2017

Development of an Evidence-Based Protocol for the Management of Acute Vertebral Fragility Fractures

Shannon De Ann Carey
Walden University

Walden University

College of Health Sciences

This is to certify that the doctoral study by

Shannon Carey

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee
Dr. Mattie Burton, Committee Chairperson, Nursing Faculty
Dr. Catherine Garner, Committee Member, Nursing Faculty
Dr. Tracy Scott, University Reviewer, Nursing Faculty

Chief Academic Officer
Eric Riedel, Ph.D.

Walden University
2017

Abstract

Development of an Evidence-Based Protocol for the Management of Acute Vertebral Fragility Fractures

by

Shannon D. Carey

MSN, University of Texas at Arlington, 2006

BSN, West Texas A&M University, 2001

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

Walden University

August 2017

Abstract

Vertebral fragility fractures are common, affecting approximately 50% of all postmenopausal women and 33% of men over the age of 50, and are the most common type of fracture seen in osteoporosis. The management of vertebral fragility fractures in the acute care setting is lacking in standardization, in the use of evidence-based practice, and in addressing the underlying cause of osteoporosis. The purpose of this project was to develop an evidence-based protocol to standardize the care of the vertebral fragility fracture in the acute care setting. This protocol included patient education, fall risk assessment, screening for osteoporosis, and follow up with an osteoporosis clinic for comprehensive management once discharged. This project used the Donabedian model to provide a conceptual framework for evaluating the structure, process, and outcomes related to the practice problem. This quantitative study involved 10 participants that were selected using purposive sampling and used process control charting to show compliance with elements of the guideline, and descriptive data to depict process change. Guideline compliance was measured over an 8-week period and indicated successful implementation of fall risk assessment with a 100% compliance rate and osteoporosis screening with an 80% compliance rate. Compliance with fracture education and securement of follow up were difficult to ascertain in the 8-week period and non-compliance evident. In conclusion, two elements of the guideline showed to be an unstable process and further work is necessary to improve. Positive social change may result from empowering nurses by education and giving them autonomy to use evidence-based practice to decrease the risk for secondary vertebral fragility fractures.

Development of an Evidence-Based Protocol for the Management of Acute Vertebral Fragility Fractures

by

Shannon D. Carey

MSN, University of Texas at Arlington, 2006

BSN, West Texas A&M University, 2001

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

Walden University

August 2017

Dedication

This project is dedicated to my son, Logan. Your enthusiasm for life has kept me on my toes and encourages me to succeed and be the best I can be. May you always find joy and happiness in the little things. Dream, big kid!

Acknowledgments

I would like to acknowledge and recognize the members of my faculty committee, Dr. Mattie Burton, Dr. Catherine Garner, and Dr. Tracy Scott. A special thanks to Dr. Burton for your encouragement, patience, and overall guidance throughout the completion of this project. Without your direction and wisdom, I would not have been able to successfully complete this milestone in my life.

I would like to acknowledge my boss, mentor, and friend, Debbie Phillips, for her understanding and patience with me during this time. She is a true leader and someone whom I am thankful to work alongside. She made a seemingly impossible task of working full time and completing this project possible, and I will always be grateful. I would like to thank Dr. Kirsten Drake for being an incredible mentor, allowing me to shadow her and learn from her exemplary leadership skills. She truly epitomizes the DNP role in her position. I would like to acknowledge Neely Nowell, the patient care facilitator on the project unit, as she helped me tremendously in identifying study participants. Additionally, I would like to thank Vicki Huff for her time and patience in helping me with the data portion of this project. Her knowledge and experience helped make this achievable.

I would like to acknowledge my peers and friends Kindra and Alison as they have listened to me talk about this project for the past year and have supported me throughout the entire process. Lastly, I would like to thank my family for their undying support in achieving my goals and never questioning why I chose to do these things.

Table of Contents

List of Tables iii

List of Figures iv

Section 1: Overview of the Evidence-Based Project 1

Introduction 1

Problem Statement 2

Purpose Statement 3

Nature of the Doctoral Project 4

Significance 5

Summary 7

Section 2: Background and Context 8

Introduction 8

Concepts, Models, and Theories 8

Relevance to Nursing Practice 10

Local Background and Context 13

Role of the DNP Student 14

Summary 15

Section 3: Collection and Analysis of Evidence 17

Introduction 17

Practice-Focused Question 17

Sources of Evidence 18

Published Outcomes and Research 19

Analysis and Synthesis 20
Summary 22
Section 4: Findings and Recommendations 23
Introduction 23
Findings and Implications 23
Recommendations 39
Strengths and Limitations of the Project 41
Section 5: Dissemination Plan 45
Analysis of Self 46
Summary 49
References 50
Appendix A: Vertebral Fragility Fracture Management Guideline 59

List of Tables

Table 1. Admittance Pattern for Implementation Period 24

Table 2. Population Demographics 24

List of Figures

Figure 1. Donabedian model……10

Figure 2. Fall risk assessment graph……28

Figure 3. Fracture education graph……30

Figure 4. Osteoporosis screening graph……32

Figure 5. Securement of follow-up graph……33

Figure 6. Overall compliance with guideline graph……34

Figure 7. Before and after comparison of mortality and readmissions……35

Figure 8. Before and after comparison of length of stays……35

Section 1: Overview of the Evidence-Based Project

Introduction

In the United States alone, there are an estimated 750,000 vertebral fractures yearly, with an associated annual cost of over 18 billion dollars (Kates & Mears, 2011). The incidence of vertebral fragility fractures increases significantly with age so that 1 out of every 6 women and 1 out of every 12 men will sustain a symptomatic vertebral fracture in their lifetime. These fractures result in a significant amount of pain, decreased functionality, and decreased overall quality of life (Gerdhem, 2013). Although the most important target is to prevent these fractures altogether, once a fracture occurs, the focus shifts to appropriate management and prevention of secondary fractures (Dionyssiotis, 2010). Up to half of patients with known vertebral fragility fractures will sustain additional vertebral fractures within 3 years, many of which will occur within the first year. These findings only accentuate that the optimal care of fragility fracture patients should be comprehensive and include not only management of the pain associated with the fracture, but also evaluation, diagnosis, and treatment of the underlying cause of the fracture (American Academy of Orthopedic Surgeons, 2009).

The nature of this DNP project involved designing a new model of care for this specific patient population using evidence-based practices and interdisciplinary collaboration. This project could potentially promote many positive social changes in the nursing profession by enhancing clinician and patient knowledge and promoting behavioral changes in this population. Nurses are key members of the interdisciplinary teams needed to manage these patients, and they act as team leaders in the coordination

of care and successful implementation of evidence-based interventions (Smeltzer, 2014). Osteoporosis and associated fragility fractures have such a high socioeconomic impact in relation to mortality, morbidity, and healthcare costs. Osteoporosis is detrimental to the patient's overall quality of care (Pisani et al., 2016). By empowering nurses to implement evidence-based practices for this patient population, it is possible to improve patient outcomes, lessen the risk for secondary fractures, and improve patient and staff satisfaction. Ultimately, the education that patients receive regarding fragility fractures and osteoporosis management as follow-up care may have a positive impact on their lives.

Problem Statement

Vertebral body fragility fractures are the most common fracture type associated with osteoporosis, yet there is a lack of substantial research on the management of these patients in the acute care setting. The practice setting was a licensed, 726-bed, Magnet-designated hospital that was a Level II trauma center. This organization saw over 92,000 patients through the emergency department in 2015, in addition to admitting nearly 34,000 to the hospital. The staff of this large organization included over 3,300 clinical personnel and approximately 1,200 physicians. The practicum setting served close to 14 counties and acted as a large referral center for neuroscience services.

The management of vertebral fragility fractures in the chosen practicum setting was often lacking in evidence-based practices, and the underlying cause of osteoporosis was often not addressed at all. Prior to the implementation of this project, the practicum setting had no formalized program or pathway for the treatment of patients with vertebral

fragility fractures. In fact, the care of this patient population was so variable that the nursing and support staff often had a difficult time managing the expectations for these patients and understanding the goal of care. The nursing staff lacked the knowledge regarding fragility fractures and osteoporosis that is needed to care for this patient population adequately. Barriers identified included the lack of a standardized approach to the care of the vertebral fragility fracture patient resulting in little to no guidance for the nursing staff. This doctoral project holds significance for the field of nursing by making a protocol available to guide practice in the care of this patient population. This allows nurses to have a direct impact in improving the health outcomes of their patients and improving patient satisfaction.

Purpose Statement

The purpose of this project was to develop a standardized practice guideline for the management of the vertebral fragility fracture in the acute care setting. This included education for both staff and patients regarding fragility fractures and osteoporosis as well as management of the fracture itself, assessment and diagnosis of osteoporosis, and securing the appropriate follow up with a dedicated osteoporosis clinic and/or physician who specializes in the disease. The health care organization where this project was implemented had no standardized approach to the management of these patients, and therefore the important elements of education and osteoporosis screening were often missing. Addressing this gap in practice, the guiding practice question for this project was whether the development and subsequent implementation of such a guideline promoting evidence-based practices would result in a more standardized nursing

approach to care and improvement in the assessment for osteoporosis in this patient population.

