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### Evaluation of an Educational Presentation on Improving Nursing Students' Knowledge About Medication Reconciliation

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EVALUATION OF AN EDUCATIONAL PRESENTATION ON IMPROVING  
NURSING STUDENTS' KNOWLEDGE ABOUT MEDICATION RECONCILIATION

A Scholarly Project Submitted to the Graduate School  
in Partial Fulfillment of the Requirements  
for the Degree of  
Doctor of Nursing Practice

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Pittsburg, Kansas

May 2022

# EVALUATION OF AN EDUCATIONAL PRESENTATION ON IMPROVING NURSING STUDENTS' KNOWLEDGE ABOUT MEDICATION RECONCILIATION

An Abstract of the Scholarly Project by  
My Trinh

Medication reconciliation is the process of comparing a patient's medications that they are currently taking and comparing it with newly ordered medications or comparing the list to another source of information. It is completed to avoid and reduce the risk for potential adverse drug events, medication discrepancies, and improve communication between transition of care settings. Although people acknowledge and perceive the value of medication reconciliation as an important process in reducing medication errors and patient harm, healthcare team members including nurses may receive little formal training and education in school. The purpose of the Doctor of Nursing Practice (DNP) scholarly project was to assess and increase knowledge of junior and senior-level nursing students before and after an educational presentation of medication reconciliation over one-month. The tools used within the project included an educational presentation, and a pre- and posttest with a demographical information portion. Data was collected among 71 eligible participants. Descriptive analysis and a paired *t*-test were used to evaluate changes in pre-and posttest scores. There was a slight increase in medication reconciliation knowledge scores after analysis of posttest scores of 8.30 out of 10 ( $SD = 0.98$ ) compared to pretest scores of 8.18 out of 10 ( $SD = 1.05$ ). However, there was not a statistically significant difference in scores between the pretest and posttest groups.

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## **Chapter I**

### **Introduction**

#### **Description of the Clinical Problem**

Medication discrepancies between medication lists are possible and substantial causes for potential adverse drug events (ADEs) that may cause patient harm. Medication discrepancies are “differences in documented medication regimens across different care sites” (Prey et al., 2018, p. 1461). Often, the patient’s medication list within the electronic health record (EHR) system will have duplicate medications, generic and brand names, dosage/frequency changes, or lack documentation. Patients may be unsure of what medication they are taking or do not know the names of new medications recently prescribed for them to take. It can also be difficult to pull a list of a patient’s medications within the EHR system from other sources including instances where the patient has been seen by providers outside of the organization, specialists, or during transition of care periods where there is a patient encounter.

Medication reconciliation is completed to avoid and reduce the risk for potential ADEs and improve communication between transition of care settings. Medication reconciliation is the process of obtaining a patient’s best possible medication history (BPMH). This process consists of obtaining an accurate list of medications that the patient is currently taking and comparing the list to another source (The High 5s Project,



2014, p. 4). Ideally, medication reconciliation should occur at pivotal error-prone transition points and at the beginning of a care episode. Error-prone transition points include episodes where patients are admitted into a hospital and after they are discharged from hospital to home because they are points where potential for ADEs is high (Wheeler et al., 2018, p. 73). Likewise, medication reconciliation should be done in- or outpatient every time there is an encounter with a patient.

Although people acknowledge and perceive the value of medication reconciliation as an important process in reducing medication errors and harm to patients, members of the health care team, including nurses, health care providers, and pharmacists, may often receive little formal training and education during their time in undergraduate or graduate schooling on obtaining a best possible medication history and implementation of the steps involved (Farha et al., 2020; Ramjaun et al., 2015). There may be various reasons as to why medication reconciliation may not be intensely covered in school for those involved. A possible explanation may be due to lack of knowledge, hazy understanding, or undefined roles as to who is responsible for completing medication reconciliation (Al-Hashar et al., 2017; Farha et al., 2020). It is generally agreed upon that the healthcare provider (HCP) is the one responsible for managing and changing the patient's medication regimen as clinically necessary. However, medication reconciliation is an important responsibility that anyone, within their role, responsibility, and training, can be a part of.

### **Significance**

Medication discrepancies can be an important risk factor to medication errors, especially during crucial transition of care periods if medication reconciliation is not done

during pivotal error-prone transition points. Up to “67% of patients admitted to the hospital have unintended medication discrepancies” which can persist at discharge (Armor et al., 2016, p. 132). Medication discrepancies can be especially problematic when accurate information is not transferred completely to other points of care. An example would be a patient being seen at their primary care provider’s office for a hospital follow-up, but the EHR system does not contain a discharge note with a list of the patient’s discharged medication list and the patient forgets the name of the medications they were prescribed or does not bring in their medications. Incomplete transfer of information between transition of care episodes or systems can increase the likelihood of ADEs occurring (Cook et al., 2019, p. 6). Medication discrepancies can also potentiate possible ADEs which can lead to lower and poorer patient health outcomes and place patients at risk for being re-admitted into hospitals. Adverse drug events have an annual cost of “\$177 billion” in the older adult population with cardiovascular disease and other comorbidities (Young et al., 2015, p. 511). Costs related to ADEs are expensive and it is pertinent that obtaining a patient’s BPMH through medication reconciliation is done at all points of care.

In inpatient and outpatient settings, having a strong understanding of medication reconciliation and competency to perform the process on all patients are important to ensuring patients receive safe and high-quality care while also minimizing their risk for potential adverse drug events. Nurses and other members of the health care team must understand their roles, make certain that patients understand what medications they are taking, answer questions they may have about their medications, obtain the BPMH from

patients, and communicate changes to the patient's plan of care to those involved in the patient's plan of care.

### **Purpose**

The purpose of the Doctor of Nursing Practice (DNP) scholarly project was to assess and increase knowledge of junior and senior-level nursing students before and after an educational presentation of medication reconciliation.

### **Theoretical Framework**

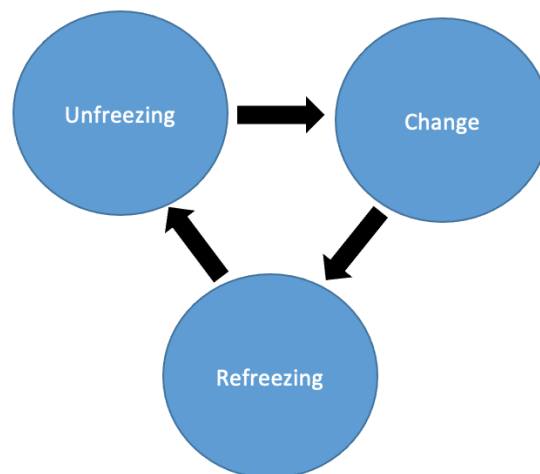
Theoretical frameworks serve as a blueprint or foundation for research projects and studies. They help demonstrate interactions and relationships between concepts to further describe the selected phenomenon and understanding of the phenomenon. Kurt Lewin's "Change Theory of Nursing" was the chosen framework that guided this DNP Scholarly Project. The theory focuses on change in a three-stage sequential model: unfreezing, change, and refreeze. Following the model, it requires prior knowledge or learning to be rejected and replaced with new learning. Behavior is a key factor within the model as Lewin defines it as a "dynamic balance of forces working in opposing direction" (Petiprin, 2016). The theory describes three main concepts: driving forces, restraining forces, and equilibrium. Driving forces push in a direction causing change to occur and can cause a shift in the equilibrium towards change. Restraining forces are forces that counter the driving forces, hindering change and cause a shift in the equilibrium opposing change. Equilibrium is a state of being where driving forces are equal to restraining forces with no change occurring (Petiprin, 2016). The dynamic nature of change in the model reflects current-world processes and is applicable to the project. There is often a push and pull regarding policy or protocol changes made within health

care settings that require members of the health care team to adapt quickly to fit the needs of the current situation. However, some members may not be as open or welcoming to change because they find comfort within the status quo.

Lewin also describes the three stages in the theory: unfreezing, change, and refreezing. The stages are completed in sequential order. Unfreezing is a process that involves finding a method of making it possible for people to let go of an old pattern that was counterproductive. The change stage, “movement,” involves a process of changing thought, feeling, and/or behavior that is more productive. Lastly, refreezing is establishing the change as a new habit so that it is standardized (Petiprin, 2016). Without refreezing, it may be easy for people to fall back into their old ways.

**Figure I**

*Illustration of Lewin’s Change Theory Stages*



*Note.* Adapted from “Kurt Lewin's Change Model: A Critical Review of the Role of Leadership and Employee Involvement in Organizational Change,” Hussain et al., 2018, p. 126.

Overcoming individual resistance and group conformity is necessary to progress towards the intended change. There are three methods that can lead to accomplishing unfreezing: increasing the driving forces that “direct behavior away from the existing situation or status quo,” decreasing the restraining forces that “negatively affect the movement from the existing equilibrium,” or finding a combination of the two methods (Petiprin, 2016). Because of the dynamic nature of the model, it may be difficult to drive change if individuals are set in their own ways or there are pertinent restraining forces working against the equilibrium. Therefore, it is necessary to utilize and evaluate which of the three methods is most suitable to promoting change for a given situation.

To create change within the nursing school setting during the unfreezing stage, assessing other areas that may need to be improved and recruiting support from management, leaders, and those in leadership roles can help promote the project’s success and sustainability. Open discussions with nursing student and staff member to introduce and remind them of the project can also create unique opportunities for members to voice their concerns or opinions on the project. During the change stage, communication about the project’s progress should be discussed often and throughout the planning, implementation, evaluation stages. Ideally, a weekly email or a bimonthly in-person meeting would take place to communicate the project to nursing students and staff members involved. To help achieve the stage, it would also be beneficial to make sure that staff members are involved in the process and feel empowered to help drive the change forward. To achieve the refreeze stage, it is important to identify what helps support the change (driving forces) and the barriers to sustaining change (restraining

forces). Continued support from leadership and promotion of continued education can help promote achievement of the stage.

### **Project Hypothesis**

The DNP Scholarly Project used a directional hypothesis to evaluate the effectiveness of an educational presentation on nursing student knowledge. Directional hypotheses specify a predicted direction of the “relationship between” the independent variable (student education) and the dependent variables (knowledge of medication reconciliation before and after an educational presentation) (Terry, 2019, p. 26). In a nursing school, providing an educational presentation on medication reconciliation to junior and senior-level nursing students will potentially increase nursing student knowledge of medication reconciliation in a one-month period.

### **Project Questions**

The identified practice problem was focused on increasing nursing student knowledge of medication reconciliation. Performing medication reconciliation at every transition point of care can help reduce risk for potential ADEs and medication discrepancies. The purpose of the project was to evaluate how promotion of an educational presentation on medication reconciliation can increase nursing student knowledge of medication reconciliation. In the project, research questions include:

1. What is the knowledge of junior and senior-level nursing students in a nursing school about medication reconciliation prior to an educational intervention?
2. What is the knowledge of junior and senior-level nursing students in a nursing school about medication reconciliation after an educational intervention?

3. Is there a significant improvement in the knowledge of medication reconciliation in junior and senior-level nursing students in a nursing school after an educational intervention?

