project, pre-intervention (56%), LPN intervention (51%), and patient intervention (60%).

None of the literature used to formulate the intervention or data collection tools used a Med Rec process compliance tracking tool. The Med Rec process tracking tool was extremely helpful in this specific project setting. It served as a reminder to team members and increased individual accountability.

Unexpected Findings

It was not anticipated that there would be a difference in the physician and PL reported number of accurate Med Recs. It was also not expected that there would be a slight increase in

the number of PL recorded inaccurate Med Recs between Phase 1 and Phase 2. The physicians found and corrected mostly incorrectness errors prior to the PL verifying the correctness. However, the physicians in both Phase 1 and Phase 2 did not find and report the incompleteness errors that the PL found. This could be related to the fact that the physicians are proficient and knowledgeable regarding the patient medication regimens, increasing the likelihood of finding incorrectness errors; however, the physicians could benefit from improvement in monitoring for incompleteness errors. The most frequently cited reasons for inaccuracies, specifically missing frequency for incompleteness and omission for incorrectness, were not expected based on the existing literature. The team member survey results prior to the conclusion of Phase 2 were surprising in that all participants expressed that the standardized, collaborative Med Rec process and tracking should continue. Finally, it was discovered that medication error reports are not commonly completed in this setting. This fact limited the ability to examine the effect of the implemented Med Rec process on patient safety.

Evaluation of Applicability of Theoretical and EBP Frameworks

The theoretical framework that was used to guide this EBP project was Kotter's Model of Change. In addition to Kotter's Model of Change, the Stetler EBP Model was used to guide the implementation of best practice in the clinical setting. The theoretical framework and EBP framework appropriateness, strengths, and limitations are discussed further.

Theoretical Framework

Kotter's Model of Change laid a foundation to successfully implement this EBP project and change current practice. The eight stages of Kotter's Model of Change are: (1) establish a sense of urgency, (2) create a powerful guiding coalition, (3) develop a vision, (4) communicate the vision, (5) empower others to act on the vision, (6) plan for and create short-term wins, (7) consolidate improvements and produce more change, and (8) institutionalize new approaches (Ritter, 2011). Each stage of the model was used to overcome barriers to change in the project setting.

Theoretical Framework Appropriateness. Kotter's Model of Change was a good fit for the project, as it was detailed in its discussion of empowering team members to change current practice. This task was especially difficult in the project setting. The model set up an environment in which change was openly discussed and agreed upon. The baseline data collected were helpful in creating a sense of urgency and facilitating the realization of the clinical problem.

Strengths of Theoretical Framework. Kotter's Model of Change was useful when implementing this organizational change. Kotter's Model of Change was easy to follow and simplistic, yet it was also thorough when it came to the entirety of the change process. The additional detail and steps that Kotter's Model of Change offered, in comparison to Lewin's Model of Change, was helpful to the novice PL. Also, the thoroughness was appreciated in a climate, such as the project site, where change was resisted and difficult to implement.

Limitations of Theoretical Framework. Kotter's Model of Change contains eight stages, which at times proved to be laborious and overwhelming to the novice PL. The model was described in a linear, step-by-step approach, which was more simplistic than change in the real environment. Changing the Med Rec process was complex and affected by many conditions. Unfortunately, the PL was seen by team members as the facilitator of the change and a powerful guiding coalition was not adequately formed. The lack of a powerful coalition set the change up to be resisted and not further continued after project completion.

EBP Framework

The Stetler Model of Evidence Based Practice was ideal in guiding the implementation of this EBP project. The Stetler EBP Model has five phases: (1) preparation, (2) validation, (3) comparative evaluation/decision making, (4) translation/application, and (5) evaluation (Dang et al., 2015 & Young, 2015). In the first phase, preparation, a problem is identified; the context of the problem is reviewed; and searching for evidence occurs. In the validation phase, the body of evidence is systematically searched. The second stage also includes choosing and

summarizing the evidence. The third phase involves organizing and condensing the evidence. The fourth phase involves the actual change in practice, or translation/application. The evidence is converted into the recommended intervention of change. The application is planned and the implementation strategy is put into action. Evaluation is the fifth, and final stage, of the Stetler Model. The evaluation stage involves evaluating the plan and determining if the goals were met (Dang et al., 2015 & Young, 2015).