The program objectives for this project incorporated the desired outcomes of developing a best practice pathway to guide the care of these patients. The major stakeholders for this project included vertebral fragility fracture patients and the nursing staff in addition to the physicians and hospital leadership (Hodges & Videto, 2011). Objectives for this project were as follows:

1. Increase the knowledge of the nursing staff about vertebral fragility fractures and the evidence-based management thereof, as evidenced by oral presentation and documentation.
2. Develop a practice guideline for the management of vertebral fragility fractures in the acute care setting that includes the following elements:
    a. Patient education related to osteoporosis and fragility fractures.
    b. Osteoporosis screening protocols with the use of laboratory studies.
    c. Using a validated fall assessment tool to assess for fall risk.
    d. Securement of follow up with the appropriate specialists after discharge for ongoing care and fracture prevention.

Nature of the Doctoral Project

This doctoral project falls into the category of guideline development. The project included developing a protocol for the management of acute vertebral fragility fractures in the acute hospital setting that included education for the patients, screening for osteoporosis if the diagnosis was not known, assessment for fall risk and education

specific to this, and securing a follow-up appointment with an osteoporosis clinic for comprehensive management once discharged.

Sources of evidence included current research on the best practices for managing this population in regard to screening and treatment during the hospital stay. The outcomes management department of the organization assisted in getting retrospective data regarding previous fragility fractures. This data was used to describe previous practices in the management of this population including length of stay, readmission rates, and discharge disposition. Further data was obtained through chart audits of individual electronic medical records for pertinent data. These data were used to address the gaps in practice by documenting inconsistency in nursing care and the need for evidence-based practices in the routine management of this patient population.

Significance

There are several stakeholders for this DNP project. Perhaps the most important stakeholder is the patient admitted with a vertebral fragility fracture. Prior to the project's implementation, the care of these patients was variable and provider dependent. Often, the underlying cause of the fracture was not addressed during the hospital stay, leaving the patient at high risk for secondary fractures. Studies have shown that there is an overall lack of knowledge in women and men of the risks associated with osteoporosis and how to reduce fracture risk (Smeltzer, 2014). Implementation of the evidence-based practice project may decrease the risk of secondary fractures and result in improvement in overall satisfaction related to care received in the acute care setting. Other stakeholders include the providers and nursing staff, who play crucial roles in successful compliance with the

guideline developed. The project allows for a standardized approach that practitioners can institute to manage this patient population using best practices and subsequently improving patient outcomes. Nurses gain autonomy in their practice in implementing a protocol that they know is based on evidence and feel empowered as they improve patient care and increase their own knowledge as well as that of their patients.

The implementation of new guidelines to guide care can occur in many different settings. Practice guidelines are used to help guide practice and therefore should be used whenever they are available. This type of project is beneficial in any type of population management role where clinicians are trying to standardize care and improve patient outcomes. The nursing role itself is dynamic. The profession is continuously changing and evolving over time so that nurses are becoming more diverse and involved in their practice. A recent survey showed that although nurses have positive attitudes toward evidence-based practices, they face barriers in employing them due to the challenges associated with change (Stevens, 2013).

Positive social change implies a transformation that results in positive or improved outcomes. This positive social change can happen at many levels, including the individual patient level, organizational level, and national level. This project's potential implications for positive social change include the positive impact of implementing an evidence-based pathway to guide the care of the patient with an acute vertebral fragility fracture on patient outcomes such as secondary fracture rate, readmission rate, and patient education and satisfaction. Benefits potentially resulting from improvement to the care of this patient population include decreases in the cost of care and burden on society.

Summary

Acute vertebral fragility fractures are a common and significant problem for the older patient population and frequently require hospitalization. However, there is a lack of practice guidelines to guide the care of this patient population; therefore, they often receive suboptimal care, with important aspects of care not being addressed. The purpose of this DNP project was to develop a comprehensive practice protocol to guide the care of the patient admitted to the hospital with a vertebral fragility fracture that addresses all components of care. These components include staff education, patient education, fall risk assessment, and securement of follow up with the appropriate specialists once the patient has been discharged from the acute care setting. By standardizing care, monitoring outcomes, and educating staff, the project may improve outcomes and patient satisfaction. In the next section, I review the conceptual framework for the evidence-based practice project as well as its relevance to nursing practice and the role of the DNP student.

Section 2: Background and Context

Introduction

The care of the patient admitted to an acute care facility with a vertebral fragility fracture varies greatly, and often the underlying cause of the fracture is not addressed. The purpose of this project was to develop a standardized, comprehensive protocol for the management of patients with vertebral fragility fractures in the acute care setting. The development and subsequent implementation of this guideline promoted evidence-based practices, resulting in a more standardized nursing approach to care and improvement in assessment for osteoporosis in this patient population. In the following sections, I discuss the concepts used for the development of this project, the relevance the project has to the nursing profession, the local background and context, and the role that I played as a DNP student in the project.

Concepts, Models, and Theories

Although evidence-based healthcare practice guidelines are available for a number of conditions, these practices are not routinely implemented in the clinical practice setting, and thus there is great variation in practice settings (Titler, 2010). This is partly due to the challenges and barriers associated with implementing such evidence-based practices. According to Titler (2010), these difficulties in implementing evidence-based practices are likely due to contextual factors. Strategies are needed to address complex systems of care, individual practitioners, administration/leadership, and the general culture of an organization. Conceptual models should be used to guide the translation of research interventions into practice.

The model chosen for this DNP evidence-based project was the Donabedian model. The original model was developed by Avedis Donabedian, an expert in the field of health care quality, in 1966. Donabedian developed a basic framework that can be used in most quality-improvement initiatives (Glickman, Baggett, Krubert, Peterson, & Schulman, 2007). Donabedian conveyed quality of care as a difficult concept to define that is often defined differently among peers. However, Donabedian himself described quality of care as a reflection of values and goals that are current in the healthcare system and the general society of which the healthcare system is a part (Donabedian, 2005).

The Donabedian framework designates a distinctive relationship between three core concepts: structure, process, and outcomes. The *structures* of healthcare can be defined as the physical and/or organizational characteristics of the organization. This includes the actual facilities, equipment, personnel, and financial processes of the system. The *processes* of the healthcare system focus on the actual care being delivered to the chosen patient population and are performed with the intention of improving patient health. The *outcomes* element of the framework consist of the actual effect that the healthcare intervention has on the patient's status and represent the combined effect of the structure and processes (McDonald, Sundaram, & Bravata, 2007).

In addition to evaluating overall quality within healthcare systems, the Donabedian model can be applicable to the treatment of specific diseases and conditions with the goal of improving quality of care in the management of these diseases (Glickman et al., 2007). The Donabedian framework as it relates to this DNP project is depicted in the process chart in Figure 1.

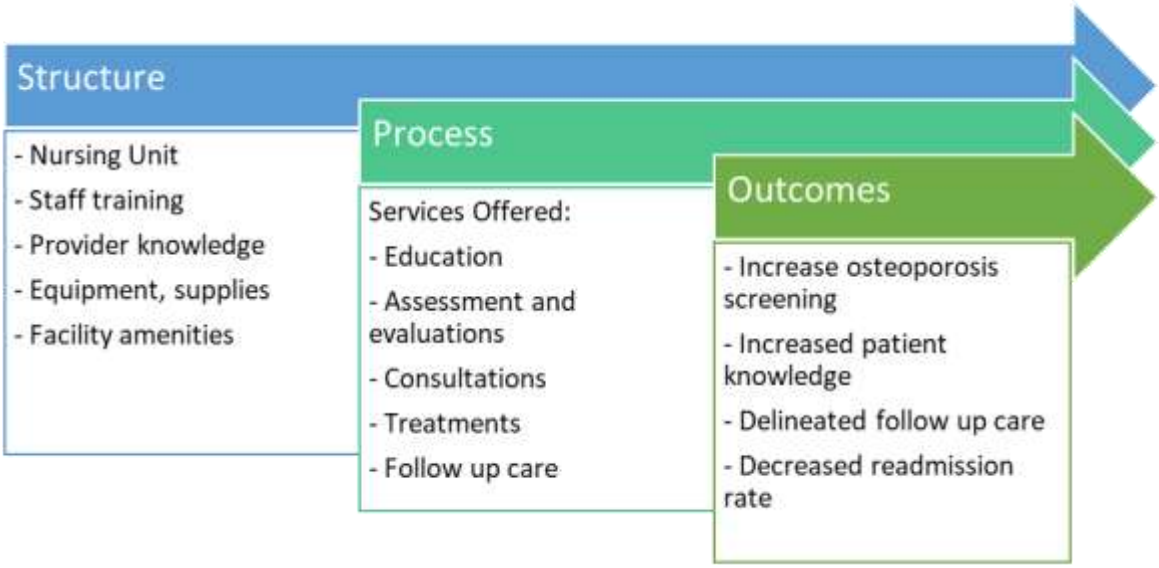

Figure 1. Donabedian framework process flow diagram.