### **Definitions of Key Terms**

***Best possible medication history:*** A medication history obtained by a HCP, includes a “thorough history of all regular medication use (prescribed and non-prescribed)” using multiple sources of information (Queen’s University Office of Interprofessional Education and Practice, 2009)

***Medication discrepancies:*** The differences between two or more medication lists (Akram et al., 2015, p. 1)

***Medication reconciliation:*** The process of “comparing medications a patient is currently taking (or should be taking) with newly ordered medications” and/or comparing the list to another source (Joint Commission, 2022, p. 5)

***Potential adverse drug event:*** A medication error with potential to cause “associate degree injury however that does not cause any injury, either due to specific circumstances, chance, or as a result of the error being intercepted and corrected” (Sahilu et al., 2021, p. 2)

***Presentation:*** An “activity in which someone shows, describes, or explains something to a group of people” (Presentation, 2021)

### **Logic Model of the DNP Scholarly Project**

A logic model was created for the scholarly project for the purpose of illustrating the relationship between the project’s inputs, activities, and its intended effects (Teen and Family Services Bureau, n.d.). Inputs (resources), activities, outputs, and results with

outcomes at different lengths of time are discussed in detail. The overall long-term outcomes are focused on increasing nursing student knowledge of medication reconciliation, increasing completion rates of medication reconciliation, and decreasing medication errors. Ideally, the interventions would also help decrease risk for potential ADEs.

**Figure II**

*Illustration of Improving Medication Reconciliation Knowledge Logic Model*

Input/Resources:	Activities/Interventions:	Outputs:	Effects/Results:
<ul style="list-style-type: none"> <li>• Education provided through a PowerPoint presentation</li> <li>• DNP student</li> <li>• IRB approval</li> <li>• Junior and senior-level nursing students at Pittsburg State University</li> <li>• Time</li> </ul>	<ul style="list-style-type: none"> <li>• Educate nursing students on medication reconciliation through an educational presentation</li> <li>• Pre- and posttest medication reconciliation knowledge assessment</li> <li>• Satisfaction survey</li> </ul>	<ul style="list-style-type: none"> <li>• October 2021 through November 2021 nursing students are educated through a medication reconciliation educational presentation</li> </ul>	<p><b>Short-term Outcomes:</b></p> <ul style="list-style-type: none"> <li>• There will be an increase in knowledge of medication reconciliation after the educational session</li> </ul> <p><b>Intermediate Outcomes:</b></p> <ul style="list-style-type: none"> <li>• There will be an increase in knowledge of medication reconciliation in nursing students</li> </ul> <p><b>Long-term Outcomes:</b></p> <ul style="list-style-type: none"> <li>• There will be an increase in knowledge of medication reconciliation in nursing students and health care team members involved</li> <li>• There will be an increase in completed medication reconciliation rates</li> <li>• There will be a decrease in medication errors</li> </ul>

**Improving Medication Reconciliation Knowledge**

**Purpose:** To increase nursing student knowledge of medication reconciliation in a nursing school through an educational presentation.

**Context/Conditions:** Medication reconciliation is perceived as a valued process but, it is an educational topic that may not be heavily emphasized during undergraduate or graduate-level schooling for members involved in the process. This may be due to lack of knowledge and understanding of medication reconciliation or unclear roles as to who is responsible for performing the process. Patient medication lists through the electronic health record can contain duplicates, changed dosages, or medications patients have already completed. Previous studies within the literature review also note high rates of medication discrepancies, especially during transition of care periods. Medication discrepancies may potentiate risk for potential adverse drug-related events and lead to poorer patient health outcomes.

*Note.* Adapted from “Section 1. Developing a Logic Model or Theory of Change,” in *Community Tool Box*, n.d. Retrieved from <https://ctb.ku.edu/en/table-of-contents/overview/models-for-community-health-and-development/logic-model-development/example>.



## **Summary**

Medication discrepancies are plausible causes for potential adverse drug events and can cause significant harm to patients. To avoid potential ADEs and improve communication between transition of care settings, medication reconciliation is completed. Ideally, medication reconciliation should be completed at the beginning of an episode of care and changes to the patient's plan of care should also be communicated to other members of the patient's health care team. Often, many patients admitted into hospitals may have medication discrepancies in their electronic health records that may persist at discharge or at other episodes of care, potentiating risk for medication errors, drug-related events, and readmission into hospitals. Adverse drug events are costly and hinder patients' health outcomes and quality of life.

The educational presentation focused on providing education to junior and senior-level nursing students in a nursing school to increase their knowledge of medication reconciliation. The project used Lewin's Change Theory as a framework for the paper and the logic model provides an illustration of the relationships between the inputs, activities, outputs, and their intended effects related to increasing nursing student knowledge of medication reconciliation. Ideally, providing nursing students education through an educational presentation will increase their knowledge of medication reconciliation and decrease rates of medication errors in the future.

## **Chapter II**

### **Review of Literature**

A systematic search of the literature was conducted using the electronic databases: Google Scholars, ProQuest, and CINAHL. Evidence was gathered for the years 2012 to 2022 using the following keywords: medication reconciliation, education, nursing students, outpatient settings, guidelines, clinics, ambulatory, discrepancies, barriers, interventions, and unintentional.

Medication reconciliation is a vital process in reducing the risk of potential adverse drug events (ADEs) and improving patient health outcomes. Reviewing the literature related to investigating medication discrepancies and medication reconciliation are necessary in identifying the cause of discrepancies and evaluating effectiveness of the medication reconciliation process in various health care settings. The purpose of the literature review was to examine the prevalence of medication discrepancies, inpatient and outpatient interventions, current medication reconciliation guidelines, factors affecting medication reconciliation including barriers, and medication reconciliation education for nursing students.

#### **Prevalence**

Unintentional medication discrepancies are not uncommon and can be found in inpatient or outpatient settings. They occur in up to 67% of patients admitted to hospitals

and can still be found at patient discharge (Hron et al., 2015; Kwan et al., 2013). Unintentional discrepancies and ADEs are often due to poor communication between health care professionals and incomplete transfer of information between health care systems. They are known to occur during transition of care points such as at beginning of hospital admission and after patients are discharged (Almanasreh et al., 2016; Kwan et al., 2013; Wheeler et al., 2018). Medication discrepancies may also follow patients into their follow-up appointments with their primary care provider and may persist beyond that. It is generally understood that medication discrepancies place patients at risk for potential ADEs and medication errors. Medication errors account “for up to 33% of all hospital errors” (Hron et al., 2015, p. 315).

Potential ADEs are costly with an ADE costing an estimated \$8,750 (Gianni et al., 2019, p. 2). In the older adult population with cardiovascular diseases and comorbidities, ADEs have an annual cost of \$177 billion (Young et al., 2015, p. 511). They may also prolong patient length of hospital stay. Armor et al. (2016) noted that patients with medication discrepancies had a “30-day hospital readmission rate of 14.3%” compared to those who did not have discrepancies (6.1%) (Armor et al., 2016, p. 132). The authors also noted that the 30-day readmission rate was “14% overall and 15% for Medicare patients” which are marginally lower but similar to the “estimated national average Medicare readmission rate of 20%” (Armor et al., 2016, p. 132).

## **Inpatient Interventions**

### **Pharmacy-Led**

According to recommendations from the World Health Organization, a pharmacist should ideally be the one involved in “gathering or validating a patient’s list

of current medications (BPMH)” and comparing the list with medication orders, but the medication reconciliation process is a “multidisciplinary activity with responsibilities shared among physicians, nurses, pharmacists, and other clinicians involved in the patient’s care” (The High 5s Project, 2014, p. 7). In the inpatient setting, patients can go through several transition of care points during their stay within the hospital. These transition of care points are often error-prone because they are points where potential for ADEs is high (Wheeler et al., 2018, p. 73). In a hospital with resources available, physicians, nurses, pharmacists, and/or pharmacy technicians may be utilized to obtain a patient’s initial medication list during admission.

A prospective 3-month study conducted by Abdulghani et al. (2018) aimed to identify types of medication discrepancies that occurred during medication reconciliation done by a pharmacist obtaining BPMH in a tertiary care hospital located in Jeddah, Saudi Arabia. The study was conducted on 286 adult patients on the basis that they were admitted for at least 24 hours and were “regularly taking at least four chronic prescription medications” (Abdulghani et al., 2018, p. 196). The authors compared medication histories taken by physicians and by a pharmacist gathering BPMH. Identified discrepancies were reviewed by a group of clinical pharmacists to assess potential to cause patient harm with the errors.

The authors found that the pharmacist obtained BPMH “of the interview patients with a mean time of 22 [minutes] per patient interview” and recorded “3,085 prescription and non-prescription medication” compared to the 2,548 identified by the physician (Abdulghani et al., 2018, p. 199). Obtaining BPMH through a standardized approach takes time but, it allows for an accurate and current list of the patient’s medications. Of

the participants, at least one “or more unintended medication discrepancies were noted in 48.3% of patients (138/286) with the most common type of discrepancy as omission at 77% (Abdulghani et al., 2018, p. 199). Unintended medication discrepancies may persist throughout the patient’s stay in the hospital, so it is important to alert the physician for resolution. The authors noted that “537 medication discrepancies were reported (17.4% of number of medication discrepancies recoded by pharmacist)” and that 52% of the identified medications had potential to cause at least moderate to severe patient discomfort (Abdulghani et al., 2018, p. 196). The authors concluded that patient medication histories were recorded inaccurately by physicians during admission and that physicians may rely solely on hospital medical records at the patient’s time of admission to determine what medications they are taking. Pharmacists have great training and expertise that can be used to perform medication reconciliation and can ease time constraints felt at admission. The authors recommends that pharmacists be involved in the medication reconciliation process using BPMH at all patient transitions of care. They acknowledge the possibility that not all hospitals may have a clinical pharmacist as part of staff or enough pharmacist resources to perform the process, so they suggest using a pharmacy technician.

In a prospective interventional study by Gianni et al. (2019), the authors evaluated the impact of medication reconciliation, using BPMH compared to a standard medication history in the first 100 consecutive patients admitted in an internal medicine ward in Southern Switzerland. The authors found that the “mean number of medications per patient” identified was  $8.57 \pm 4.79$  “after performing a standard drug history” and  $11.56 \pm 5.17$  after performing BPMH, meaning that an “average of three drugs per patient

was omitted” when using standard drug history (Gianni et al., 2019, p. 4). The authors also found that admission discrepancies totaled “524 (5.24 discrepancies per patient) with at least 1 discrepancy per patient” (Gianni et al., 2019, p. 1). More than half of the discrepancies (67%) were found during the pharmacist-conducted interview portion with patients and/or their caregivers while obtaining BPMH and 63% of medication discrepancies were classified as drug omission (Gianni et al., 2019, p. 4).

A few limitations identified by the authors include the fact that patients’ relevant outcomes (hospital length of stay, readmissions) were not assessed, the small sample size, and the study was performed in an internal medicine ward of a single hospital, limiting generalizability of the study’s findings. The study is integrated in the national program process of medication reconciliation promoted by the Swiss Patient Safety Foundation which allowed authors to apply a valid and structured methodology for medication reconciliation. The authors emphasize the importance of including a structured interview with patients while obtaining BPMH and using more than one source of information to obtain the patient’s most current medication list. This study conveys that medication reconciliation undertaken by pharmacists leads to strong identification of medication discrepancies, especially when a structured and standardized interview is conducted. The structured interview may also be completed by other members of the health care team with medication reconciliation responsibilities.