EBP Framework Appropriateness. The Stetler EBP Model was appropriate and extremely applicable to this EBP project. The model detailed the process of successfully implementing evidence into practice. The model re-enforced using literature in clinical practice to improve a clinical problem.

Strengths of EBP Framework. Strengths of the Stetler EBP Model included an easy to follow step-by-step approach to implementing evidence into practice. The step-by-step approach was extremely helpful to the novice PL. Although the patient population and setting was specific, the Stetler EBP Model was easily applied. The visual flowchart and graph that detailed the steps of EBP implementation were helpful. The steps laid the foundation for successful EBP implementation. The foundation and focus of the Stetler EBP Model is critical thinking and using research findings to guide care, which was the ultimate goal of this EBP project.

Limitations of EBP Framework. The Stetler EBP Model's limitations include the number of steps and also the complexity of each step. The steps at times seemed overwhelming and lengthy. Finally, the model flows in a linear pattern, and as discussed with the Kotter's Model of Change, EBP implementation is complex.

Implementation Modifications

The implementation of the EBP project was fully supported by the site contact and the medical director of the clinic. One meeting was set up with the medical director to review the project, proposed data collection/outcomes, and the intervention. The medical director desired

to educate the other physicians on the project, data collection requirements, and intervention. Also, the timeframe was adjusted, the medical director was willing to collect data for three weeks pre-intervention and three weeks post-intervention, on every patient.

During Phase 1 data collection, team members became suspicious of the physician data collection and began asking the PL questions. It was imperative not to discuss the details of data being collected, in an effort to ensure behaviors did not change based on process monitoring. There is a chance that the team members discovered the Med Rec process was being tracked and sought to improve accuracy prior to the intervention.

The PL developed a script used during correctness data collection to ensure consistent representation of the project and data collection. Also, during Phase 1 the PL had to inform the charge nurse of the project and data collection. This was in an effort to provide competent ethical care to the patients whose Med Rec needed clarification or additional follow up.

The team members were receptive during the education component of the intervention. Role responsibility in the Med Rec process was clearly defined and agreed upon at this time. Once the team member data collection began, the team members often discussed the additional time the data collection form required. The PL was available during Phase 2 to reassure and encourage team members of the importance of accurate Med Rec. There were no physician's present during the unit meeting when the Med Rec education was provided by the PL.

Future Modifications

In the future if this project were to be re-implemented, there are modifications that may be beneficial. Prior to implementation of future Med Rec focused EBP projects a specific process to manage Med Rec inaccuracies found should be formulated. This would be in an effort to coordinate care and ensure patient safety.

Calling all caregivers to review Med Rec correctness may be beneficial to increasing the participant number and allowing a clearer picture of physician versus PL data. Ideally, the PL

would be able to collect all the Med Rec accuracy data via the EHR and the physicians would not be involved in data collection. However, it is important to consider the time component of making the correctness telephone calls. The location of the telephone calls should also be taken into consideration. During the project, the location of the telephone calls was a computer and phone located in a busy hall, which was less than ideal when explaining the project to patients and verifying, oftentimes numerous, medications.

Ideally, the physicians would have been educated by the PL regarding data collection and also would have been present during the team member education component. This may have increased buy-in to the project. The Med Rec process monitoring was considered time consuming by team members and is not present in the literature, one could consider not tracking this. Finally, the team members may have benefited from more individualized Med Rec accuracy updates. Individualized Med Rec accuracy reports may have increased the accountability for inaccurate Med Recs.

Strengths and Limitations of the EBP Project

Strengths

Strengths of this project include the use of Kotter's Model of Change and Stetler's EBP Model as a foundation. The use of these frameworks emphasized using existing evidence to implement and change practice in the clinical setting. The literature, although not specific to the population and setting, was the foundation for improving the Med Rec process in the pediatric hematology/oncology outpatient setting. The Stetler EBP Model guided the projects use of literature to improve a clinical problem. This was in combination with Kotter's Model of Change that addressed barriers to change in the real life environment.

The EBP project was focused on a collaborative effort between team members, caregivers, and patients. This is important given the dynamic, complex medication regimens many of the pediatric hematology/oncology patients are using. Education included all team

members present at the unit meeting. The project addressed a topic and clinical problem that needed attention and improvement.