Relevance to Nursing Practice

A *fragility fracture* is defined as a fracture sustained from a fall from standing height or presenting with no signs of trauma. Such fractures can occur with simple body mechanics such as bending, coughing, and lifting (Rosen, Walega, Rosen, & Mulder, 2015). These fractures occur most frequently in the spine, hip, and wrist and are commonly seen with osteoporosis (American Academy of Orthopedic Surgeons, 2009). Osteoporosis is a chronic disease characterized by a loss of bone mass and deterioration of the bone tissue that leads to weakened bone strength (Panda, Das, & Baruah, 2014). Reduced bone density seen with osteoporosis is a significant risk factor for the development of these fractures. Other risk factors include glucocorticoid use, age, sex, previous fractures, and family history of osteoporosis (National Institute for Health and

Care Excellence [NICE], 2012). Among the different fragility fractures associated with osteoporosis, vertebral fractures are the most common and are seen earliest. The most common location for vertebral fractures is the thoracic and lumbar spine. It is estimated that vertebral fractures account for over 700,000 of the 1.5 million osteoporotic fractures diagnosed yearly in the United States (Ensrud, 2013).

Studies have shown that vertebral fractures are a significant predictor for subsequent fragility fractures in osteoporotic patients. Up to half of patients with a known vertebral fragility fracture will have a five-fold risk of sustaining additional vertebral fractures within 3 years, with the greatest risk within the first year. Having a vertebral fragility fracture can lead to a prolonged medical course ultimately leading to increased disability (American Academy of Orthopedic Surgeons, 2009). Vertebral fractures are associated with back pain, which can become chronic. Additionally, these fractures can lead to physical deformity such as kyphosis, decline in physical function, decreased quality of life, depression, and increased morbidity and mortality (Panda et al., 2014).

Because of these findings, the optimal care of fragility fractures should include not only management of the fracture itself, but also diagnosis and treatment of the underlying cause for the fracture (American Academy of Orthopedic Surgeons, 2009). Traditionally, vertebral fragility fractures have been treated with conservative treatment initially. Conservative treatment includes medical management of pain with or without orthotic use. However, successful medical management involves evaluation and screening for osteoporosis and the appropriate follow-up treatment (McConnell et al., 2013). The current standard of care most commonly used results in 80% of fragility

fractures not being assessed or treated for the underlying cause of osteoporosis (International Osteoporosis Foundation, 2012).

Other evaluations that should help to drive clinical decisions are the patient's neurological findings and diagnostic studies, which could lead the surgeon to recommend surgical interventions for the fracture such as a vertebral augmentation. Most vertebral fractures do not require surgical intervention. However, if the patient's pain is unmanageable with medications within 7 days of admission, the recommendation is to proceed with vertebral augmentation versus continued medical management (Rosen et al., 2015). Bracing is another treatment modality that is often used variably. Despite limited evidence that shows the efficacy of orthotic use in the improvement of pain and mobility, orthotics are often used. According to best-practice recommendations, if bracing is used to aid in pain control, it should only be used in the acute or subacute phases of care because orthotics may cause atrophy of the core musculature with prolonged use (Rosen et al., 2015).

Not only do fragility fractures associated with osteoporosis have a significant burden on health and socioeconomic resources, but the impact of these fractures on individuals can be devastating and lead to loss of independence, loss of mobility, and chronic pain. Vertebral fractures are associated with increased mortality, which continues to increase with every additional fracture (Gittoes et al., 2015). It is for these reasons that implementing best practices for the care of this patient population is so important. The prevention of secondary fractures through the diagnosis and treatment of osteoporosis is

imperative and requires evidence-based interventions to reduce this risk and improve outcomes (Mitra, Chaudhury, & Ali, 2011).

Local Background and Context

The practice setting was a 726-bed, Magnet-designated organization. This facility was a Level II trauma center and primary stroke center, was chest pain accredited, was Nurses Improving Care of Healthsystem Elders (NICHE) designated, and had Joint Commission certifications for disease-specific care (DSC) in spine surgery, brain tumor, hip/knee replacements, hip fracture, ortho-trauma, palliative care, and congestive heart failure. This facility employed over 3,300 clinical staff and had close to 1,200 physicians on staff. This facility served as a major referral center for neuroscience services including those related to spinal diseases such as vertebral fragility fractures. This organization had many subspecialists available for the comprehensive treatment of this patient population, including neurosurgeons, orthopedists, bone health specialists, hospitalists, interventionists, palliative services specialists, and others.

The project was implemented on the neurosurgical unit. This unit was a 29-bed unit that specialized in the care of neurosurgical patients. The nurses on this unit received specialized training on spine patients. The majority of patients admitted with vertebral fractures unrelated to trauma were admitted to this floor. I participated in the multidisciplinary rounds that took place daily on this unit and by doing so came to the realization that these patients were not being cared for in an evidence-based, comprehensive manner. In addition to this observation, the clinical nurse leaders (CNLs) on the unit frequently brought forth concerns about the goal of care for these patients.

The care of patients admitted with vertebral fragility fractures varied in the management of pain, orthotics use, and mobility, and often the diagnosis or assessment for osteoporosis was not addressed at all. This made it difficult for the nursing staff to adequately care for these patients. In addition, the care transition managers (CTMs) and the CNLs had difficulty with discharge planning because the course of patients' hospital stay was virtually unknown.

Role of the DNP Student

I currently work at the organization in which the evidence-based practice project was developed and implemented, where I function as the nurse practitioner for the neurosurgery service line. This job includes population management of the neurosurgical patients, including those in the spine surgery program, those in the brain tumor program, and the neurotrauma population. It was by working in this position that I identified the practice issue addressed in this project. In regard to the evidence-based practice project, I functioned as the developer of the protocol for the project. The idea for this project developed from my current role in the organization, in which I manage multidisciplinary rounds on the neurosurgical units. Based on my experiences during these rounds and my discussions with the nursing staff and discharge planners, I concluded that these patients had no continuity of care. The clinical staff was often left not truly knowing what the overall plan or goal for the patient was. It was also in these discussions that I realized that the staff exhibited a knowledge deficit related to what best practices were for this patient population. From these informal discussions and observance of care gaps, I formed the idea for the development of a protocol to guide the nurses in the care of these patients

with the overall goal of closing the knowledge gaps of both clinicians and patients while improving patient outcomes.

One potential source of bias that was considered related to my involvement in this project was my close working relationship with the unit in which the project was implemented. This may have been positive, in that the nurses were familiar with me as a practitioner already and therefore may have afforded me a certain amount of respect. There was a concern, however, that the nursing staff would have difficulty separating my role as a nurse practitioner for the neurosurgery team from my role as the developer and implementer of this evidence-based project. This potential bias was addressed by educating the nursing staff on my role in the project versus my day-to-day role at the organization.

Summary

There is a known gap in knowledge and use of evidence-based practices in the current practice setting, as evidenced by informal conversations and observations of care. Therefore, the implementation of a protocol to help guide decisions empowers the nursing staff to play an active role in the care of this patient population. The use of conceptual frameworks such as the Donabedian model helped to guide the project in the intended direction of improved patient experience and outcomes. This project was able to improve the knowledge deficit within the nursing staff and improve patient outcomes. Nurses play major roles in patient education and in advocating for the patient. Decreasing the patient's knowledge deficit can result in significant improvements in the patient's outcomes. In the following section, I discuss the practice question for this project and

how the sources of evidence, as well as analysis and synthesis of this evidence, was important in the success of the project.

Section 3: Collection and Analysis of Evidence

Introduction

Approximately 750,000 vertebral compression fractures occur yearly in the United States, and this number will only increase as the U.S. population ages (Kates & Mears, 2011). Over 70,000 of these fractures, approximately 10%, will require hospitalization. The average length of stay for these hospitalizations is 8 days due to the complexity of these cases. Often, a combination of pharmacological, functional, and surgical treatment options needs to be considered (Kates & Mears, 2011). There is a documented lack of evidence-based care being used in the management of the patient with a vertebral fragility fracture in the chosen practice setting of a large acute care hospital. The purpose of the evidence-based practice project was to address this care gap by developing a standardized, comprehensive protocol for the use of evidence-based practices in the care of this patient population that addressed all relevant areas, including patient education, fall risk assessment, osteoporosis evaluation and management, and securing follow up. In the following section, I report the practice questions addressed, the sources of evidence used for review, and the analysis, synthesis, and evaluation techniques used.