### **Nurse Practitioner-Led**

Medication reconciliation should be a shared responsibility among trained staff members involved in the patient’s care. However, if a hospital does not have resources available or pharmacists and/or pharmacy technicians on hand, medication reconciliation

duties may be performed by physicians, nurses, or nurse practitioners. Through a prospective, pre-post study design, Young et al. (2015) examined the effects of advanced practice nurse (APN)-managed medication reconciliation on medication discrepancy occurrences in older cardiac patients who were discharged from a rural community hospital (Young et al., 2015, p. 511). The study aimed to develop strategies promoting medication safety and quality of care during transition of care points in rural communities.

The authors found that intentional and unintentional medication discrepancies were common in both pre-and post-intervention groups with the most common drug classes involved being medications for pain control “(111 [55.5%])”, gastrointestinal (82 [41%]), and cardiovascular and anti-infectious medications (76, [38%]) (Young et al., 2015, p. 513-514). The mean number of medication discrepancies decreased from “ $8.09 \pm 6.75$  in the preintervention group to  $4.32 \pm 5.66$  in the postintervention group ( $p = .005$ )” and the average number of unintentional medication discrepancies per patient also decreased from “ $5.09 \pm 4.60$ ” to “ $0.30 \pm 1.904$ ” respectively (Young et al., 2015, p. 514-515).

However, the average number of intentional medication discrepancies per patient increased from “ $3.00 \pm 2.93$  in the preintervention group” to “ $4.02 \pm 4.62$  in the postintervention group” (Young et al., 2015, p. 515). The authors note that medication reconciliation is primarily done by nursing staff in rural hospitals due to lack of designated pharmacists and that there is no supporting evidence for effectiveness of medication reconciliation completed by nursing staff on medication discrepancies (Young et al., 2015, p. 516). Several limitations were discussed, including that no data

was gathered related to ADEs induced by medication errors due to difficulty in obtaining the data after patient discharge, an APN was involved in every step of the medication reconciliation which may not be a realistic approach in rural hospital settings, and the study was done in one single hospital so there is limited generalizability of the findings.

The authors highlight the accuracy and completion of medication documentation is “comparable with medication reconciliations led by pharmacists” and the “net savings generated by APN-led medication reconciliation was \$15, 758.40” through cost analysis (Young et al., 2015, p. 516). The authors emphasize the importance of clearly defining medication discrepancies across health care team members, providing continuity of medication management, and commitment to obtaining the best possible medication history through the first medication history interview. The authors call for replicating interventions in other rural hospitals and scaling it upward to reach larger rural populations. There is a gap in the literature regarding nurse-led or nurse practitioner-led efforts to address medication discrepancies through medication reconciliation interventions.

Another study that was nurse practitioner-led was completed in a skilled nursing facility (SNF) setting. A pre- and postimplementation quality improvement project by Anderson & Ferguson (2020) examined how a nurse practitioner-led medication reconciliation on admission would reduce hospital readmission rates from a rural Tennessee skilled nursing facility over a 30-day project period. The authors explained that after a needs assessment was completed for the 90-bed for-profit facility, it was found that there was “no formalized program in place to reduce hospital readmissions, including a systematic medication reconciliation process, resulting in a 2-month average



30-day readmission rate of 24.15%” compared to the national average of 21.1% (Anderson & Ferguson, 2020, p. 161). A workflow process for a systematic medication reconciliation process was created through information obtained from the AHRQ, the IHI, and evidence-based journal articles for the nurse practitioner to use. The nurse practitioner used the workflow process as a guide to complete a comprehensive medication review for each admission (Anderson & Ferguson, 2020, p. 162).

The authors found a reduction in hospital readmission rates of “19.2% pre-implementation and 13.5% postimplementation, reflecting a 29.7% decrease in the rate of hospital readmissions within a 30-day period (Anderson & Ferguson, 2020, p. 160). The authors also concluded that although the statistical results did not convey significance, there were reduced rates of hospital readmission, increased revenue by keeping patients within the facility for treatment, no deficiencies in an annual state survey, and the facility was “now prepared to meet the Centers for Medicare and Medicaid Services (CMS) mandate for having a timely medication reconciliation at the time of patient admission” (Anderson & Ferguson, 2020, p. 165). The authors suggest that having a full-time nurse practitioner in skilled nursing facilities can improve quality measures as nurse practitioners can provide excellent knowledge and skills in the management of older adults with complex health needs. The authors also acknowledge that some facilities may not have the resources available for a nurse practitioner to perform medication reconciliation on each admission and that the time frame of 30 days was short. More research should be done regarding medication reconciliation being performed by a nurse practitioner in different inpatient or outpatient settings.

## **Outpatient Interventions**

Performing a thorough BPMH or completing medication reconciliation may not be seen as a high priority in the outpatient setting because there are competing priorities and time constraints. The accuracy of the list can also be dependent on the patient's ability to provide the information. However, it should still be completed at each transition of care and through a good faith effort (Joint Commission, 2022, p. 5). Completing medication reconciliation in the outpatient setting is a team effort and are strengthened with support from pharmacists.

A retrospective observational pilot study conducted by Armor et al. (2016) aimed to evaluate adverse drug events, potential adverse drug events (pADEs), and medication discrepancies occurring between hospital discharge and follow-up with primary care in an academic family medicine clinic. Medication reconciliation was completed in a pharmacotherapy clinic for 25 patients and 18 patients were seen at the hospital follow-up visit jointly with the physician. After patients were contacted by telephone to schedule an appointment with the pharmacist for a comprehensive review of their medications, the pharmacist conducted face-to-face medication reconciliation interviews with them. There was some lack of patient participation due to barriers like transportation and co-pay costs.

In the 43 participants, the authors identified a total of 124 ADEs/pADEs, averaging 2.9 events per patient, and a total of 171 medication discrepancies averaging 3.9 medication discrepancies (Armor et al., 2016, p. 134-135). Some of the most common ADEs/pADEs found were “nonadherence/underuse (18%), untreated medical problems (15%), and lack of therapeutic monitoring (13%)” (Armor et al., 2016, p. 132). Over half of all ADEs/pADEs could be allocated to “antihypertensives (23%), hypoglycemics

(15%), and psychiatric medications (11%) (Armor et al., 2016, p. 134). Common actions taken to resolve the medication discrepancies and problems were to educate the patient, order diagnostic or lab testing, and/or discontinue the medication.

The authors note that most of the ADEs/pADEs were “minor (i.e., need for laboratory monitoring or medication prescribed without listed indication),” but there were several potentially serious identifiable events “(i.e., repeated hypoglycemia, altered mental status, and critical laboratory values” (Armor et al., 2016, p. 135). The authors emphasize the importance of proficient communication skills to prevent further pADEs and improve medication management. Accessibility to a patient’s hospital and primary care records is another essential factor in gathering information and identifying medication discrepancies, drug interactions, and patient compliancy. A few limitations are noted in the study, including small sample size, incomplete medication lists at discharge, and low show rates for medication reconciliation visits which made it difficult for authors to evaluate more patients. The authors conclude that strategies to improve medication management during transition of care points are needed in primary care with efforts in quality improvement.

A retrospective chart review study by Holt & Thompson (2018) aimed to assess effectiveness of medication reconciliation implementation in an internal medicine clinic at an academic medical center. A pharmacy-led education process involved educating nursing staff about conducting standardized medication histories during the triage process. Educational sessions were attended by nursing staff to improve education regarding the medication reconciliation process and staff attitudes toward the study. Information in the educational sessions included instructions on printing medication lists,

reviewing the list, documenting medication discrepancies, and identifying medications needing refills. Each nurse had a “check-off session” where a PharmD “observed and evaluated a direct patient interaction” to ensure competency and consistency between staff (Holt & Thompson, 2018, p. 2). The PharmDs gave feedback to nurses and the review was performed annually.

Nursing staff printed off the patient’s medication list and reviewed each medication with the patient at triage. Staff documented “taking” or “not taking” for each medication on the printed list and within the electronic medical record while discrepancies were “noted on the medication list and given to the provider” (Holt & Thompson, 2018, p. 2). The physician finalized the medication reconciliation process by “addressing all discrepancies noted by the nursing staff and correcting the patient’s electronic medical record” (Holt & Thompson, 2018, p. 2). Afterwards, PharmDs retrospectively reviewed medication lists to note any medication discrepancies.

In 3,263 patients, the authors found a total of “4,470 discrepancies” with most (71%) of discrepancies from documented medications on the list that patients were no longer taking (Holt & Thompson, 2018, p. 1). The implementation of a nurse-driven medication reconciliation process identified a great deal of medication discrepancies within the clinic, and an improvement was noted in the number of medication reconciliations performed by nursing staff. However, the number of completed medication reconciliations done compared to the number of patients seen in clinic per month “reflected an overall lack of compliance with the process” (Holt & Thompson, 2018, p. 4). The authors conclude that implementation of a nurse-driven medication history-taking process identified a sizeable amount of medication discrepancies in patient

charts within the clinic. They acknowledge that the medication reconciliation process can be difficult especially with complex medication regimens and active patient participants.

There was resistance or pushback from nursing staff and physician colleagues due to the time-intensive nature of medication reconciliation. Under the “Epic Ambulatory™ outpatient medical record” system, health care providers reviewing the medication list were able to select medications as “mark as reviewed,” which applied the status to the entire patient’s medication list, without the need to evaluate each medication independently (Holt & Thompson, 2018, p. 4). The type of technology made it difficult to determine if a full medication reconciliation was done or was merely marked as completed. The authors emphasize the importance of ongoing and quality staff training to implement meaningful medication reconciliation processes, especially assessment of provider compliance to completing the process. It also requires adherence to protocols and procedures by the team members involved in the medication reconciliation process.

### **Guidelines and Recommendations**

Medication reconciliation guidelines and recommendations have been established at the national and international level. The Joint Commission which also operates as an accrediting body, and the Agency for Healthcare Research and Quality (AHRQ), are the national agencies that provide a general list of recommendations to promote medication reconciliation and reduce risk for medication errors. The World Health Organization (WHO) is an international agency that provides a general list of medication reconciliation recommendations and guidance for implementation as well.

### **Guidelines from the Joint Commission**

The Joint Commission includes general recommendations for medication reconciliation in their annual *National Patient Safety Goals® for the Ambulatory Health Care Program* (Joint Commission, 2022, p. 1). The Joint Commission recognizes that obtaining a complete and comprehensive list of a patient’s medication can be difficult because the accuracy may be dependent on the patient’s ability to recall and share information but, the goal is “designed to help organizations reduce negative patient outcomes associated with medication discrepancies” (Joint Commission, 2022, p. 3). The accrediting body stresses the importance of obtaining and updating the patient’s current medication list at the beginning of an episode of care through a “good faith effort,” documenting the updated list for others managing the patient’s care and medication, comparing medication information brought in by the patient with medications ordered to identify and resolve discrepancies, and providing the patient with written information on medications changes and new medications to be taken at the end of the episode of care (Joint Commission, 2022, p. 4). Types of medication information should also be defined and collected, including the name, dose, frequency, route, and purpose.