Upon searching the current literature, common intervention and outcome themes were found. The intervention and outcomes used during this EBP project were consistent with existing literature. Although the tools used in this project were self-developed by the PL, they were based on the common terms and components of accurate Med Recs found in the literature. By using common concepts found in the literature, it allowed the EBP project findings to be compared to existing literature and guided future modifications and improvement of the project.

Finally, the PL was familiar with the team members, caregivers, patients, and Med Rec process at the project site. This facilitated a trusting relationship in which improvement was possible. The PL was able to foresee barriers to improvement and successfully navigate the implementation of evidence into practice.

Limitations

The specific patient population and setting target of this EBP project limited the applicable research found by the PL. However, current literature focused on pediatric inpatient and adult outpatient studies was used to develop an intervention aimed at improving the Med Rec process and ultimately patient safety.

The data collection, specifically calling the caregivers for correctness verification was time consuming, and presents a barrier to continuation of the Med Rec accuracy tracking process. No medication errors were reported during the EBP project timeframe or during the previous year. Therefore, this may not have been an appropriate measure of the effect of inaccurate Med Recs on ADE's. The EBP project took place in a specific setting, serving a specific population, this may limit the applicability of the project findings to other clinical settings.

Implications for the Future

The EBP project can impact Med Rec accuracy in the outpatient setting, specifically the pediatric outpatient setting, in numerous ways. Areas that may be affected by the project

findings include practice, theory, research, and education. Overall, the project adds to the body of evidence focused on Med Rec process accuracy and patient safety.

Practice

The implementation of the standardized, collaborative Med Rec process during the EBP project did result in a significant increase in the matched physician reported accurate Med Recs. And although not significant, there was an increase in the total physician reported accurate Med Recs. This indicates that continuation of the patient/caregiver and team member component of the intervention may be helpful in further improvement of the Med Rec process. In order to continue tracking of the Med Rec process, specifically the accuracy, tracking measures must be re-examined and a less time consuming option may be appropriate. It must be determined if particular parts of the intervention, such as the caregiver reminder to bring their child's medications, should continue. Also, continued tracking of the Med Rec process compliance may not be necessary. The physicians may need to be included in the education and inaccuracy data updates, as they were not recording numerous incompleteness errors that the PL found.

All team members and caregivers/patients are critical to the success of an accurate Med Rec process. Without everyone invested in the process improvement, future implemented measures may meet the same resistance. The MA and nurse are the bridge between the patient and provider. They are responsible for educating the caregivers/patients regarding their medications and interacting with the caregiver/patient to produce the most accurate Med Rec.

The pediatric hematology/oncology outpatient clinic may benefit from further discussion and refinement of the evidence-based intervention. Also, discussions with the IT department may be beneficial in setting up a process in which the EHR would stop forward movement, a hard stop, in the Med Rec process unless each medication had a name, dose, frequency, and route of administration documented. This would eliminate the incompleteness factor of the inaccurate Med Recs.

Theory

There is a large amount of literature detailing the role of Med Rec in improving patient safety. However, there is also discussion in the literature surrounding the difficulties with implementing an accurate Med Rec process. A barrier discussed in detail in the literature is the different processes that exist in various settings and with various populations. Using theoretical and EBP frameworks when implementing evidence into practice in the future will ensure development and forward movement of refining the Med Rec process. Using the Kotter's Model of Change and Stetler's EBP Model as frameworks for this EBP project facilitated the use of the best evidence into clinical practice. Future use of the Stetler EBP Model to implement and improve Med Rec processes is recommended.

Research

In the future, the EBP project could be modified and replicated in the same setting to strive for further improvement of Med Rec accuracy. The project could also be replicated to determine if a significant increase in Med Rec accuracy can be achieved in a similar or different outpatient setting. Implementing similar interventions and outcomes would be helpful in comparing future findings. There is a lack of literature focused on the Med Rec process in the pediatric outpatient setting, more research focusing on this specific patient population and setting would fill this gap.

Education

The education provided to team members during the intervention, regarding the completeness, correctness, and accuracy of the Med Rec process could be provided to all healthcare providers and team members regardless of the setting. Moving forward improving patient safety will continue to be a much discussed topic. Med Rec should be promoted as a means to improve patient safety. Whether it be in the educational or clinical setting, increasing knowledge of the importance of an accurate Med Rec process must be a focus. The EHR and

complexity of medical care today has increased the need for patient and provider collaboration, in an effort to improve medication safety.