Practice-Focused Question

The vertebral fragility fracture is the most common type of osteoporotic fracture, with approximately 30-50% of women and 20-30% of men developing a vertebral fracture in their lifetime (Suzuki, Ogikubo, & Hansson, 2008). Studies have shown that vertebral fractures are a key predictor of future osteoporotic fractures. These fractures are

associated with significant pain, physical deformity, loss of function, and impaired quality of life, as well as increased morbidity and mortality (Panda, Das, & Barush, 2014).

According to the American College of Orthopedic Surgeons (2009), the optimal care of fragility fracture patients includes not only managing the fracture itself, but also evaluating, diagnosing, and treating the underlying cause of the fracture, which is typically related to osteoporosis. The current practicum setting has no consistent approach to taking care of these patients, and often the underlying cause of osteoporosis is not addressed during the hospital stay. Therefore, the purpose of this evidence-based project was to standardize the care of the patient admitted for a vertebral fragility fracture using evidence-based practices with a focus on osteoporosis screening and management.

The practice-focused question pertained to how the development of an evidence-based protocol for the management of vertebral fragility fractures would result in a more standardized nursing approach and overall improvement in the management of osteoporosis in this patient population. There was an overall gap in the knowledge of the staff related to the care of these patients. By developing this protocol, a standardized approach was taken to care for this patient population, and all pertinent areas were addressed, leading to better outcomes and patient satisfaction.

Sources of Evidence

The sources of evidence used to address the practice problem included current research on best practices for managing the patient with an acute vertebral fragility fracture in addition to best practices in the management of osteoporosis. Other sources

included relevant clinical practice guidelines from the American Association of Orthopedic Surgeons (AAOS), Up To Date, the National Guideline Clearinghouse, and the National Osteoporosis Organization. This literature search was used to develop a comprehensive approach to managing this patient population, including all relevant aspects of care. The outcomes management department of the organization was able to assist in patient capture for the data by diagnosis code. The outcomes department electronically abstracted certain data points such as readmission rate, length of stay, discharge disposition, and consults (physical therapy, occupational therapy, bone health, etc.). Other data were obtained by chart audits of the individual records. Collection and analysis of these data helped to guide the project in the direction necessary by identifying further gaps in care.

Published Outcomes and Research

The literature search for this project occurred through the following electronic databases: Cumulative Index of Nursing and Allied Health Literature (CINAHL), Medline, ProQuest, Academic Search Complete, Science Direct, and Google Scholar. Other Internet sites used for the literature review included the National Guideline Clearinghouse and UpToDate, which I used to research current clinical practice guidelines (CPGs) that might pertain to the topic, as well as the websites of professional organizations such as the American Association of Orthopedic Surgeons (AAOS) and the American Association of Neurological Surgeons (AANS), which I accessed to review standards of care for fragility fractures associated with the specialty. The search criteria were limited to articles published within the past 10 years for the most part, and the most

common search terms included *vertebral fragility fractures*, *fragility fractures*, *osteoporosis*, *osteoporotic fractures*, *osteoporosis screening*, *fall risk assessment*, and *fragility fracture guidelines*.

Analysis and Synthesis

The population for this project included those patients admitted to the neurosurgical unit with a diagnosis of a vertebral fragility fracture. As previously mentioned, a fragility fracture is typically sustained from a low-impact injury such as a ground-level fall or without known injury. Therefore, excluded from this population was any patient admitted with high-impact traumatic injuries, malignancies, or infectious processes that may have led to the fracture. All patients who met the inclusion/exclusion criteria who were admitted to the neurosurgical unit were monitored for compliance with the guideline. Data were abstracted concurrently, and patients were captured by daily unit census review or referral from the clinical nurse leaders on the unit or the neurosurgeon involved. A set number of participants was not required, as there was no way of knowing how many patients would be admitted during the set time frame, given that admissions typically originated in the emergency department. Based on previous admission rates at this organization for this diagnosis, there were 20 participants expected during the 8-week project period. However, only 10 patients were ultimately admitted who met the criteria, as I discuss in more detail in this section.

Procedures used to ensure ethical protection of the participants in this doctoral project included deidentifying the data obtained. Mandatory Institutional Review Board (IRB) training was completed prior to pursuing IRB approval. The project was reviewed

by the organization's IRB manager, who determined that it did not qualify as human subjects research as defined by Department of Health and Human Services (45 CFR 46) and the Food and Drug Administration (21 CFR 56) regulations. Due to this determination, this project did not fall under the oversight of the organization's IRB, and an official letter was obtained stating this. This project did pass through the Walden IRB, and a data use agreement was obtained from the organization that indicated agreement to share deidentified data with me for the purposes of the doctoral project.

The project question pertained to whether the guideline would result in a standardized approach to the care of the patient with a vertebral fracture and improvement in the assessment and management of osteoporosis. The analysis of the data aided in the development of action plans and implementation of measures to sustain and improve performance. Data were pulled electronically through the electronic medical record by the outcomes management department. Additionally, data were collected by audits of the electronic medical record completed concurrently and retrospectively and entered into an Excel database. The purpose of the data collection and evaluation was to assess for compliance with key components of the guideline, thus resulting in an overall increase in the standardization of care in addition to evaluating improvement in key performance indicators when compared to the period prior to the implementation.

The outcomes management department used the data pulled electronically and the data entered into the database to determine compliance with the guideline, including the following:

1. Was the patient educated on fragility fractures?

2. Was a fall risk assessment completed?
3. Was the patient assessed for osteoporosis by way of Vit D, 25 hydroxy level, and calcium level?
4. Was follow-up care secured with a bone health specialist?

Data that were collected for evaluation and comparison before and after the implementation of the guideline included length of stay, discharge disposition, and mortality rate.

Summary

There is a perceived knowledge gap regarding the care of the vertebral fragility fracture in the acute care setting and a lack of best practices being used. The development of a protocol to guide the care of the vertebral fragility fracture patient in the acute care setting instituting evidence-based practices has the potential to close the knowledge gap, improve quality outcomes, and improve patient satisfaction. Because of this, it is essential to collect and analyze data and evaluate the process in order to appraise the impact of a new care model on outcomes, as I did in this project. It is through such ongoing evaluation that processes can be modified to achieve the desired effect, which is improved patient outcomes.

Section 4: Findings and Recommendations

Introduction

Vertebral fragility fractures are a significant problem leading to secondary fractures, increased morbidity, and decreased function. Patients with such fractures are often admitted to an acute care facility, but often the underlying cause of the fracture is not addressed. This doctoral project aimed to provide a standardized approach to caring for these patients that involves evidence-based practices that comprehensively address the problem, including screening for osteoporosis, fall risk assessment, fracture education, and securement of follow up with a bone health specialist. As previously mentioned, all patients admitted to the neurosurgical floor with a diagnosis of a vertebral fracture were included in the program, with the exception of patients who had experienced high-impact traumatic events, pathological fractures from malignancies, or infectious processes. Data were collected by way of concurrent manual chart abstraction and analyzed by process control charting, showing compliance with the developed guideline by the clinical staff on the four chosen indicators.

Findings and Implications

The initial portion of the project included the development of the guideline. This process occurred over several months and was accomplished through interprofessional collaboration with the organization's bone health specialists, the advanced practice registered nurse for the hip fracture program, and the neurosurgeons. The guideline was drafted and included evidence-based recommendations that were felt to be of most importance for this patient population, taking into consideration any barriers perceived

(Appendix A). Once the guideline had been drafted and approved and the organization's and university's IRB approvals were documented, the implementation phase began. The project was implemented over an 8-week period. During that period, a total of 10 patients who met the inclusion/exclusion criteria were admitted to the neurosurgical unit and included in the project. There were no patients during Week 1 or Week 4 who met the criteria, unfortunately. The average age was 76.8 years, with a range from 57 years to 97 years. Eight out of the 10 patients were female, and five out of the 10 patients had a previous diagnosis of osteoporosis.

Table 1

Admittance Pattern for Implementation Period

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Total
0	1	2	0	2	1	2	2	10

Table 2

Population Demographics

Average age	76.8 years
Female gender	8 (80%)
Number with previous osteoporosis diagnosis	5 (50%)
Average length of stay (LOS)	4.5 days
Current alcohol use	0 (0%)
Current tobacco use	0 (0%)
Number who underwent surgical procedure	2 (20%)

The purpose of this project was not only to develop the evidence-based guideline for the management of the vertebral fragility fracture in the acute care setting, but also to monitor compliance with the developed guideline within the limited timeframe. Compliance with the stated guideline was measured using four specific points chosen from the guideline. These four points were thought to be a good representation of the important aspects of the guideline by the guideline development interdisciplinary team. These data were collected via chart abstraction for these specific metrics. These four points for which compliance data were collected were the following:

- Fall risk assessment
- Fracture education
- Osteoporosis screening via Vit D, 25 hydroxy level
- Securement of follow-up appointment.