### **Resources from the Agency for Healthcare Research and Quality**

The Agency for Healthcare Research and Quality (AHRQ) provides a resource, *Medications at Transitions and Clinical Handoffs (MATCH) Toolkit* (Gleason et al., 2012), with general recommendations and guidelines targeted towards organizations wanting guidance in designing or redesigning the medication reconciliation process in their workplace setting. The toolkit is led by the guiding principles for successful medication reconciliation, and it also discusses importance in integrating the process into

existing workflow and considerations for different practice settings. The guiding principles include: developing a single medication list shared by the multidisciplinary team to document and update a patient's current medications, defining roles and responsibilities, standardization and simplification of the medication reconciliation process, making the "right thing to do the easiest thing to do," prompts for consistent behavior, educating patients and family on their roles in the medication reconciliation process, and ensuring the process meets regulatory requirements (Gleason et al., 2012). The toolkit also describes obtaining continual leadership support within the organization, providing education and staff training, pilot testing, and assessment and process evaluation. Obtaining leadership support is essential to the success of implementation of the medication reconciliation process while assessment and process evaluation are key to determining sustainability.

### **Guidelines from the World Health Organization**

The High 5s Project created the "Standard Operating Protocol," a set of guidelines and recommendations, for medication reconciliation to address medication errors and ADEs in a hospital setting (The High 5s Project, 2014). Similar to the AHRQ toolkit, it is also guided by guiding principles, defines medication reconciliation, discusses patient and family involvement, education and staff training, implementation strategies, pilot testing, and maintenance and improvement strategies. The guideline describes seven guiding principles: obtaining and using an up-to-date and accurate patient medication list, using a "formal structured process" for medication reconciliation, conducting medication reconciliation on admission, integrating medication reconciliation into "existing processes for medication management," sharing accountability of the process with staff

who understand their roles and responsibilities, involving patients and families, and training qualified staff members to take the best possible medication history (BPMH) and perform medication reconciliation (The High 5s Project, 2014, p. 7-8). The guideline also breaks down medication reconciliation into four steps: obtaining the BPMH, verifying the accuracy of the history with another source, reconciling, or comparing BPMH with the prescribed medications and resolving discrepancies with the prescriber, and supplying accurate medication information to patient and other providers part of the patient's care team during transfer of care (The High 5s Project, 2014, p. 10). Although the medication reconciliation process may differ between practice settings, the four-step breakdown contains the core ideas and systematic approach to the process.

### **Barriers**

A commonly held belief about medication reconciliation is that it is a time-consuming and sometimes resource-intensive process. A qualitative study by Kennelty et al. (2015) examined barriers and facilitators faced by community pharmacists during medication reconciliation for recently discharged patients through semi-structured interviews from a Wisconsin pharmacist-based research network. After interviewing ten pharmacists, the authors noted several themes including attitudes towards medication reconciliation, social beliefs, and barriers and facilitators. The pharmacists conveyed importance of performing medication reconciliation for their recently discharged patients and that it was "part of their job," but they also agreed that the process was time consuming (Kennelty et al., 2015, p. 7). Half of the pharmacists mentioned lack of reimbursement as another disadvantage for medication reconciliation.



Perceived social influences that valued medication reconciliation included professional patients, pharmacy organizations, physicians, and pharmacy management. When relationships were already established, pharmacists believed they had an easier time obtaining information from providers and patients regarding patients' medications. However, they also felt that management was "driven by budgets, prescription counts, and costs" and were displeased with their organization's practice of incentivizing patients for "transferring a prescription from a pharmacy competitor," potentially increasing use of multiple pharmacies (Kennelty et al., 2015, p. 8). Time was considered as the largest barrier shared among pharmacists while performing medication reconciliation. Another barrier mentioned was patients with complex medication regimens unless the patient or caregiver was a reliable "historian" because pharmacists did not have to contact providers to clarify medication orders (Kennelty et al., 2015, p. 10). Pharmacists also discussed inability to access patient electronic medical records or clinical notes, which affected time to reconcile medications as well. One pharmacist mentioned that it was difficult for her pharmacy to contact prescribers from a nearby discharging facility to clarify prescriptions because there was no affiliation between the pharmacy and facility.

The authors note that there is some communication between providers and community pharmacies, especially when providers contact them to check patient medication-taking history, but community pharmacies should be included in future transitional care research because they serve as a vital health care resource for patients within the community. Limited resources may be another barrier to medication reconciliation, especially in critical access hospitals or smaller facilities where pharmacists or pharmacy technicians may not be staffed. With limited resources, the

responsibility of completing medication reconciliation is often done by nurses and physicians. There is a definite need for more information regarding nurse-led medication reconciliation management in outpatient settings.

### **Standardized Medication Reconciliation and Auditing Tool**

A multi-site gap analysis study by Elbeddini et al. (2021) aimed to develop a standardized medication reconciliation framework implementable in various health care settings and create a standardized auditing tool to assess quality of the medication reconciliation process. Data was collected at four sites: two hospitals, a long-term care facility, and a local community pharmacy and a standardized medication reconciliation tool was developed based on the data collected. The authors found that a standardized medication reconciliation process was not implemented in any of the four observed sites and the sites lacked delegated medication reconciliation teams and training related to the process, leading to medication discrepancies at discharge (Elbeddini et al., 2021, p. 1).

The authors' proposed standardized medication reconciliation framework included formulating a pharmacy-led medication reconciliation team, proactively obtaining a BPMH, obtaining an accurate BPMH, identify discrepancies between BPMH and medication orders, and create a patient's own document sheet at discharge to ensure patients are aware of changes in their medication regimen (Elbeddini et al., 2021, p. 5-7). The authors also proposed two standardized medication reconciliation auditing tools, one focused on the pharmacy-led team and the second focused on the medication reconciliation process. Each question on the tool is given a score of "1 or 0 based on corresponding answers of yes or no, respectively" and the score for each question is added up to an average medication reconciliation score "for every patient file being

audited,” with a total of at least 20 patients being audited each month “to ensure high-quality medication reconciliation processes” are completed (Elbeddini et al., 2021, p. 7).

The standardized medication reconciliation auditing tool includes questions on obtaining an accurate BPMH on admission, transfer, and discharge, if discrepancies between BPMH and “medication administration record (MAR) [were] identified and resolved within 24 [hours] of admission” and discharge, if a standardized discharge report was faxed to the patient’s primary pharmacy, if the patient received their own patient document sheet at discharge, if the patient was counselled on all medications at discharge, and if there was a discussion on medication cost and insurance coverage with the patient (Elbeddini et al., 2021, p. 8). Implementation of a thorough auditing tool allows for continuous quality improvement and higher quality patient care. The authors do note that some of the limitations to the study include the fact that the auditing tool was not validated and that a small sample size of health care settings was used. The authors also emphasize that having a standardized medication reconciliation framework can have meaningful impact on reducing potential ADREs, medication errors, and hospital readmission rates. They note that future research will need to be done to validate the auditing tool and the medication reconciliation framework.

### **Nursing Student Medication Reconciliation Education**

There are different teaching approaches used to educate nursing students on medication errors and medication reconciliation. A quasi-experimental one-group pre-and posttest study by Saude et al. (2020) examined how an intervention guided by the Chronic Card Model could improve patients’ activation (self-care management skills) and delivery of chronic disease care by family nurse practitioner (FNP) and baccalaureate

nursing students (BSN) at a nurse-managed student-run free clinic. Data was collected from 19 patients who had at least one chronic health condition, were uninsured or underinsured, and were between the ages of 18 to 65 years receiving care between May 2015 and July 2015 (Saude et al., 2020, p. 3). The intervention, Patient Activation Intervention (PAI), aimed to “enhance patient activation (i.e., self-care management) and the chronic illness care provided by FNP students and BSN students to medically underserved people” with education including “medication management, basic knowledge of the chronic disease, when to call the clinic to report symptoms, diet, and physical activity” (Saude et al., 2020, p. 2). The Patient Activation Measure (PAM) tool and chart audit tool were used to collect data for PAI evaluation. The PAM tool was a 13-item instrument that assessed patient perception of “knowledge, skills, and self-confidence in managing their health or chronic illness” (Saude et al., 2020, p. 3). Nursing faculty, healthcare providers, BSN and FNP students in the clinic were “trained on relevant aspects of the intervention” prior to intervention implementation (Saude et al., 2020, p. 3).

The authors found that the mean PAM score was 60.95, equating to a level three of four on patient activation, indicating that patients scoring a level of three “have been found to have excellent foundational understanding of their chronic illness and are working on their self-care management abilities” (Saude et al., 2020, p. 3). They also found “statistically significant increase from baseline for documentation of medication reconciliation [from 58.1% to 95.2%], patient-centered goals [from 2.3% to 71.4%], self-care management education [from 41.9% to 100%], and follow-up appointment scheduling” (Saude et al., 2020, p. 4). The authors concluded that “improved patient

activation and clinical outcomes can be attributed to accurate medication reconciliation, providing self-care management education, and enhanced access to follow-up appointments” ensuring that care is provided across the continuum and that “this care can be effectively provided by nursing students” (Saude et al., 2020, p. 4). Limitations mentioned in the study included small sample size, frequent changes in BSN students, and unique barriers present in the uninsured and underinsured patient population (lack of resources, transportation, language barriers, low health literacy levels). The study helps inform nurses and nurse educators about a unique and innovative approach in engaging nursing students within their own communities to increase healthcare service and accessibility to a special patient population. It also helps convey how nursing students can benefit from receiving medication reconciliation education and being able to use the skill in practice.

Another study focused on nursing student perception of the effectiveness of an educational intervention. Hewitt et al. (2015) examined Bachelor of Nursing (BN) students’ perceived effectiveness of an educational intervention that promoted a “systems approach to understanding medication adverse effects and errors” at an Australian university through a post-education survey. Data was collected from 28 students out of 460 eligible students, who had completed a “Medication and safe administration” course and had started clinical practice the previous year” (Hewitt et al., 2015, p. 19). The educational intervention consisted of a “series of short digital recordings” designed for “first-year BN students using structured learning activities that focused on [interprofessional learning (IPL)] teamwork activities” which illustrated “interactions between health care professionals” involved in medication administration and were

“loosely based on de-identified real-life scenarios of medication error situations in acute care settings” experienced by the researchers” (Hewitt et al., 2015, p. 19). Each digital recording focused on system factors like individual, task, team, and system factors that could increase likelihood of a medication error occurring with strategies to avoid those situations provided afterward (Hewitt et al., 2015, p. 19). The survey was a 6-item survey with an opportunity for students to provide qualitative feedback as an open-ended question. The survey was designed to evaluate “effectiveness of the recordings and resources in highlighting system factors and the multidisciplinary nature of medication administration and errors” (Hewitt et al., 2015, p. 19).

The authors found that the educational intervention proved to be useful in achieving the aim of the study’s purpose. Based on the participating students, 67.9% reported that the “recordings clearly demonstrated a systems approach to safe medication practice” related to the different system factors and that the strategies “outlined to prevent medication error were very applicable to current clinical practice” (Hewitt et al., 2015, p. 19). Most of the students (82.1%) believed the “content as it related to safe medication practice, was very appropriate for undergraduate BN students” (Hewitt et al., 2015, p. 19). A theme noted from the qualitative comments included clear and applicable provided information after evaluation of the educational intervention. The authors concluded that the results from the study support the “use of the digital recordings that are based on real-life experiences, as a means of demonstrating systems factors that are otherwise difficult to [conceptualize] and comprehend” (Hewitt et al., 2015, p. 20). Limitations for the study included small sample size and demographic data was not collected. The authors mention that the educational intervention allows for ease of transferability among other health

education providers and that the intervention can encourage students to carry learned skills into their clinical practice. The article suggests a positive impact on nursing students who are learning about medication administration and medication errors during their schooling.