Conclusion

The standardized and collaborative Med Rec process increased the number of physician reported accurate Med Recs. The physicians reported mostly incorrectness errors, while the PL reported mostly incompleteness errors. The most commonly assigned Med Rec inaccuracy severity was class 1 (minor). There were no voluntary reported medication errors during the duration of the EBP project. In general, the project was well received and shed light on a process that can lead to improved patient safety. The complexity of oncology care, coupled with the complexity of pediatric medication administration, places pediatric oncology patients at a significant risk for medication discrepancies and subsequent adverse drug events (Walsh et al., 2009). Furthermore, a standardized, collaborative Med Rec process can be used to improve patient safety in this vulnerable population.

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BIOGRAPHICAL MATERIAL

Traci graduated from Indiana University Bloomington with a Bachelor of Science in Microbiology in 2008. She proceeded to attend Indiana University-Purdue University (IUPUI) and graduated with a Bachelor of Science in Nursing in 2010. Mrs. Pulliam is currently pursuing her Doctor of Nursing Practice, with a clinical focus as a family nurse practitioner, at Valparaiso University, with anticipated graduation in May 2017. As a student nurse, Traci worked in an adult surgical intensive care unit (ICU) and an adult transplant ICU. After graduation in 2010, Traci began practicing as a pediatric inpatient and pediatric hematology/oncology outpatient nurse, where she serves as a member of the preceptor and mentor programs. She is a certified pediatric nurse and is certified through the Association of Pediatric Hematology/Oncology Nurses to administer chemotherapy. Traci was inducted into the Sigma Theta Tau International Alpha Honor Society in 2011 and remains a member. She is also currently a member of the American Association of Nurse Practitioners (AANP) and the Midwest Nursing Research Society (MNRS). Throughout her years as a pediatric nurse, Traci became passionate about caring for pediatric hematology/oncology patients and their families. Providing compassionate, safe, and holistic care to these patients has been and continues to be her focus. Traci's evidence-based practice (EBP) project focused on pediatric hematology/oncology patient safety, specifically on accurate medication reconciliation. Mrs. Pulliam was selected to present her EBP project findings at the MNRS Conference in April 2017.

ACRONYM LIST

AHRQ: Agency of Healthcare Research and Quality

ADE: Adverse Drug Event

BPMH: Best Possible Medication History

CINAHL: Cumulative Index for Nursing and Allied Health

CPG: Clinical Practice Guideline

EBP: Evidence-Based Practice

EHR: Electronic Health Record

ER: Emergency Room

IHI: Institute of Healthcare Improvement

IRB: Institutional Review Board

IT: Information Technology

JBI: Joanna Briggs Institute

LPN: Licensed Practical Nurse

MA: Medical Assistant

MATCH: Medications at Transitions and Clinical Handoffs

MRE: Med Rec Errors

NPSG: National Patient Safety Goal

NICE: National Institute for Health and Care Excellence

OTC: Over-the-Counter

PCP: Primary Care Provider

PL: Project Leader

RCT: Randomized Controlled Trial

SOP: Standardized Operating Protocol

SPSS: Statistical Package for the Social Sciences

SR: Systematic Review

WHO: World Health Organization

Appendix A

Pre-Intervention Medication Reconciliation Process Team Member Survey

Pediatric Hematology/Oncology Outpatient Clinic

Medication Reconciliation (Med Rec) Process Team Member Survey Pre-Intervention

Instructions:

Please complete the following items by filling in the blank or marking the item that best describes you.

<u>Date:</u>	<u>Last three digits of employee number:</u>
<u>Age:</u>	<u>Gender:</u> <input type="checkbox"/> Female <input type="checkbox"/> Male
<u>Ethnicity:</u> <input type="checkbox"/> African American <input type="checkbox"/> Asian-Pacific Islander <input type="checkbox"/> Caucasian <input type="checkbox"/> Hispanic <input type="checkbox"/> Native American <input type="checkbox"/> Other _____	
<u>Highest Level of Education:</u> <input type="checkbox"/> Less than high school <input type="checkbox"/> High school/ GED <input type="checkbox"/> Some college <input type="checkbox"/> 2 year college degree (Associates) <input type="checkbox"/> 4 year college degree (Bachelors) <input type="checkbox"/> Master's Degree <input type="checkbox"/> Doctoral Degree <input type="checkbox"/> Professional Degree (MD, JD)	
<u>Current Employment Status:</u> <input type="checkbox"/> Full-time <input type="checkbox"/> Part-time <input type="checkbox"/> PRN	
<u>Current Position:</u> <input type="checkbox"/> Physician <input type="checkbox"/> Nurse <input type="checkbox"/> Medical Assistant <input type="checkbox"/> Unit Assistant	
<u>How long have you worked in this outpatient clinic?</u>	
<u>What aspects of the current Med Rec process do you feel are working well?</u>	
<u>What aspects of the current Med Rec process do you feel are NOT working well?</u>	
<u>Please provide ideas for future improvement of the Med Rec process.</u>	