Compliance with each of these four points was analyzed via process control charts. Process control charts are a type of statistical analysis that helps in visualizing the longitudinal development of specific quality indicators, which thereby helps in detecting whether the underlying process is successfully changing (Peek, Goud, & Abu-Hanna, 2008). These charts are routinely used to monitor and improve outcomes associated with evidence-based guidelines. There are three main characteristics of process control charts. The first is that the chart is based on a timeline. The second is the central line, which is a visual reference for the variation in practice. The third is the upper and lower control limits, which are calculated based on the available data and are placed equal distances from the central line (iSixSigma, 2017). Clinical practice guidelines and protocols such as

the one developed for this project lead to better care of the specific patient population by standardizing care and reducing variation, thereby improving patient outcomes (Peek et al., 2008). For these reasons, the process control charting analysis technique was thought to be the optimal choice for monitoring compliance with the specified guideline indicators.

The first metric was fall risk assessment. The most common mechanisms of injury for fragility fractures are falls, and falls are the leading cause of morbidity and mortality in the elderly population. It has been reported that 1 in 3 adults over the age of 65 will fall every year and 1 in 2 over the age of 80 will fall every year (Ambrose, Curz, & Paul, 2015). The organization uses the Johns Hopkins Fall Risk Assessment Tool (JHFRAT). This tool allows for a standardized approach to assessing the patient's risk of falling. The JHFRAT assess seven risk factors that have been shown to be associated with an increased risk of falling (Klinkenberg & Potter, 2017). These seven risk factors are age, fall history, mobility, elimination (bowel and urine), medications, patient care equipment, mobility, and cognition. Each of these categories is then broken down further, and points are given for each positive response. The scores for each section are then added, giving a total score. Depending on the sum of the scores, the patient is then placed into a low-, moderate-, or high-risk category. This tool is a part of a flowsheet in the electronic medical record that is easily accessed by the nursing staff and is the tool of choice for the organization, which is why it was chosen for this assessment.

Out of the 10 patients admitted for a vertebral fragility fracture, all 10 did have their fall risk assessment completed upon admission, for a 100% compliance rate. Nine

out of the 10 patients were scored > 13, which coded them into the high-fall-risk category; the last patient was coded as moderate risk. The patients were educated by the nursing staff on the risk of falls per the electronic medical records care plan and given a handout from the Centers for Disease Control and Prevention (CDC, 2015) regarding their role in the prevention of falls. This handout is made available for the public on the CDC's website and encourages the patient to take responsibility to proactively prevent falls.

The process flow chart below depicts the process throughout the 8-week guideline implementation period. The upper and lower control limits are calculated as two standard deviations from the mean. In the case of this metric, there was 100% compliance; therefore, the upper and lower control limits are shown to be 100% as well. Therefore, there was no variation seen in the metric, and the process was considered stable.

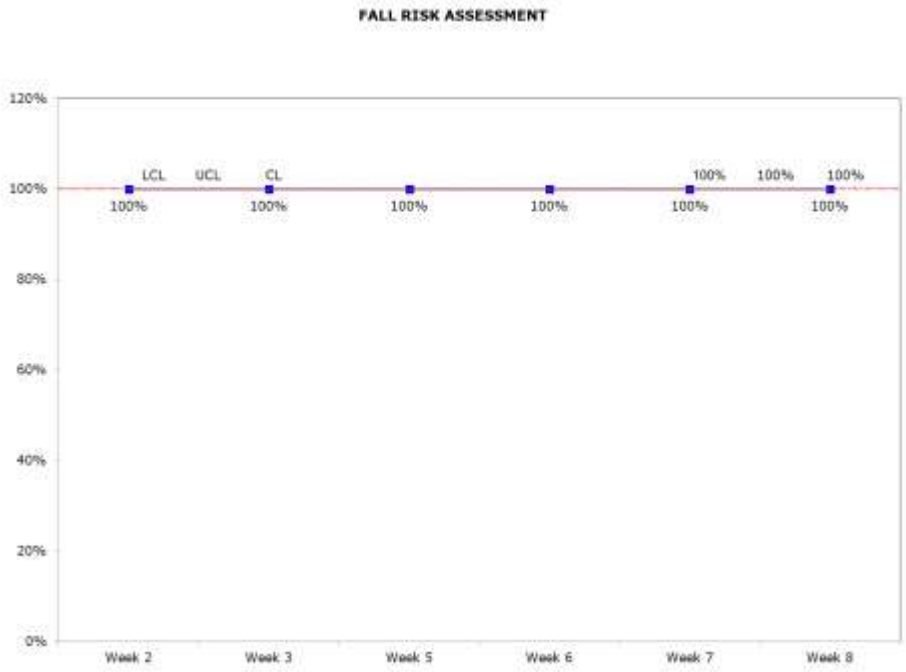

Figure 2. Fall risk assessment.

The second metric abstracted and analyzed was fracture education. Fracture and secondary fracture education is of utmost importance in this patient population, as evidenced by the significant risk for future fractures stated earlier. Not only is education on the fracture and osteoporosis necessary, but education on nutrition, tobacco cessation, pain management, fall prevention, and mobility is very important as well (Lamb et al., 2017). Studies have shown that providing education to patients encourages them to seek additional information (Smeltzer, 2014). Fracture education was required by the nursing staff, and compliance was indicated by the addition of the fracture care plan on the patient's chart and documented education prior to discharge. Points in this care plan available to be addressed by the nursing staff included fracture healing and anatomy, fracture treatment options, activity and positioning, therapeutic modalities, safe home

environment, minimization of risk for falls, osteoporosis risk factor prevention and management, potential problems (signs/symptoms, prevention, follow-up strategy), and lifestyle alterations (present and future).

The overall compliance with this indicator showed a 60% control limit or mean, meaning that 6 out of the 10 patients received this education from the nursing staff prior to discharge. The upper control limit was again 100%, and the lower control limit was 0% due to the maximum weekly volume of two. The process chart in Figure 3 depicts the process during the 8-week implementation period. As seen, there is quite a bit of variation in this measure, indicating an uncontrolled variation. When the electronic medical record was reviewed, there was no specific associated cause identified as to why the education was not completed. Due to this variation, the process outcome is considered unpredictable related to a uncontrolled variation (iSixSigma, 2017).

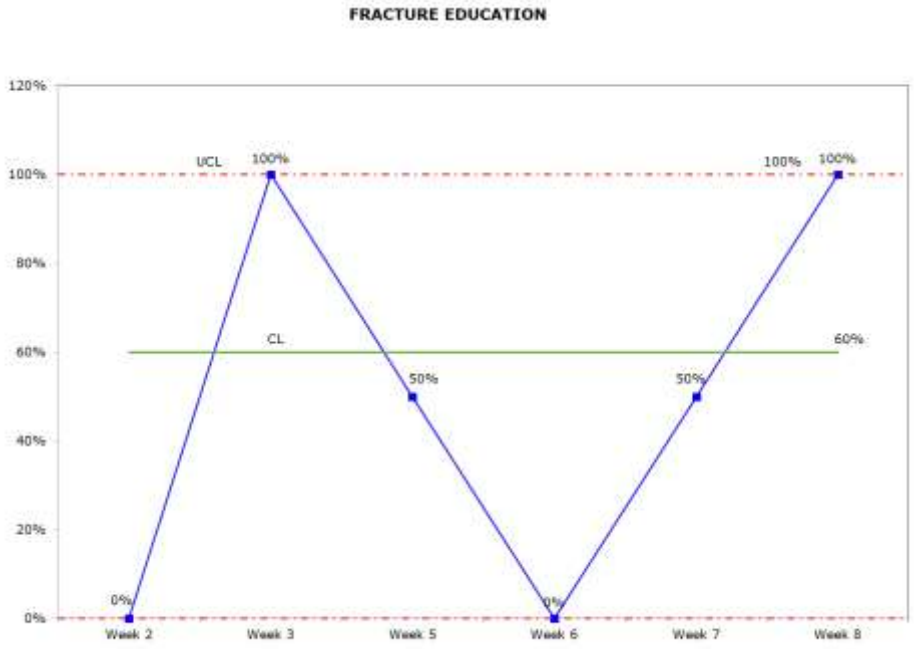

Figure 3. Fracture education.

The third metric abstracted and analyzed for compliance with the developed guideline was osteoporosis screening. Compliance was indicated by completion of the vitamin D, 25 hydroxy and calcium laboratory test during the patient's hospital stay. According to the National Osteoporosis Society Vitamin D Guideline (2014), the measurement of serum vitamin D, 25 hydroxy (25OHD) is the best way of estimating vitamin D deficiency and is recommended for patients with bone disease that may be improved with vitamin D treatment or patients with musculoskeletal symptoms that could be attributed to a vitamin D deficiency. Vitamin D deficiency contributes to bone loss from decreased vitamin-D-mediated intestinal calcium absorption. Not only is this laboratory value important to maintain bone strength, but vitamin D deficiency has been

associated with an increased fall risk in the elderly exacerbating the problem (Gani & How, 2015). Vitamin D supplementation has been shown to improve muscle strength and reduce fall frequency by up to 50% (Kennel, Drake, & Hurley, 2010).