One study examined nursing student education and role in the medication reconciliation process based on perspectives from academic faculty and hospital nurses in leadership positions. Krivanek et al. (2019) conducted a descriptive study design with a survey component to understand perspectives of the medication reconciliation process from academic faculty and practice leaders in the state of Ohio. Of the identified nursing leaders in 90 schools of nursing and 160 Ohio nurse executives invited to participate in the survey in 2015, surveys were completed by “47% of the academic leaders (42/90) and 23% of the practice leaders (42/160)” (Krivanek et al., 2019, p. 76). Participants from academic and healthcare institutions received a four-item survey with questions relevant to the institution which were piloted by pharmacists and nursing content experts with revisions to enhance content and clarity. Academic institution survey questions focused on teaching methods used in nursing schools about medication reconciliation and the student’s role in the medication reconciliation process in clinical learning environments while healthcare institution survey questions focused on formal training, medication reconciliation purpose, who is involved in the process, and if nursing students could perform medication reconciliation at the healthcare facility (Krivanek et al., 2019, p. 76).

The authors found that academic faculty respondent definitions of medication reconciliation “varied widely” and that 33% of respondents reported receiving “site-specific medication reconciliation education on the policy and process,” 24% did not

receive education, and 38% were unsure (Krivanek et al., 2019, p. 77). Academic faculty respondents from “75% of the schools of nursing reported that the medication reconciliation curriculum was mostly taught in the classroom” and during clinical time, “33% of faculty reported that students had direct involvement and 33% had the opportunity to observe the process of medication reconciliation” (Krivanek et al., 2019, p. 75). Responses from nurses in leadership positions in healthcare institutions reported that “more than half of the practice sites (52%) clinical faculty and nursing students were provided with formal training on medication reconciliation, however students were usually not permitted to perform medication reconciliation in nearly 80% of the practice settings” (Krivanek et al., 2019, p. 77-78). Identified healthcare team members involved in the medication reconciliation process included “physicians (75%), nurses (75%), pharmacists (50%), and pharmacy technicians (50%)” (Krivanek et al., 2019, p. 78). The authors concluded that results of their findings indicated a need to improve nursing education of the medication reconciliation process in collaboration with leaders in healthcare practice settings. They also supported efforts to clarify roles and responsibilities regarding medication reconciliation in practice settings. The authors highlighted the importance of gaps noted in students’ education and role related to medication reconciliation, reporting that “students did not consistently receive education on medication reconciliation in the classroom or the clinical setting” (Krivanek et al., 2019, p. 78). The authors note that collaboration between academic and healthcare institutions in terms of medication reconciliation education is necessary for students to acknowledge and understand the medication reconciliation process as an involved safety intervention. Nursing students with an understanding of the medication reconciliation



process, roles, and responsibilities of healthcare team members involved can be better prepared to participate in the process as practicing registered nurses in the future.

### **Summary**

Medication discrepancies are not uncommon, and they can happen in inpatient or outpatient settings. Identifying and resolving medication discrepancies through medication reconciliation is key in reducing risk for potential adverse drug events and improving patient health outcomes. Ongoing staff education and training are necessary to promote continuous quality improvement and understanding of current evidence-based guidelines or recommendations. Standardization of the medication reconciliation process is essential to maintaining consistency and accuracy among staff members involved. The process may be a time-consuming, but it is a vital component to promoting patient safety and high-quality patient care.

## **Chapter III**

### **Methodology**

This chapter reviews the specific methodology for the Doctor of Nursing Practice (DNP) scholarly project regarding project design, data collection, instrumentation, and statistical analysis. The DNP scholarly project was focused on evaluating how promotion of medication reconciliation education to junior and senior-level nursing students can increase knowledge of medication reconciliation within a nursing school.

#### **Project Design**

The DNP scholarly project used an educational intervention with a quantitative research design, utilizing a combination of a pretest and posttest questionnaire assessing medication reconciliation knowledge with a demographical information portion. The pretest was completed prior to the educational presentation and the posttest was completed after the presentation.

#### **Target Population**

The project was conducted in two classes offered to junior and senior-level nursing students in a Midwest regional university of Fall 2021, Nursing Fundamentals and Concepts of Leadership, respectively. The target population for the project included all nursing students enrolled in those classes during the semesters listed. There were 84

enrolled senior-level nursing students and 89 junior-level nursing students enrolled per class.

### **Target Population Recruitment**

Participants were invited to engage in the educational presentation and complete the questionnaires through an online announcement, the first of three announcements, made by the instructor of the course through Canvas between the week of November 1<sup>st</sup> and November 5<sup>th</sup>. The first announcement introduced the researcher's project. For participants who voluntarily agreed, the educational presentation, and questionnaires were administered by the researcher and instructors of the courses.

Participants who agreed were directed, via the second online Canvas announcement on November 8<sup>th</sup>, to the course's modules where a module included the researcher's questionnaires, and educational presentation for participants to take and complete. Full participation in the study included completion of the educational presentation, and completion of the pretest and posttest.

### **Inclusion and Exclusion Criteria**

Inclusion criteria for participants included all nursing students enrolled in Nursing Fundamentals or Concepts of Leadership during Fall 2021. The participants needed to be over the age of 18 years old. Exclusion criteria included those who did not give consent, those who did not speak or understand English, were under the age of 18, not enrolled in one of the two nursing classes, or those who did not fully participate in all steps of the project.

## **Protection of Human Subjects**

The criteria form for human subjects was reviewed by the researcher and deemed that the project followed Pittsburg State University's human subject guidelines and criteria as an exempt study. The project's procedures were reviewed by the Human Subject Committees in the Irene Ransom Bradley School of Nursing and Pittsburg State University. The target population did not include minors under 18 years of age as participants, prisoners, nor was it targeted towards people of a particular race, religion, or gender. The educational presentation and questionnaires presented minimal risk to participants. Possible risks included emotional stress or discomfort, loss of confidentiality and embarrassment. Participants were informed that their participation in the study would be voluntary and that their responses would be kept confidential. Completion of the questionnaires implied consent in the project. Every effort was made to maintain participant confidentiality. The questionnaires were numbered. After the questionnaires were completed, they were stored in a locked and secured box accessible only to the researcher and the DNP Scholarly Project committee. At completion of the scholarly project, the questionnaires will be stored in a locked box and in the locked cabinet of the scholarly project advisor's office to be shredded two years later.

## **Internal Review Board Approval**

The DNP scholarly project was presented to and approved by the researcher's scholarly project committee members and through the Protection of Human Subjects (PHS) committee of Pittsburg State University Irene Ransom Bradley School of Nursing (IRBSON) upon approval of the proposal by the scholarly project committee. After

approval through the IRBSON PHS committee, the IRB application was sent to the PSU IRB Committee.

Prior to obtaining IRB approval through the IRB of PSU, the researcher contacted the Director of the IRBSON and each instructor involved in teaching the nursing classes. An approval letter was obtained from each and included in the PSU Irene Ransom Bradley application. After obtaining IRB approval through PSU, the researcher made contact again with each instructor and a signature from each instructor was obtained granting approval to conduct the educational presentation and administer the questionnaires to nursing students enrolled in their respective nursing classes. After project approval, the time frame for data collection was set from October 2021 through November 2021.

### **Instruments**

The tools used within the project included the educational presentation and a pre- and posttest with a demographical information portion. The educational presentation (Appendix B) contained content regarding the purpose and importance of medication reconciliation, identification of medication discrepancies, barriers to the medication reconciliation process, and ways to improve the medication reconciliation process.

The pretest (Appendix A) and posttest (Appendix A) questionnaires were adapted and used with permission from Dr. Rana Abufarha (Personal communication, June 25, 2021) (Appendix D). This researcher added in a demographical information portion (Appendix A) to the beginning of the pre- and posttests with five questions identifying participants by: their current year of nursing school, gender, age, years of experience in

health care, and if they are aware of medication reconciliation. The nursing students will not have access to the questionnaire results.

The questionnaires were administered to participants before and after the educational presentation respectively. The 10-item questionnaire assessed nursing student knowledge of medication reconciliation, medication discrepancies, best possible medication history (BPMH), and roles in medication reconciliation through multiple-choice answers. It was also used to evaluate the effectiveness of the educational presentation related to medication reconciliation.

### **Project Resources**

The resources required for the project included online access to the nursing classes and access to a computer system to develop and administer the questionnaires at the time of the educational presentation to participating and voluntary nursing students.

### **Procedure**

The purpose of this quality improvement project was to assess and increase knowledge of junior and senior-level nursing students before and after an educational presentation of medication reconciliation. The scholarly project included a pretest with a demographical information portion, an educational presentation, and a posttest. The pretest and posttest with a demographical information portion and educational presentation were administered through Canvas as an ungraded assignment.

For Fall 2021, the instructor of each respective nursing class created three announcements through Canvas: the first one announced and introduced the project, the second one announced the opening of the pretest and educational presentation, and the third one announced the opening of the posttest. In each announcement, the purpose of

the project was explained, participants were informed that their confidentiality would be maintained, participant answers would be kept anonymous, and that they can stop participation at any time.

Participants were invited to engage in the educational presentation and complete the questionnaires through the first online announcement, made by the instructor of the course through Canvas between the week of November 1<sup>st</sup> and November 5<sup>th</sup>. After recruiting interested and voluntary participants through the second online course announcement made on November 8<sup>th</sup> in Canvas, participants were directed to the researcher's module that included the pretest and posttest with a demographical information portion, and educational presentation. The pretest and educational presentation were open from November 8<sup>th</sup> through November 13<sup>th</sup> for voluntary participants. The educational presentation (Appendix C) was presented as a voiceover PowerPoint presentation to the participants which lasted 15 minutes. At the end of the presentation, participants were reminded to participate in the posttest.

There was a two-week gap beginning November 15<sup>th</sup> through November 27<sup>th</sup> to allow for a break between pre- and posttest. The third and final online announcement through Canvas about the posttest was announced on November 29<sup>th</sup> when the posttest was open. Afterward, the instructor of the class opened the ungraded assignment that included the posttest for participants to take between November 29<sup>th</sup> through December 4<sup>th</sup>.

The number of participants during Fall 2021 was 71. Participant answers to the pre- and posttest questionnaires with a demographical information portion were kept anonymous and confidential. Using Canvas to administer the pretest, posttest, and

voiceover educational PowerPoint presentation minimized variation in teaching and allowed for ease of data collection electronically. Only the researcher and the DNP Scholarly Project committee have access to the information collected.

### **Data Analysis**

Data analysis was accomplished through use of SPSS 26. Data was collected electronically and inputted into SPSS 26. A probability level of  $p < 0.05$  is considered statistically significant (Farha et al., 2020, p. 4). Therefore, the probability level of  $p < 0.05$  was selected for determination of statistical significance for this project.

Descriptive analysis was performed on each subset of data. Additionally, paired *t*-tests were be conducted for the pre- and posttest results.