Appendix B

Post-Intervention Medication Reconciliation Process Team Member Survey

Pediatric Hematology/Oncology Outpatient Clinic

Medication Reconciliation (Med Rec) Process Team Member Survey Post-Intervention

Instructions:

Please complete the following items by filling in the blank or marking the item that best describes you.

Thank you!

<u>Date:</u>	<u>Last three digits of employee number:</u>
<u>Age:</u>	<u>Gender:</u> <input type="checkbox"/> Female <input type="checkbox"/> Male
<u>Ethnicity:</u> <input type="checkbox"/> African American <input type="checkbox"/> Asian-Pacific Islander <input type="checkbox"/> Caucasian <input type="checkbox"/> Hispanic <input type="checkbox"/> Native American <input type="checkbox"/> Other _____	
<u>Highest Level of Education:</u> <input type="checkbox"/> Less than high school <input type="checkbox"/> High school/ GED <input type="checkbox"/> Some college <input type="checkbox"/> 2 year college degree (Associates) <input type="checkbox"/> 4 year college degree (Bachelors) <input type="checkbox"/> Master's Degree <input type="checkbox"/> Doctoral Degree <input type="checkbox"/> Professional Degree (MD, JD)	
<u>Current Employment Status:</u> <input type="checkbox"/> Full-time <input type="checkbox"/> Part-time <input type="checkbox"/> PRN	
<u>Current Position:</u> <input type="checkbox"/> Physician <input type="checkbox"/> Nurse <input type="checkbox"/> Medical Assistant <input type="checkbox"/> Unit Assistant	
<u>How long have you worked in this outpatient clinic?</u>	
<u>Should the patients/parents continue to be reminded to bring their medications to their next visit?</u> <input type="checkbox"/> Yes <input type="checkbox"/> No <u>If not, what is the reason?</u> <u>If so, do you have any suggestions to improve the reminder?</u>	
<u>Should the patient/parent education regarding Med Rec continue?</u> <input type="checkbox"/> Yes <input type="checkbox"/> No <u>If not, what is the reason?</u> <u>If so, do you have any suggestions to improve the education?</u>	
<u>Should tracking of the Med Rec process and discrepancies continue?</u> <input type="checkbox"/> Yes <input type="checkbox"/> No <u>If not, what is the reason?</u> <u>If so, do you have any suggestions to improve the monitoring?</u>	



Appendix C

Physician Medication Reconciliation Tracking Form

Patient Initials: _____ Patient DOB: _____

Patient Code Number: _____

Physician Medication Reconciliation Tracking Form

Medication List Information

	Yes	No (if no continue to table below)
Medication list accurate (Accurate= complete and correct Med Rec)		

	What makes the Med Rec inaccurate? (Please provide more information in tables below.)
A. Incompleteness (Complete= name, dose, frequency, and route of all meds documented)	
B. Incorrectness (Correct= no discrepancies between the med list in EHR and the meds the patient is taking at home)	

Medication Discrepancy Data

A. Completeness

	Place check next to what med element is missing.	Name of med(s) missing this information?
Name		
Dose		
Frequency		
Route		

B. Correctness

	Place check next to what element is incorrect.	Name of med(s) with the incorrect information?
Addition (med on Med Rec that patient is not taking)		
Omission (med not on Med Rec that patient is taking)		
Duplication (med listed twice)		
Incorrect name (med with incorrect name)		
Incorrect dose (med with incorrect dose)		
Incorrect frequency (med with incorrect frequency)		
Incorrect route (med with incorrect route)		

Severity of Discrepancies

	Place a check next to the severity of the Med Rec discrepancy.
Class 1 (potentially minor)	
Class 2 (potentially moderate)	
Class 3 (potentially severe)	

Appendix D

Project Leader Medication Reconciliation Tracking Form

Project Leader Medication Reconciliation Tracking Form

Patient Code Number: _____

Patient Demographic Data

Age (years)	
Gender	<input type="checkbox"/> Female <input type="checkbox"/> Male
Diagnosis	
Number of medications the patient is taking (includes OTC, herbal supplements, vitamins, and prescriptions)	
Was the Med Rec correctness verified via telephone?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Who verified Med Rec correctness via telephone?	