The analysis of these data showed that for the 8-week period, a total of 8 out of the 10 or 80% of patients had a 1, 25-hydroxyvitamin D laboratory level drawn and resulted. Vitamin D can be obtained from both dietary sources and UV-B light (sun) on the skin. It is hydroxylated at the 25^{th} carbon in the liver and then further hydroxylated at the 1 carbon in the kidney, creating the 1, 25-hydroxyvitamin D (AOTrauma, 2014). Vitamin D insufficiency is considered to be anything less than 30 ng/mL, and deficiency is defined as levels < 20 ng/mL (Lolascon, De Peitro, & Gimigliano, 2009). Interestingly, one of the lowest scores resulted (15.3 ng/mL) was for one of the two male patients who was 61 years of age. The lowest result was 13.3 ng/mL in a 65-year-old female patient. Six out of the 10 patients (60%) had vitamin D levels less than 30 ng/mL.

The calcium level is important to assess for other causes of osteoporosis such as parathyroid disease. Additionally, calcium helps the essential vitamin D be absorbed (AOTrauma, 2014). All 10 of the patients were compliant with the calcium level screening, and all 10 patients had a normal calcium level resulted. However, this particular metric was not considered fully met unless both the 1, 25-hydroxyvitamin D and the calcium laboratory values were resulted during the hospital stay. Figure 4 shows the process control chart depicting this metric over the 8-week period. Although there is some variation noted in the process control chart, this process is stable, and the variation

is considered controlled. This means that the outcome is predictable within the bounds of the control limits.

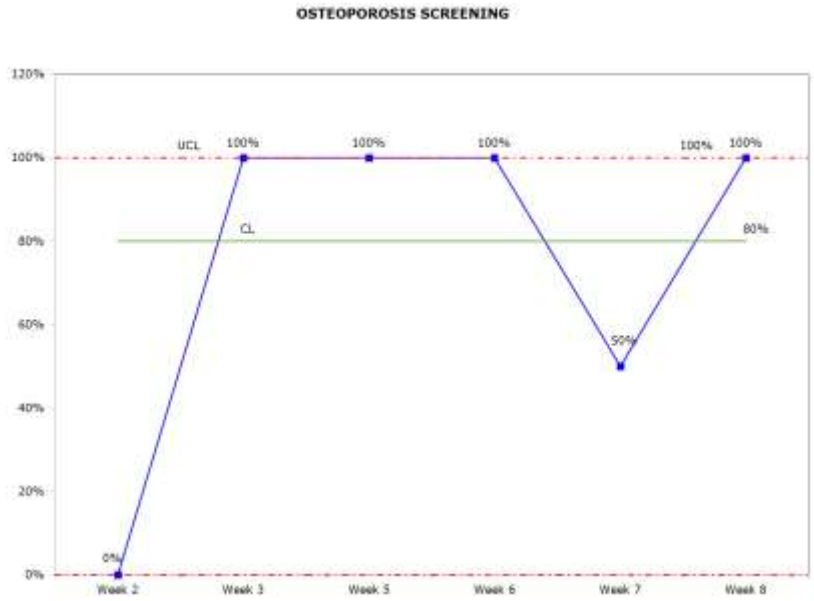

Figure 4. Osteoporosis screening.

The last metric abstracted and analyzed for compliance with the stated guideline was the procurement of a follow-up appointment with a bone health specialist after discharge. The bone health specialist, otherwise known as *fracture liaison service* (FLS), is a model of care that coordinates postfracture care and ensures that the individuals who sustain an fragility fracture receive the appropriate diagnosis and management of their fracture along with the necessary support (National Bone Health Alliance, 2012). In September 2016, the American Academy of Orthopedic Surgeons released a position statement that endorsed the importance of follow up, including mechanisms to ensure that fragility fractures receive the appropriate risk assessment and long-term care

coordination, which includes monitoring compliance with the recommended therapies (AAOS, 2016).

This metric was considered compliant if the bone health physician assistant completed a consult during the hospital stay. The bone health consult included a follow up appointment made at the bedside for patients with their office. This information was given to the patient at that time as well as reiterated in the discharge instructions they received prior to discharge. Seven out of the 10 (70%) patients during the 8-weeks were seen by the bone health specialists and follow up appointments secured. The process control chart did show some variance with this process over the 8-week period as evidence by the peaks and valleys seen on the graph. This would indicate that the process had uncontrolled variation and further efforts are warranted to stabilize the process.

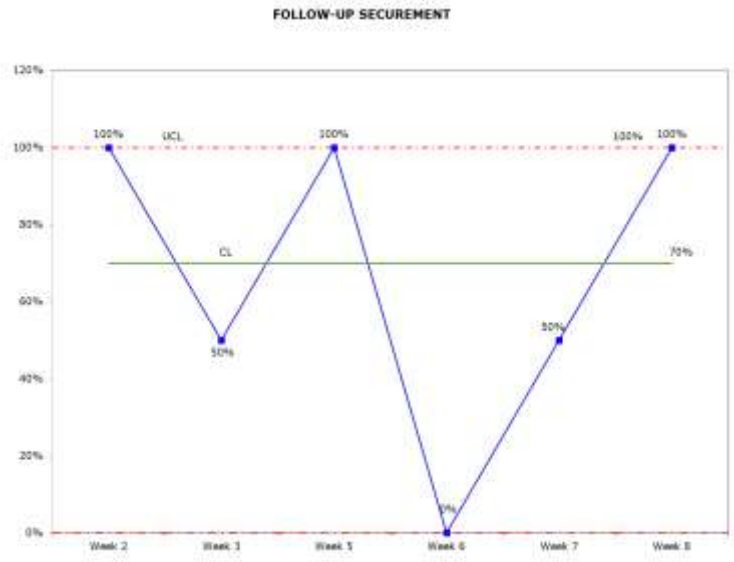

Figure 5. Securement of follow-up after discharge.

In summary, the overall compliance with the guidelines during the eight week timeframe was 75%. There were a total of 40 metrics required for the 10 patients and 31 of them were met successfully during the hospitalization. Figure 6 below shows the overall compliance with the four metrics for the entire eight weeks.

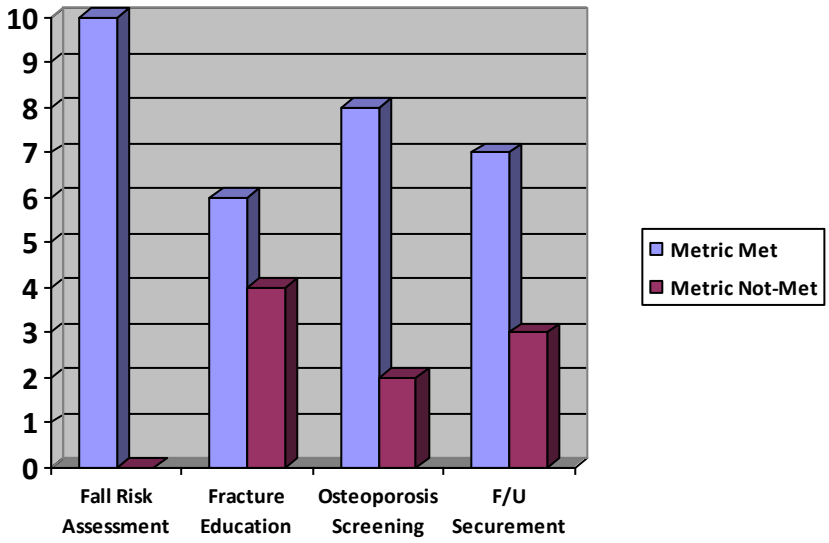

Figure 6. Overall guideline compliance.

There are three indicators that the researcher chose to compare before and after implementation of the project. Since there was only 10 participants in the project sample, the researcher chose the ten vertebral fragility fracture admissions that met the criteria before the project of implemented for comparison purposes. The chosen indicators were readmission rate, mortality rate, and overall length of stay. The Figure 7 below depicts the findings of the comparison. Neither the before implementation or the after implementation group had a mortality. The before implementation group had two

readmissions within 15 days of discharge and the after implementation group had one. The length of stay for the pre-implementation group was 7.5 days compared to the post-implementation group of 4.5 days.