Outcome data included the assessment and evaluation of participant medication reconciliation knowledge through the pre- and posttest, and demographical information. To assess nursing student knowledge of medication reconciliation before and after the educational presentation, percentage of correct answers on the pretest were compared to percentage of correct answers on the posttest. These rates were compared through use of a paired *t*-test to analyze if significant improvement was achieved. A  $p < 0.05$  was used to determine if the difference was significant.

Based on the analysis of the pre- and posttest, the following outcomes will be generated by the SPSS program for the following research questions:

1. What is the knowledge of junior and senior-level nursing students in a nursing school about medication reconciliation prior to an educational intervention?
2. What is the knowledge of junior and senior-level nursing students in a nursing school about medication reconciliation after an educational intervention?



3. Is there a significant improvement in the knowledge of medication reconciliation in junior and senior-level nursing students in a nursing school after an educational intervention?

### **Outcomes**

Outcomes of the scholarly project were a result of the assessment and evaluation of nursing student knowledge of medication reconciliation through percentage rates of correct answers to the pre- and posttests regarding medication reconciliation knowledge prior to and after implementation of the educational presentation and obtained demographical information. Results from the scholarly project can guide future action through promotion of continued education and research towards improving the quality of education provided to students regarding medication reconciliation. The results conveyed the continued need for ongoing medication reconciliation knowledge to ensure clinical competency and the push for clearer roles concerning medication reconciliation responsibilities.

### **Evaluation Measures Linked to Objectives**

Objectives in the logic model were used as evaluation measures. The project contained a pre- and posttest with a demographical information portion, and an educational presentation to evaluate knowledge regarding medication reconciliation. The outcomes to be evaluated included increasing nursing student knowledge of medication reconciliation, collecting percentage rates of correct answers to the pre- and posttests regarding medication reconciliation knowledge prior to and after implementation of the intervention, assessing data from the pre- and posttest, and evaluating data to determine if there was a significant increase in nursing student knowledge of medication

reconciliation after intervention. Correct answers on the posttest meant that a positive outcome was achieved. A short-term outcome to be accomplished was increased knowledge of medication reconciliation after the educational presentation. An intermediate outcome was an increase in knowledge of medication reconciliation in nursing students. Long-term outcomes included increase in knowledge of medication reconciliation nursing students and health care team members involved and, ideally, a decrease in medication errors.

### **Tools Described and Linked Objectives**

The measurement tools included a pre- and posttest prior to and after an educational presentation over evidence-based research of medication reconciliation with a demographical information portion included in the pre- and posttest. At the beginning of the pre- and posttest, there was a demographical information portion that included three questions identifying participants by: current year as a nursing student, gender, and if they were aware of medication reconciliation. Following, the pre- and posttest included ten medication reconciliation knowledge-based multiple-choice questions. The posttest utilized the same questions as the pretest. Each question was worth 1 point if correct and 0 points if incorrect. A total score of correct answers were calculated for each participant. The responses to the questions can validate adherence to evidence-based practice related to medication reconciliation and are used and adapted with permission from Farha et al. (2020). The table below represented questions answered and intended outcomes for the project.

**Table I***Objectives, Measurements, and Outcomes*

Research Questions	Measurement	Outcome	Analysis
Participants will have knowledge of medication reconciliation prior to an educational intervention in a nursing school	Participants will submit correct answers on the pretest prior to an educational intervention in a nursing school	Participants will appropriately identify correct answers on the medication reconciliation questionnaire, pretest	<i>t</i> -test
Participants will have knowledge of medication reconciliation after an educational intervention in a nursing school	Participants will submit correct answers on the pretest after an educational intervention in a nursing school	Participants will appropriately identify correct answers on the medication reconciliation questionnaire, posttest	<i>t</i> -test
A significant increase in knowledge of medication reconciliation in junior and senior-level nursing students in a nursing school will be provided	A significant improvement in knowledge of medication reconciliation after an educational intervention will be provided after analyzing the difference between knowledge of medication reconciliation through correct answer percentage rates prior to and after the intervention	A significant increase in knowledge of medication reconciliation in junior and senior-level nursing students in a nursing school after an educational intervention will be accurate	Paired <i>t</i> -test

### **Methods of Analysis for each Measurement**

Data collected was analyzed using SPSS software. Descriptive analysis was completed to determine frequency, mean and standard deviation (SD) for continuous variables. To evaluate pre- and posttest knowledge changes, a paired *t*-test was used. A *p*-value of less than 0.05 was deemed statistically significant for statistical analysis (Farha et al., 2020, p. 4) in this project.

### **Project Sustainability**

For the project to be sustainable, it must have organizational and leadership support, nursing student support and willingness, continued teaching and education, and routine monitoring and evaluation of the project's outcomes. If nursing student knowledge of medication reconciliation enrolled in the nursing classes decreased after implementation of the educational presentation, a post-implementation audit or a root cause analysis may be considered to identify potential causes and barriers. After identification of root causes, improvement strategies should be targeted towards those causes. The sustainability of the project depends on the previously mentioned concepts with emphasis on the continued support and willingness of the school and instructors, leadership, and nursing students.

### **Summary**

The DNP scholarly project was an educational intervention with a quantitative research design that collected data from nursing students who met the inclusion criteria and voluntarily chose to participate in the study. The purpose of the project focused on increasing nursing student knowledge of medication reconciliation. Instruments utilized within the project included an educational presentation, and a pre- and posttest with a

demographical information portion. Several statistical tests were used to analyze collected data. Although various factors affect the project's sustainability, much emphasis is placed on the continued support and willingness that extend from the school and instructors to the individual nursing students.

## **Chapter IV**

### **Evaluation of Results**

The purpose of the project was to assess and increase knowledge of junior and senior-level nursing students before and after an educational presentation on medication reconciliation. Data was collected and analyzed from pre-and posttest scores to determine if there was a significant improvement in medication reconciliation knowledge after the educational presentation. This chapter provides a discussion of the studied sample population, analysis of collected data, and discusses the overall results of the project.

#### **Description of Sample Population**

The sample population for this DNP scholarly project was the population from Pittsburg State University of nursing students enrolled in Nursing Fundamentals or Concepts of Leadership during Fall 2021. There were 173 students eligible to participate in the project. Of the 173 nursing students, 104 junior and senior-level nursing students participated by completing the pretest and/or posttest. There was a total of 101 participants with data captured during the pretest time frame and 89 participants with data captured during the posttest time frame. However, full participation included the completion of the educational presentation, and completion of the pretest and posttest. From the 104 participants, data was included and examined from 71 participants based on matching unique codes provided by participants for the pretest and posttest who had

completed what was needed for full and complete participation. The other 33 participants had either completed the pretest and did not complete the posttest or completed the posttest and did not complete the pretest, so their data was not included in data analysis.

The pretest included demographical information questions on participants including gender (Table II), age (Tables III), years of experience working in healthcare (Table IV), and familiarity with the term of medication reconciliation (Table V).

**Table II**

*Junior and Senior-Level Nursing Student Gender*

	Frequency	Percent
Male	8	11.3
Female	63	88.7
Total	71	100.0

**Table III**

*Junior and Senior-Level Nursing Student Age*

	Frequency	Percent
18-21	55	77.5
22-25	12	16.9
26-29	1	1.4
30+	3	4.2
Total	71	100.0

**Table IV**

*Junior and Senior-Level Nursing Student Years of Experience Working in Healthcare*

	Frequency	Percent
No experience	12	16.9
Less than or equal to 1 year of experience	24	33.8
1-2 years of experience	21	29.6
More than 3 years of experience	14	19.7
Total	71	100.0

**Table V***Junior and Senior-Level Nursing Student: Heard of Medication Reconciliation?*

	Frequency	Percent
Yes	51	71.8
No	20	28.2
Total	71	100.0

Data was collected and examined from 71 (41.4%) participating junior and senior-level nursing students of the 173 eligible nursing students. Most students identified as female (88.7%, n = 63), being between the ages of 18 to 21 years of age (77.5%, n = 55), and had heard of medication reconciliation (71.8%, n= 51). For the question related to gender, 11.3% of participants (n = 8) identified as male. Age was broken down into different age ranges with responses from students who were between 18-21 years of age (77.5%, n= 55), 22-25 (16.9%, n = 12), 26-29 (1.4%, n = 1), and over 30 years of age (4.2%, n= 3). There were differences in years of experience that the students had spent working in healthcare including those who had no past experience (16.9%, n = 12), less than a year of experience (33.8%, n= 24), one to two years of experience (29.6%, n = 21), and more than three years of experience (19.7%, n = 14). Over a third of students (33.8%, n = 24) answered that they had less than a year of experience. Although most (71.8%, n = 51) students answered that they had heard of medication reconciliation, more than a quarter (28.2%, n = 20) of students answered that they had not heard of medication reconciliation before.

**Description of Key Variables**

The independent variable for this project was the educational presentation provided to nursing students in either Nursing Fundamentals or Concepts of Leadership



of Fall 2021 at Pittsburg State University. The dependent variable for the project was the pre-and posttest scores prior to and after the educational intervention for nursing students. The overall goal was to determine if the pre-and posttest scores were affected by the educational presentation provided to nursing students. The pre- and posttest included ten medication reconciliation knowledge-based multiple-choice questions. Additional key variables included the year the nursing student was in and when the student completed the pretest and posttest. Senior-level nursing students would have had an additional school year of clinical experience and knowledge compared to junior-level nursing students who would have just started nursing school in the fall.

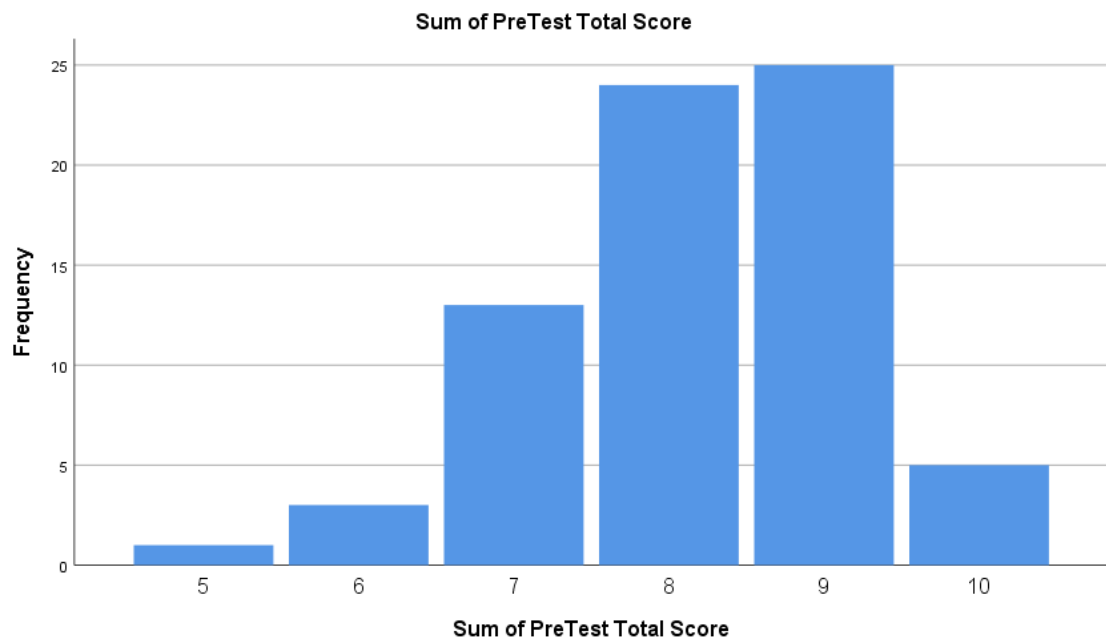
### **Analyses of Project Questions**

1. What is the knowledge of junior and senior-level nursing students in a nursing school about medication reconciliation prior to an educational intervention?