Medication List Information

	Yes	No (if no continue to table below)
Medication list accurate (Accurate= complete and correct Med Rec)		

	What makes the Med Rec inaccurate?
A. Incompleteness (Complete= name, dose, frequency, and route of all medications documented)	
B. Incorrectness (Correct= no discrepancies between the medication list in EHR and the medications the patient is taking at home)	

Medication Discrepancy Data

A. Completeness

	Place check next to what med element is missing.	Name of med(s) missing this information?
Name		
Dose		
Frequency		
Route		

B. Correctness

	Place check next to what element is incorrect.	Name of med(s) with this incorrect information?
Addition (med on Med Rec that patient is not taking)		
Omission (med not on Med Rec that patient is taking)		
Duplication (med listed twice)		
Incorrect name (med with incorrect name)		

Incorrect dose (med with incorrect dose)		
Incorrect frequency (med with incorrect frequency)		
Incorrect route (med with incorrect route)		

Severity of Discrepancies

	Place a check next to the severity of the Med Rec discrepancy.
Class 1 (potentially minor)	
Class 2 (potentially moderate)	
Class 3 (potentially severe)	

Appendix E

Educational Patient Handout

Medication Reconciliation

Medication reconciliation ensures the most up-to-date list of your medications is available.

This up-to-date list benefits both you and the healthcare team.

Medication reconciliation promotes medication safety.

Medication reconciliation is the responsibility of the patient and the healthcare team.

Successful medication reconciliation is a collaborative effort.

Medications include:

- prescription medications
- over-the-counter medications
- vitamins
- nutritional supplements
- complementary medications

Your role in medication reconciliation:

- Bring your child's medications to every visit.
- Question you should be able to answer include:
 - What medications does your child take, including the name, dose, frequency, and route?
 - Why are they taking them?
 - How do they take them?
 - When was the last time they took each medication?
 - Are they having any problems with their current medications?

Together, with you, we want to improve your child's medication safety.

Appendix F

Educational Power Point ®

Medication Reconciliation (Med Rec)

Traci Pulliam, Valparaiso DNP Student
Fall 2016

Med Rec Process

- ▶ Three steps:
 - ▶ **Verification**- the act of generating a list of the patient's current medications, using various sources of information
 - ▶ **Clarification**- the medications are checked for appropriateness
 - ▶ **Reconciliation**- the medication list is reviewed and any changes are documented
 - ▶ Failure to ensure an accurate medication list may result in medication error, subsequent adverse drug events (ADEs), and ultimately comprised patient safety.

[AHRQ, 2015; Barnsteiner, 2008; Redmond et al., 2013]

Med Rec Overview

- ▶ "a process of identifying the most accurate list of all medications a patient is taking — including name, dosage, frequency, and route — and using this list to provide correct medications for patients anywhere within the health care system (Institute of Healthcare Improvement, 2016, Medication Reconciliation Review section, para. 2)"
- ▶ The ultimate goal of Med Rec is to create an all-inclusive medication list that informs both the patient and the healthcare provider.
- ▶ Med Rec is the responsibility of the patient and the entire healthcare team.
- ▶ Developing and agreeing on an accurate medication list is a collaborative effort.

[The Joint Commission, 2015; Redmond et al., 2013]

Transitions of Care

- Med Rec should be performed at any and all transitions of care
- **Transitional care:** "changes in the level, location, or providers of care as patients move within the healthcare system (Redmond et al., 2013, p. 3)."
- Transitions of care are particularly vulnerable times, in which medication discrepancies and errors occur more frequently
- Transitions of care can include:
 - Admission
 - Discharge
 - Transfer

[AHRQ, 2012; IHI, 2016; The Joint Commission, 2015]

Challenges of Med Rec

- Med Rec is not without its challenges.
- Challenges include:
 - accuracy of patient information given to the healthcare provider
 - a multi-step process
 - willingness of the patient to give information
 - the inter-professional nature of Med Rec
 - time efficiency
 - staffing resources
 - effectiveness of the electronic or paper documenting system
 - frequent staff turnover
- According to the Joint Commission (2015), despite these barriers healthcare providers are urged to make a good faith effort to complete an accurate and complete Med Rec, at all transitions of care.