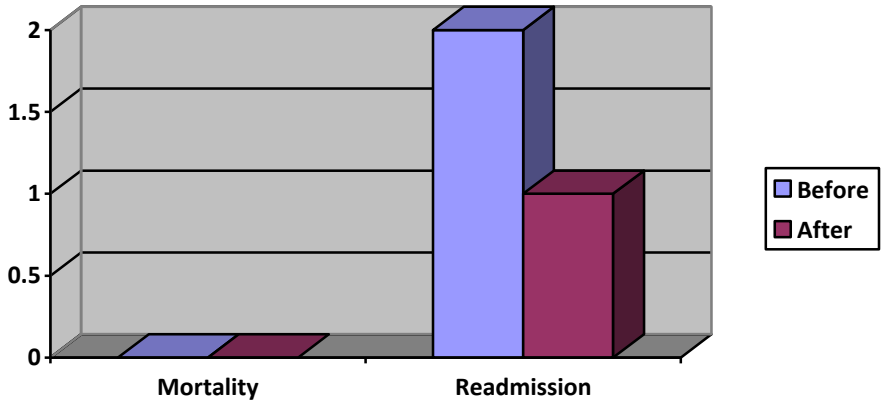

Figure 7. Before and after project implementation comparison for mortality and readmissions.

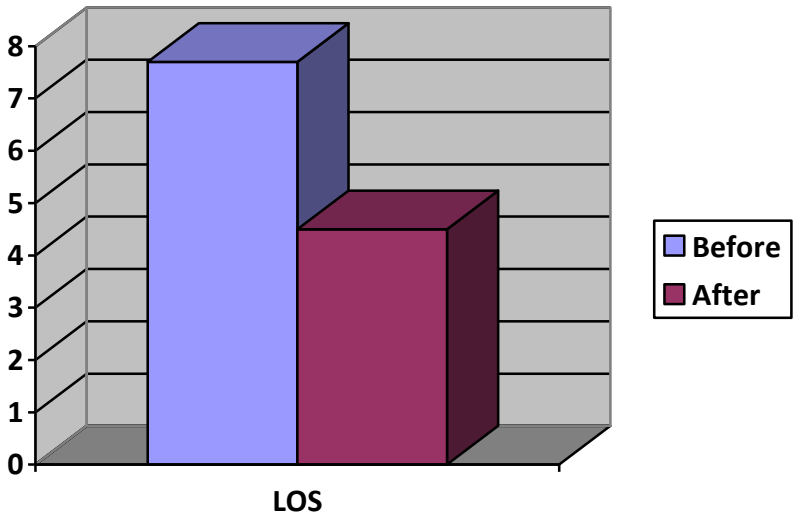

Figure 8. Comparison of before and after project implementation length of stays.

There were a couple of unanticipated limitations that potentially affected the outcome of this project. The most significant limitation included the unexpected small sample size during the 8-week period. The final sample size by the end of the project period was 10 encounters. Previous to this project, the neurosurgical unit averaged three patients a week that met the inclusion criteria. Therefore, sample size closer to 20 was anticipated. This patient population is almost exclusively admitted through the emergency department; therefore there was no control over the low sample size. Out of the 8-week period there were two weeks (week 1 and week 4) that yielded no patients meeting in the inclusion criteria for admission. The remaining weeks averaged 1-2 patients per week for the total of 10. With such a small denominator, any missed indicator made a huge impact on the final compliancy rates. With having only two patients per week, the upper and lower control limits for the process control charting were always 100% and 0%. It is generally recommended to have at least 20 data points before constructing a control chart. By using the control chart with fewer data points, it must be recognized that the control limits may be wider or narrower than appropriate for actual process (Amin, 2001).

Another unanticipated limitation was the lack of neurosurgery consultation on several of the patients. Education of the guideline was focused on neurosurgery as they are typically the managing consultation for vertebral fractures. The APRN had the authority to write orders on behalf of neurosurgery per their credentials, but could not do so for the hospitalist. Therefore, without neurosurgery on the case, several indicators fell to the medicine team for completion including the consultation of the bone health

specialist and the osteoporosis screening lab work. In one instance, the nurse requested a bone health consult per the guideline recommendations however, it was done incorrectly and the consult was not completed.

As previously discussed, fragility fractures are extremely prevalent in our aging population. As the population ages, there is not only an increase in the number of fractures but the burden on the healthcare system, society, and patients (AOTrauma, 2014). One of the greatest risk factors for a fragility fracture is a previous fragility fracture. In addition, vertebral fragility fractures are often the initial fracture seen. These vertebral fragility fractures can cause significant physical limitations, and disabilities in addition to significantly increasing medical cost (Bottai, et al. 2016). A 2011 study calculated that the annual cost of secondary fractures was close to 2 billion dollars (IOF, 2012). That being said, it has been reported that adherence to evidence based guidelines is lacking and that up to 70% of patients receive incorrect management as delineated by current practice guidelines (Elvey, Schaller, Dhotar, Patel, & Oddy, 2014).

The implications this has for individuals, communities, and an institution is huge. Individuals are not getting the care they need to prevent further fractures, and suffering not only increased morbidity but increased financial burden and decreased quality of life. This affects the communities related to the cost as well but also the decreased functionality of these patients make burdens on family and caregivers as well as medical and community resources. The high sociological and economic impact of fragility fractures and the underlying cause of osteoporosis is related to the increased incidence of the disease, increased morbidity and mortality, and fracture related costs, and will only

continue to increase with our aging population as long as the guidelines are not being adhered to (Pisani, et al., 2016).

Guideline non-compliance is apparent in the institution setting as evidenced by the readmission of vertebral fragility fracture patients related to secondary fractures, no follow up procurement, and lack of addressing the underlying cause of the fragility fracture – osteoporosis. The institution can also see an increased cost of care due to an increased length of stay and management of secondary fractures which are often times more severe than the initial fracture. Therefore, it is important for the institutions to take accountability for the screening and diagnosis of osteoporotic fragility fractures. This can be accomplished by adhering to evidence based guidelines (Smeltzer, S.C., 2013).

Fortunately, fragility fractures and resultant secondary fractures are preventable (Pisani, et al., 2016). Prevention is the ultimate goal; however, prevention of these fractures requires action from the individual, community, and institutions (Gittoes, et al., 2015). Despite the available evidence based practices available, unfortunately patients still do not receive the appropriate treatment or remain untreated altogether. One study showed that a large barrier to intervention or treatment was poor knowledge levels regarding osteoporosis and fragility fractures and that the majority of hospitalized patients did not understand or were not informed that osteoporosis was the underlying cause of their fragility fracture and that osteoporosis is treatable (Inderjeeth, et al., 2010).

The key to social change in regards to vertebral fragility fractures and osteoporosis for the individual is education. Improving the awareness of the public to the risk of osteoporosis and fragility fractures and giving the public the knowledge to take

control and reduce their risk is the ultimate goal (Inderjeeth, et al., 2010). From a provider and institutions standpoint, developing and implementing user friendly guidelines that incorporate evidence based practices is the key to improving the assessment of and management of all fragility fractures and the underlying osteoporosis. Patient education and provider guidelines have the potential to make a positive social change in the treatment and compliance with management which would not only improve patient outcomes and prevent secondary fractures but to decrease the burden on society from disability and healthcare costs.

Recommendations

The focus of this project was to develop and implement an evidence-based guideline to aid in the management of the vertebral fragility fracture patient in the cute care setting. The elements of the developed guideline have all been proven to be an integral part of the management of vertebral fragility fractures; however the gap is in the implementation of the guideline. The proposed guideline (see Appendix A) involves four specific sections to be addressed during the patients hospital stay. The sections are then broken down further into specific elements that need to be addressed for each section. The purpose of the developed guideline is to provide guidance on the management of patients admitted with vertebral fragility fractures.

The first section delineates the nursing responsibilities in the guideline. These responsibilities include education on tobacco cessation for active tobacco users due to the detrimental effects this has on bone health. The other nursing responsibilities include the fall risk assessment, and associated fall risk education. The fall risk education is available

through the care plans in the electronic medical record as well as additional information through the Centers for Disease Control and Prevention. The nursing staff is also responsible for education about osteoporosis, and fracture specific education through the National Osteoporosis Foundation. Additional education will be given by the bone health specialists as they deem appropriate.

The second section in the guideline outlines the Neurosurgeon or his or her Advance Practice Nurse or Physician Assistants expectations. These included the consultation of the bone health specialists and the ordering of the required laboratory studies. The third section dictated the specific laboratory studies required for the screening for osteoporosis. Finally, the last section was specific to the bone health specialists. Those requirements included having a letter sent to the patients Primary Care Physician (PCP) regarding the new or current diagnosis of osteoporosis and treatment plans. The bone health specialist was also expected to do in-detail education with the patient and family regarding the need to decrease the risk for future fractures and treatment options available. Lastly, the bone health specialist was expected to make a follow up appointment with the patient to follow up in their clinic post discharge.