Based on the gathered data from junior and senior-level nursing students, the average baseline pretest score was 8.18 (SD = 1.05) out of 10 possible points.

**Table VI**

*Sum of Pretest Total Score*

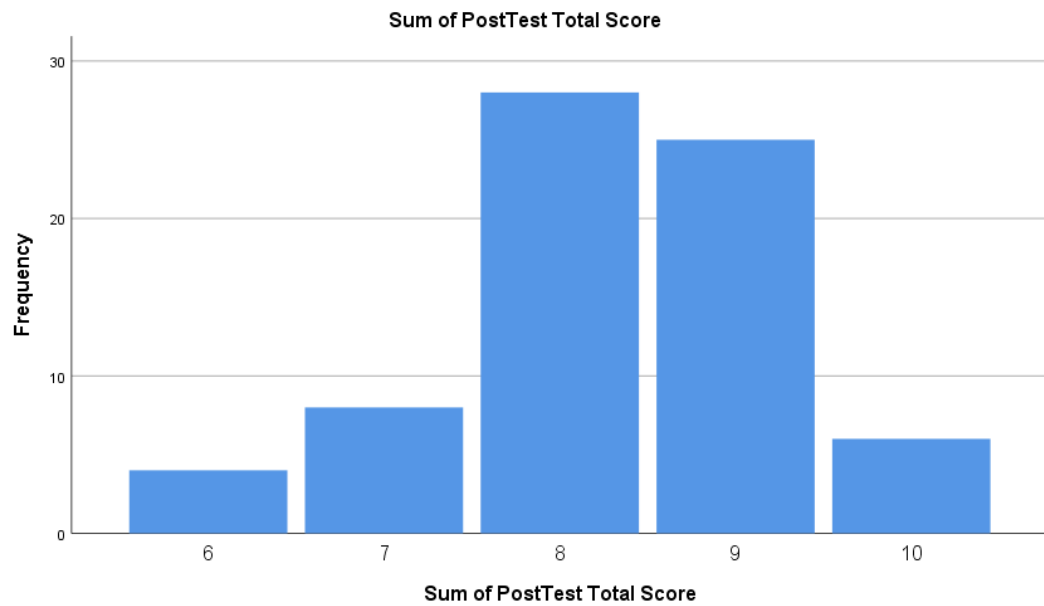


2. What is the knowledge of junior and senior-level nursing students in a nursing school about medication reconciliation after an educational intervention?

Based on the gathered data from junior and senior-level nursing students, the average posttest score was 8.30 (SD = 0.98) out of 10 possible points. There was a slight increase in medication reconciliation knowledge scores after analysis of posttest scores compared to pretest scores. However, there was not a significant difference in scores between the pretest and posttest groups.

**Table VII**

*Sum of Posttest Total Score*



3. Is there a significant improvement in the knowledge of medication reconciliation in junior and senior-level nursing students in a nursing school after an educational intervention?

There was not a significant improvement (2-tailed significance = 0.428,  $p < .05$ ) noted in nursing student medication reconciliation knowledge after the educational intervention.

**Table VIII***Paired Samples Test*

		Paired Samples Test							
		Paired Differences			95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	Sum of Pre 1 - Sum of Post 1	-.014	.267	.032	-.077	.049	-.445	70	.658
Pair 2	Sum of Pre 2 - Sum of Post 2	-.028	.167	.020	-.068	.011	-1.424	70	.159
Pair 3	Sum of Pre 3 - Sum of Post 3	-.085	.280	.033	-.151	-.018	-2.542	70	.013
Pair 4	Sum of Pre 4 - Sum of Post 4	.000	.378	.045	-.089	.089	.000	70	1.000
Pair 5	Sum of Pre 5 - Sum of Post 5	-.056	.287	.034	-.124	.012	-1.653	70	.103
Pair 6	Sum of Pre 6 - Sum of Post 6	.014	.463	.055	-.095	.124	.256	70	.798
Pair 7	Sum of Pre 7 - Sum of Post 7	-.014	.119	.014	-.042	.014	-1.000	70	.321
Pair 8	Sum of Pre 8 - Sum of Post 8	.000	.169	.020	-.040	.040	.000	70	1.000
Pair 9	Sum of Pre 9 - Sum of Post 9	.113	.494	.059	-.004	.230	1.921	70	.059
Pair 10	Sum of Pre 10 - Sum of Post 10	-.056	.532	.063	-.182	.069	-.893	70	.375
Pair 11	Sum of PreTest Total Score - Sum of PostTest Total Score	-.113	1.190	.141	-.394	.169	-.798	70	.428

**Summary**

The purpose of the project was to assess and improve nursing student knowledge of medication reconciliation in a nursing school. Data was collected and examined through pre-and posttest information obtained from voluntary and eligible participants. Although there was no significant improvement in medication reconciliation knowledge in junior and senior-level nursing students in a nursing school, the posttest scores slightly increased compared to pretest scores. The outcome of the project's results indicated a

potential for the educational intervention to have had a positive effect on improving nursing student knowledge of medication reconciliation.

## **Chapter V**

### **Discussion**

#### **Relationship of Outcomes to Research**

The purpose of the scholarly project was to assess and increase knowledge of junior and senior-level nursing students before and after an educational presentation on medication reconciliation. Previous discussion of literature review conveys the continued importance of performing medication reconciliation and using BPMH practices to reduce risk for potential medication errors (The High 5s Project, 2014; Gianni et al., 2019; Abdulghani et al., 2018). There are medication reconciliation guidelines and recommendations established at the national and international level supported by Joint Commission, AHRQ, and WHO. Although people acknowledge and perceive the value of medication reconciliation as an important process in reducing medication errors and harm to patients, healthcare team members may often receive little formal training and education during academic schooling on ways to obtain best possible medication history and how to implement steps (Farha et al., 2020; Ramjaun et al., 2015).

Using different media forms to teach students about medication reconciliation can be effective ways to enhance student learning and understanding (Farha et al., 2020, p. 1). The outcomes of this project conveyed slightly similar results of improved knowledge of medication reconciliation. Although this project found that there was no significant

improvement in knowledge of medication reconciliation in junior and senior-level nursing students in a nursing school after an educational intervention, posttest scores did increase from pretest scores (8.30 compared to the average pretest score of 8.18 out of 10 possible points), which is an improvement. It is important to note that nursing students may have had past knowledge of medication reconciliation prior to this project and that education on medication reconciliation occurred early in the nursing program and is retained. Nursing students who worked in healthcare roles may have also received medication reconciliation education prior to the project's data collection time.

### **Observations**

General observations noted during the project time included differences in number of participants among junior and senior-level nursing students and differences in number of participants during the pretest and posttest time periods. There were 61 junior nursing students compared to 10 senior nursing students who fully participated in the project. Although Canvas was utilized for the project to electronically distribute the tools (pretest, posttest, educational presentation) and collect data afterwards, the primary instructors involved in the distribution of the tools distributed them in differing ways. One instructor had assigned class time periods for students to voluntarily complete the pretest, educational presentation, and posttest which led to higher rates of participation. Another instructor did not have time to allow assigned class time periods for students to voluntarily participate in the project, so participation was based on student willingness to complete the project from online reminders and routine announcements through Canvas.

After evaluation of data collected for the project, it was noted that there were differences in the number of participants who completed the pretest compared to the

number of participants who completed the posttest. Ideally, those who completed the pretest would also participate in the posttest to ensure full participation. With the two-week gap between to assess knowledge gain and retention, students may have forgotten to participate in the posttest, leading to less participants with full participation. There were a few participants who did not match their unique code during pretest and posttest or forgot what their unique identity code was. These participants were not included during data analysis.

### **Evaluation of Theoretical Framework**

Kurt Lewin's "Change Theory of Nursing" was the chosen theoretical framework for this project. The framework focuses on change in a three-stage sequential model: unfreezing, change, and refreezing. The framework requires prior knowledge or learning to be rejected and replaced with new learning. Behavior is the main factor that is to be changed within the framework. Students continually acquire new knowledge while also re-learning and un-learning past information or teaching. Acquiring education on medication reconciliation can help expand student knowledge of the concept as they carry their knowledge with them throughout their professional practice and career. The framework's concepts were utilized throughout the project to increase nursing student knowledge and retention of medication reconciliation. Although nursing student knowledge was not significantly improved, there was some improvement in posttest scores to convey that some knowledge was retained. Long-term effects of the educational intervention were not evaluated with the limited time given during the writing of the scholarly project. The results of this project may not have demonstrated an urgent need to restructure or implement a medication reconciliation educational presentation for nursing



students in the nursing school. However, the results and the framework discussed may aid in future quality improvement projects related to medication reconciliation.

### **Evaluation of Logic Model**

The logic model (Figure II) for this project conveyed the different resources, activities, and outcome results involved in the improvement of medication reconciliation knowledge. The short-term outcome that focused on an increase in knowledge of medication reconciliation after the educational presentation was met because there was an increase in posttest scores after a two-week break in-between the pretest and educational presentation and the posttest. The intermediate outcome that focused on an increase in medication reconciliation knowledge was met and can be seen from the data collected. Although the increase was slight, it was a positive increase, nonetheless. The long-term outcomes have not been met yet, but they have the potential to be met after the project has been completed. The results of the project and education may serve as useful resources for those involved in medication reconciliation or wanting to expand knowledge of medication reconciliation.

### **Limitations**

There were several limitations for this project. Although some statistically significant data could be evaluated from the sample size of 71 students, results should not be used for generalizability since it is a small sample size. Two cohorts of students (first semester junior-level nursing students and final semester senior-level nursing students) from one nursing school were used to collect data, limiting generalizability of results. Multiple factors led to participant data not being counted towards data analysis. These factors include unmatched unique codes and participants who completed pretest or

posttest which further limited the sample size. The results from the project conveyed no statistically significant difference in the scores medication reconciliation knowledge between the two groups. This may indicate that medication reconciliation teaching occurs early in the program and is retained. It is also possible that the wording of pre- and posttest questions affected student scores since it was used with permission from Farha et al. (2020) with some changes to questions to better fit nursing student education.

### **Implications for Future Projects/Research**

The scholarly project has potential to contribute to the creation of future projects that are similarly focused on education and improvement of medication reconciliation knowledge. Future projects may consider different media forms as educational interventions to promote learning and knowledge retention. Future projects can consider teaching different audiences, particularly those directly involved in medication reconciliation including patients, family members, nurses, pharmacists, physicians, and nurse practitioners. In addition to evaluating knowledge gained and retained, it would be ideal to evaluate the effectiveness of the educational intervention provided to determine where changes need to be made to enhance content learning and understanding.