[Cotley et al., 2009; The Joint Commission, 2015]

What Med Rec does?

- **Decreases medication errors and subsequent ADEs**
- Med Rec has been studied in many clinical practice settings, such as inpatient hospitals and outpatient offices.
- Shown increase in medication safety across the lifespan

[IHI, 2016; Redmond et al., 2013; Varkey et al., 2007]

Pediatrics

- Med Rec can be an extremely important tool in pediatric patient care, specifically safety.
- Pediatric medication safety is oftentimes complex for many reasons, including:
 - weight based calculations
 - various medication formulations
 - developmental levels making it difficult for children to communicate adverse reactions
- Children are particularly vulnerable to medication errors.
- After the medication is prescribed, the caregivers of the child must be educated to ensure proper medication administration at home.

(McPhillips et al., 2005, Stone et al., 2010)

Cancer Care

- Cancer care has shifted from mostly inpatient care to the majority of care occurring in the outpatient setting.
- This shift relocates the complex care oncology patients receive to outpatient settings.
- According to Walsh et al. (2009), "systems to prevent outpatient medication errors are often inadequate because of factors such as lack of recognition of errors, communication problems, and fragmentations of care" (p. 891).
- The complexity of oncology care, coupled with the complexity of pediatric medication administration places pediatric oncology patients at a significant risk for medication discrepancies and subsequent ADEs.

(Walsh et al., 2009)

Supporting Research

- Walsh et al. (2009) examined medication errors among adults and children with cancer in an outpatient setting.
- Almost **19%** of pediatric visits involving medications were associated with a medication error (95% CI [12.5, 26.9]) (Walsh et al., 2009).
- This rate was higher than the adult comparison group with only 7.1% of visits associated with a medication error (Walsh et al., 2009).

The Joint Commission

- In 2006, in an effort to improve medication safety, the Joint Commission called for accurate and complete Med Rec across the continuum of care.
- The Joint Commission's third National Patient Safety Goal (NPSG), in 2015, was to improve the safety of using medications.
 - This goal emphasized an organization's focus on the reduction of medication discrepancies and errors.
 - Specifically, NPSG.03.06.01 cites the role of Med Rec in improving medication safety.
 - According to the Joint Commission (2015), Med Rec facilitates identifying and resolving medication discrepancies, such as duplications, omissions, and interactions.

(The Joint Commission, 2015)

Additional Initiatives

- In 2005, the IHI launched its 100,000 Lives Campaign with the goal of reducing morbidity and mortality in the United States.
 - One of the pillars of the 100,000 Lives Campaign was implementing Med Rec, specifically with the goal of preventing ADEs.
- In 2006, the World Health Organization (WHO) formulated the High 5s Project.
 - The goal of the High 5s Project was to improve patient safety by implementing standardized operating protocols (SOPs).
 - One of the High 5s SOPs focused on Med Rec at transitions of care.

(IHI, 2005; IHI, 2016; WHO, 2015)

Additional Initiatives Continued

- Finally, the Agency of Healthcare Research and Quality (AHRQ) and the National Institute for Health and Care Excellence (NICE) developed and updated a guideline in 2015.
 - The goal of this guideline was to explain the best practice of care for patients who require medications.
 - Recommends Med Rec in primary care settings be completed when a patient is discharged from the hospital or another care setting and before any new prescriptions or medication changes are made.
 - The AHRQ is also responsible for the development of a toolkit that urges healthcare providers to review and redesign the Med Rec process currently in place, in order to improve patient safety.

(AHRQ, 2012)

EBP Project

- The purpose of this evidence based practice (EBP) project is to improve the accuracy of the Med Rec process in a pediatric hematology/oncology outpatient clinic by developing, promoting, and evaluating a standardized Med Rec process.
- The goal of this EBP project will be to reduce the number of medication discrepancies and improve the current Med Rec process.
- The measurable outcome will be the number of medication discrepancies found prior to and after the intervention implementation. The severity and type of the medication discrepancies will also be recorded, in an effort to predict the potential outcome of the discrepancy.