### **Implications for Practice/Education**

The results of this project indicate the continued need for increased education related to medication reconciliation. No matter the content, there is always room for improvement and areas where changes can be made to enhance student learning experience and understanding of contents. Although the results found no significant improvement in pretest and posttest scores for medication reconciliation knowledge in nursing students, medication reconciliation is a process they will run into and complete in

future practice. The knowledge gained and retained prior to and after the educational intervention can help students as they practice as nurses in the future. Individuals directly involved in medication reconciliation may also seek to change medication reconciliation processes within the systems they work in. A quality improvement project may be beneficial in helping create those changes in processes. Incorporation and evaluation of a medication reconciliation simulation scenario could also positively impact student understanding and learning experience. It would be interesting for future research to consider a longitudinal study to determine long-term outcomes and effects of a similar educational intervention as well.

### **Conclusion**

Medication reconciliation is a shared responsibility among patients, family members, nurses, pharmacists, and healthcare providers. Performing medication reconciliation aims to improve patient and medication safety, reduce risk for medication errors and potential adverse drug events, and keep patient medication information as current and accurate as possible. As undergraduate and graduate healthcare professional students prepare to enter the workforce in their respective professions, they may have lack of knowledge related to understanding BPMH practices, the medication reconciliation process, or unclear roles for those responsible for medication reconciliation. Medication reconciliation content may not be thoroughly covered content within the academic setting contributing to the lack of knowledge.

The purpose of the DNP scholarly project was to assess and increase knowledge of junior and senior-level nursing students before and after an educational presentation of medication reconciliation. The participants of this project included junior and senior-level

nursing students in a nursing school. Knowledge of medication reconciliation was measured through the comparison of pretest and posttest scores before and after an educational presentation. The results of the project demonstrated that although the posttest scores had slightly increased from pretest scores, there was no statistically significant difference in medication reconciliation knowledge. These results convey that medication reconciliation teaching most likely occurred early in the nursing program and was retained. This researcher hopes that the results of the project may serve as a contribution to current and future literature and that it may promote future research to be completed on improving knowledge of medication reconciliation and/or improving the medication reconciliation process.

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## APPENDIX

## Appendix A

### Evaluation of an Educational Presentation on Improving Nursing Students' Knowledge about Medication Reconciliation Demographics

1. **What year of nursing school are you in?**
  - a. Junior (1<sup>st</sup> year nursing student)
  - b. Senior (2<sup>nd</sup> year nursing student)
2. **What is your gender?**
  - a. Male
  - b. Female
3. **How old are you?**
  - a. 18-21 years of age
  - b. 22-25 years of age
  - c. 26-29 years of age
  - d. 30+ years of age
4. **How many years of experience working in health care do you have?**
  - a. No experience
  - b. ≤ 1 year of experience
  - c. 1-2 years of experience
  - d. More than 3 years of experience
5. **Have you ever heard of medication reconciliation?**
  - a. Yes
  - b. No

### Assessment of Nursing Student Knowledge Regarding Medication Reconciliation

For each of the following statements, select all correct options regarding medication reconciliation.

1. **Medication reconciliation is:**
  - a. The process of reporting adverse drug reaction to the authorized organization
  - b. A formalized, interactive, and multi-professional process for creating the most accurate and complete list of a patient's current medications and comparing the list to a patient's record or medication orders at interfaces of care
  - c. A simple interview of the patient
  - d. The process of providing patient counseling about risky medications
  - e. The process of ensuring appropriate use of abbreviations while writing medications in the inpatient or outpatient setting
2. **Why is it important to reconcile medications?**
  - a. To obtain a complete list of medications the patient is regularly taking
  - b. To reduce risk for adverse drug events

- c. To ensure the patient is receiving appropriate drug therapy
  - d. All of the above
- 3. Medication reconciliation can be achieved:**
- a. At patient admission
  - b. During an internal transfer at hospital
  - c. At discharge of the patient from hospital to home
  - d. During an outpatient office visit
  - e. At all of these transition of care points
- 4. What are the sources of information during the reconciliation process?**
- a. The patient
  - b. The physician
  - c. Family member/caregiver
  - d. Medication list
  - e. Community pharmacy profile
  - f. All of the above
- 5. A medication discrepancy may correspond to:**
- a. Omission of the drug usually taken by the patient
  - b. Drug dosage higher than the dosage usually prescribed
  - c. Drug duplicate from brand/generic name combinations or formulary substitutions
  - d. Drug dosage lower than the dosage usually prescribed
  - e. All of the above
- 6. To formalize a Best Possible Medication History (BPMH), it is best to consult:**
- a. One source of information
  - b. At least 2 sources of information
  - c. At least 3 sources of information
  - d. As many sources as possible that are involved in the patient's care
- 7. When collecting Best Possible Medication History (BPMH), we should collect information about:**
- a. Prescription medication
  - b. Over-the-counter medication
  - c. Complementary herbal medicine
  - d. Vitamins and supplements
  - e. All of the above
- 8. Who can be involved in the medication reconciliation process?**
- a. Nurses
  - b. Physicians
  - c. Pharmacists
  - d. Certified medical assistants
  - e. Pharmacy technicians
  - f. All of the above can be involved in medication reconciliation
- 9. According to the High5 Project under WHO, which of the following is not a step in the medication reconciliation process?**
- a. Obtain

- b. Verify
- c. Intensify
- d. Supply
- e. Reconcile
- f. All of the above are correct

**10. The medication list should include a medication's:**

- a. Name, dose, frequency, and route
- b. Name, frequency, last time taken, and route
- c. Name, dose, and route
- d. Name, dose, frequency, last time taken, and route
- e. None of the above are correct

## Appendix B

### Educational Session PowerPoint Presentation



1

*WHAT IS  
MEDICATION  
RECONCILIATION?  
(MED REC)*

- **Definition:** A process for creating the most accurate and complete list of a patient's current meds
  - AND comparing the list to a patient's record or med orders at transitions of care
- **Purpose:** Avoid medication errors + reduce risk for potential adverse drug events (PADEs) at transition of care points

(Joint Commission, 2021)

The slide has a light blue background with a vertical red line on the left side. The text is in a serif font, with the title in italics and the bullet points in a standard font. The definition and purpose are underlined for emphasis.

2

## *IMPORTANCE OF MED REC*

- Joint Commission National Patient Safety Goals 2020
- Reduce risk for potential adverse drug events (ADEs)
- Ensure patient is receiving appropriate drug therapy (health care providers)
- Improve communication and patient involvement

(Joint Commission, 2021)

3

## *DEFINITIONS*

- **Medication Lists:** External lists of medications obtained from the patient, hospital, another health care provider (HCP)
- **Transition of Care Points:** Hospital admission, transfer, discharge, ambulatory primary care, specialty, long-term care, home health
- **Sources of Information:** Patient (1), family member, physician, electronic health record (EHR), medication bottles, community pharmacy profile

("Medication reconciliation to prevent adverse drug events," 2021; Rattray et al., 2018)

4



*DEFINITIONS  
(CONTINUED)*

- **Medication Discrepancy:** The differences between two or more medication lists
  - Omissions, duplication, addition, incorrect dosages, drug interactions
- **Unintentional:** Lack documentation of medication changes in the patient's EHR list or clinical record

(Akram et al., 2015, p. 1)

5

*BEST  
POSSIBLE  
MEDICATION  
HISTORY  
(BPMH)*

- A thorough history of medication use with at least 2+ sources of information including an interview with the patient
- Includes:
  - Prescription medications
  - Over-the-counter (OTC)
  - Complementary herbal medicine
  - Vitamins and supplements
  - As needed (PRN) medications

(How to obtain the best possible medication history, 2009)

6

## STEPS TO MED REC

1. Obtain

2. Confirm

3. Reconcile

4. Supply

- 1. **Obtain** BPMH
  - Compile list patient is taking through an interview w/patient
- 2. **Confirm** history accuracy
  - Verify with 2+ sources of information
- 3. **Reconcile** BPMH with meds prescribed
  - Compare BPMH with ordered medications
  - Resolve discrepancies with prescriber + document changes
- 4. **Supply** accurate medication information
  - To the receiving clinician, patient, caregiver when transferring care
  - Include list of current medications and reasons for changes

(The High 5s Project, 2014)

7

## BARRIERS

- **Time**
  - Time-intensive
  - Competing responsibilities
- **Patient**
  - Knowledge and understanding
  - Reliability as a historian
  - Attitudes, self-management?
- **Staff**
  - Knowledge and understanding
  - Attitudes - resistance (work culture, status quo) and interest
  - Roles and responsibilities
- **Health information exchange (HIE) + EHR system** capabilities
  - Patient seeing an HCP outside of the system
  - Pharmacist without access to patient health record

(Kennelty et al., 2015; Redmond et al., 2020)

8

*WHO IS  
INVOLVED?  
WHAT CAN  
WE DO?*

- Physicians, pharmacists, nurses, medical assistants, patients and family members
- Promote a workplace culture of safety
  - Interprofessional cooperation + engagement
  - Leadership and management support
  - Safety policies and procedures
- Patient education
  - Assess level of understanding, importance of medication reconciliation
  - Current medication list
- Continued staff training
  - Standardized approach (workflow)
  - Documentation (name, dose, route, frequency)
    - Clarify with HCP
  - Individualize feedback

(Linden-Lahti et al., 2019; McCarthy et al., 2016)

9

*THANK YOU  
FOR YOUR  
TIME!*

- Please make sure to fill out the posttest!

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- The High 5s Project (2014). *The High 5s Project – standard operating protocol: Assuring medication accuracy at transitions in care: Medication reconciliation* [PDF file]. The World Health Organization.  
<https://www.who.int/patientsafety/implementation/solutions/high5s/h5s-sop.pdf?ua=1>.

# Appendix C

## E-Mail for Questionnaire Use Approval

to me ▾ Fri, Jun 25, 2021, 7:43 AM ☆ ↶ ⋮

Hi MY,

Hope this email finds you well. For sure you can use the questionnaire included in the article, and if you need any help do not hesitate to ask me.

Regards,  
Rana

*Dr. Rana Abu Farha, BPharm, MSc, PhD*  
*Associate Professor*  
*Department of clinical pharmacy and therapeutics*  
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*Amman-Jordan, 11931. P.O.Box 166*

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**From:** MY TRINH [REDACTED]  
**Sent:** Wednesday, June 23, 2021 9:59 PM  
**To:** [REDACTED]  
**Subject:** Requesting Approval for Questionnaire Adaptation

📎

Hello, Dr. Abu Farha!

My name is My and I am a second-year nurse practitioner student working on my Doctor of Nursing Practice (DNP) scholarly project at Pittsburg State University.

I am writing this email to personally ask for your permission to adapt the questionnaires used in your article "Evaluation of the effect of video tutorial training on improving pharmacy students' knowledge and skills about medication reconciliation" (<https://dx.doi.org/10.1186/s12913-020-17111-1>). I think the article is appropriate for my topic idea and would help tie my scholarly project together.

My scholarly project is focused on medication reconciliation in an outpatient internal medicine office setting so I would like to use and adapt the questions asked and the format in "Table 2. Evaluation of students' knowledge pre and post the video tutorial training" and "Table 3. Evaluation of students' satisfaction with the training process." I would also like to re-word some of the questions to better fit the outpatient office setting. I plan to use an educational PowerPoint presentation in place of a video tutorial. I will make sure to credit you as the author and the study appropriately in my paper.

Please contact me with any questions or concerns. I look forward to hearing from you soon.