Common Themes

- Little literature exists examining the impact of Med Rec in the pediatric outpatient population
- Common themes:
 - Importance of having a standardized Med Rec process that is clear and communicated to all team members and patients.
 - Most frequently used outcome in the literature was the assessment of the number of medication discrepancies .
 - Classifying the discrepancy severity in an effort to assess the possible adverse outcome if the discrepancy had not been identified.

(Hron et al., 2015; Huynh et al., 2013; Huynh et al., 2016; Nassaralla et al., 2007; Nassaralla et al., 2009; Stock et al., 2009; Varkey et al., 2007; Weingart et al., 2007)

Intervention

- Common interventions included a patient and provider component.
- Patient component:
 - (a) a reminder to bring their medications to the visit
 - (b) a brochure, letter, or hand-out emphasizing the importance of medication safety and reconciliation
 - (c) education about the Med Rec process
- Provider component:
 - (a) education regarding the importance of the Med Rec process
 - (b) specific role assignment in the process
 - (c) regular updates of Med Rec compliance and accuracy

(Nassaralla et al., 2007; Nassaralla et al., 2009; Varkey et al., 2007; Weingart et al., 2007)

Data Collection

- In order to assess the current climate and belief regarding the Med Rec process, a survey was conducted prior to implementation of the intervention.
- Baseline data was collected by both the physicians and the project leader that included the number, type, and severity of the medication discrepancies.
- The definitions of completeness, correctness, and accuracy found in the literature was used to evaluate individual medications and the overall medication list.
- The severity of the discrepancies was measured using the class 1, 2, and 3 scale.
- This data will also be collected after the intervention.

(Huynh et al., 2013; Huynh et al., 2016; Nassaralla et al., 2007; Nassaralla et al., 2009)

Discrepancy Definition

- **Completeness:** a medication having the name, dose, frequency, and route of administration documented in the EHR
- **Correctness:** no discrepancies occur in the name, dose, frequency, or route of administration between the medication list in EHR and the medications the patient are taking at home
- **Accuracy:** the Med Rec is both complete and correct
- **Severity:**
 - Class 1: potentially minor effect
 - Class 2: potentially moderate effect
 - Class 3: potentially severe effect

(Huynh et al., 2013; Huynh et al., 2016; Nassaralla et al., 2007; Nassaralla et al., 2009)

Baseline data

- Preliminary results:
- Physician collected data:
 - 19/99 Med Recs were inaccurate for a variety of reasons
 - Common discrepancies included:
 - Medication omissions: AMP, MTX, and Septra
- Project leader collected data:
 - 26/99 Med Recs were inaccurate
 - Common discrepancies included:
 - Incompleteness: frequency and dose
 - Especially prn medications

Monitoring Med Rec Process Improvement

- Approximately 3 weeks
 - Fill out Med Rec process tracking form on every patient
 - Physician data collection
 - Project leader data collection

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Appendix G

Medication Reconciliation Team Member Information Sheet

MEDICATION RECONCILIATION

3 steps:

Verification

Clarification

Reconciliation

Complete

Name, dose, frequency, and route of all meds are documented

Correct

*No discrepancies between the med list in the EHR and
the meds the patient is taking at home exist*

Accurate

Complete and Correct Med Rec

Appendix H

Master Coding Form

Master Coding Form

Code Number	Patient Name	Medical Record Number (MRN)	DOB
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			

Appendix I

Medication Reconciliation Process Data Collection Form

Patient Label

Patient Code Number: _____

Medication Reconciliation Process Data Collection Form

Instructions: Please complete the following items for each patient and place the completed form in the locked box. Thank you.

Task	Yes		No
Was the caregiver reminded to bring the patient's medications to the next visit?			
Did the patient/caregiver bring their medications to the appointment?			
Was the patient/caregiver given the brochure and educated regarding medication reconciliation, during their visit? By Who (role)?	MA		
	Nurse		
	Both		
Were all three steps of the medication reconciliation process completed? By Who (role)? (Verification= generating a list of the patient's current medications) (Clarification= medications are checked for appropriateness) (Reconciliation= medication list is reviewed and any changes are documented)	Verification	MA	
		Nurse	
		Both	
	Clarification	MA	
		Nurse	
		Both	
Reconciliation	Physician		

Appendix J

Ethics Training Completion Certificate