The guideline will only be successful if it is implemented in its entirety. This project showed gaps in the implementation process, specifically around nursing education, and consulting the bone health specialist. It is recommended that more intense education regarding the guideline and expectations of the guideline be addressed with the nursing staff. This can be done through poster presentations on the unit and during unit meetings. It is also recommended that the bone health specialist do some specific

education for the nursing staff regarding the pathophysiology as well as patient education materials available.

A proposed element that could potentially be added to the guideline at some point is the use of FRAX or Fracture Risk Assessment Tool. This is a validated tool developed by the World Health Organization that gives a 10 year absolute fracture risk by incorporation BMD (bone mineral density) and clinical risk factors. These clinical risk factors include age, sex, weight, height, previous fractures, smoking status, steroid use, rheumatoid arthritis diagnosis, and alcohol use (American College of Rheumatology, 2017). For bone mineral density reporting, the T-score of the femoral neck or spine is preferred. A T-score of less than or equal to 2.5 for bone mineral density warrants the initiation of medical therapy. Although this tool would be a great addition to the current guideline, to help aid in the treatment of osteoporosis it does require the ability to get a bone mineral density test completed. The organization does currently have the ability to do heel ultrasonography for bone mineral density testing. Research shows that a heel scan result in the osteoporotic range is highly predictive of osteoporosis as defined by the BMD. However, the test is more useful in ruling in osteoporosis in high risk patients than ruling out osteoporosis (Hashmi & Elfandi, 2016).

Strengths and Limitations of the Project

This project exhibited many strengths and limitations, some expected and some unforeseen. One of the primary strengths of the project was the availability of the tools and education in the electronic medical record. The fall risk assessment tool was already located in the flowsheet for the nurses and already being used so there was no delay or

confusion with using that particular tool. Also, the education available through the nursing care plans already included education on osteoporosis, fractures, and fall risk prevention so additional outside resources were added if necessary. Another strength of this project is the availability of the bone health specialists. Most organizations do not have a team like this available to see patients. These professionals were not only willing to see the patients, but to spend time educating the nursing staff and myself as well.

The knowledgeable nursing staff was considered strength as well. This particular unit was already the dedicated unit for several disease specific programs including the brain tumor program, and spine surgery program. Therefore, this staff had a basic understanding and acceptance of implementing evidence-based practices and really no push back was perceived. The clinical nurse leaders (CNLs) on the floor were instrumental in making sure the staff knew when fragility fracture patients were admitted and were involved in completing some of the required metrics.

There were several limitations in this project, some were anticipated and some were unexpected. The first known limitation is the bone health specialist consultation service. This service was listed as a strength previously because the work and education they did with this patient population is phenomenal. However, at the time, they were only available for consultation Monday through Friday. For the purpose of the project, if a patient were admitted late Friday afternoon and discharged over the weekend, they would not be seen by the service. The nursing staff were still able to give the patients the information about the service and the number to call and make an appointment; however

this is not as successful as being seen in person by the specialists and receiving the education first hand.

An unforeseen limitation was the sample size. Based on previous admission rates, the estimated sample size prior to the project implementation was 20 to 25. However, during the 8-week period, only 10 patients were admitted to the chosen unit that met the inclusion and exclusion criteria previously set forth. Although this made data collection fairly non-cumbersome, the use of the process control chart which had been previously decided upon were not be the best way to analyze and show the data due to not having the suggested 20 data points.

Another limitation was time frame. It would have been beneficial for the project to continue another four to six weeks. In addition, the comparison indicator of readmission was only monitored for 15 days post discharge. Meaning all readmissions were counted if they presented back to the hospital within 15 days of discharge. The national standard for this is a 30 day window; however, due to time constraints of this project, the time frame was unable to be extended to 30 days.

It is recommended that this project itself continue until the processes are stable and the compliance rates are acceptable. There are additional metrics that would be beneficial to be monitored including the 30 day readmission rates. Other potential metrics include patient satisfaction, discharge disposition, nursing satisfaction, and ultimately whether the patient presented back at any point with a secondary fracture. In addition, being able to compare these metrics to before the implantation of the guideline would be extremely beneficial. All these metrics would give the organization great information on

the overall success of the guideline implementation. The DNP student believes that adding the FRAX score to analyze the risk for future fractures should be considered as an addition to the guideline.

Section 5: Dissemination Plan

According to *The Essentials of Doctoral Education for Advanced Nursing Practice* (AACN, 2006), the DNP role is designed to prepare nurses for leadership in their chosen practice coupled with scientific inquiry. The DNP is prepared to use research to influence practice in a variety of settings and populations (Alexander, 2016). One purpose for disseminating research and outcomes is to communicate this information to peers and other interprofessionals as well as with key stakeholders, both in the organization and the community (Zaccagnini & White, 2011).

According to the Centers for Disease Control and Prevention (2015), a *dissemination plan* is simply a plan for informing the audience of the findings associated with research. The target audience for the information disseminated from this project is the nursing staff and the organization's leadership. Part of the dissemination plan for this project will be the development of a scorecard that shows the nursing staff compliance with the chosen indicators. This scorecard can be updated monthly to show progress as well. Use of the balanced scorecard to show performance measurement initiatives has been found to improve quality and compliance (Demartini & Trucco, 2017).

Another element in the dissemination plan for this project is a presentation of the findings to the neurosurgery division. This presentation will give the information directly to the neurosurgeons involved in the case as well as allow time for questions and answers. The variances in compliance that were directly related to physician ordering, such as those pertaining to lab work and consultations, can be addressed in this setting. A poster can be presented at a conference of a national organization such as the American

Association of Neuroscience Nurses outlining the process change. This would be a way to disseminate the information on a much larger scale not necessarily focused within the organization.

The ultimate goal is dissemination through a written publication. This is the gold standard for disseminating research/project findings (Zacagnini & White, 2011). Picking the correct journal to translate this information will be imperative. There are two appropriate options for this. One is the *Journal of Neuroscience Nurses*, and the other is the *Orthopedic Nursing Journal.* Both of these journals cater to nurses taking care of spinal fractures, including fragility fractures. It is thought that continuing the project over a longer time frame and gaining a larger sample size would yield very informative findings that would be appropriate to disseminate through a journal format. In the meantime, however, the dissemination plan is to complete the scorecard, oral presentation, and poster presentation.

Analysis of Self

The 3 years that it has taken me to get to this point have been difficult but very rewarding. This program and the resulting project have all but demanded that I grow both personally and professionally and have made me a stronger individual all around. There is a great sense of accomplishment and pride when I consider the achievement of the terminal degree in my specialty.

It is in the role of practitioner that I feel the greatest comfort; this was my reason for choosing a practice-focused doctoral program. According to the AACN Essentials

(2006), a DNP program is practice focused, and an integral aspect of such a program is the experience that students bring to the practice setting.

The road I have taken through the DNP project as a scholar has perhaps been the most difficult. As mentioned earlier, I am more comfortable in the practitioner role; therefore, the scholar role had challenges. That being said, this is probably the role that I had the most growth in. According the AACN Essentials (2006), clinical scholarship is the hallmark of doctoral education. Examples of clinical scholarship that I as a DNP student am prepared to practice are the use of analytical methods for literature review and data, the design of evaluation processes, the implementation of quality improvement practices, the application of research findings, the use of information technology in data collection, and the dissemination of findings (AACN, 2006). The use of clinical scholarship aligns with Essential III, "Clinical Scholarship and Analytical Methods for Evidence-Based Practice." I was able to use all of this new scholarship not only to develop my evidence-based guidelines for the care of the vertebral fragility fracture, but also to implement the project and analyze compliance.

My role as project manager has been perhaps the most fulfilling. This role has truly encompassed the entire process of my project, from development to implementation to evaluation. This role allowed me to participate in every phase of the project and be part of its inner workings. The project manager role truly involved many different disciplines and roles that had to come together to make this project successful. Collaboration with the surgeons, nursing staff, consultation services, and patient care facilitators was imperative for all of the program's aims to be met. This role best met AACN Essential

VI, "Interprofessional Collaboration for Improving Patient and Population Health Outcomes" (AACN, 2006). This role required me to improve my leadership skills as well as communication and collaborative skills in order to create the requested change and successfully implement the guideline.

The process of completing the project from inception to data analysis has been quite rigorous, with many hurdles. Getting through the paperwork stage with the IRBs of Walden and my organization took significantly longer than I anticipated. In hindsight, I see that I should have started this process long before I actually did. Trying to balance working full time and the requirements of the DNP program was challenging, but there must be some accountability and sacrifices in order to make it happen, and this was a choice I made. Having to wait on paperwork approval and feeling that I was at a standstill was frustrating; however, once this paperwork had been approved, the remainder of the project went exceptionally fast. Another hurdle I faced involved the analysis of the data. This process took me longer than I anticipated as well because I did not have the software I needed to complete it. I ended up collaborating with the organization's quality improvement person to complete the process control charts, but this required a delay in my original timeline.

Overall, I believe that I started out the project in a fairly organized manner; I was just perhaps too overzealous in working full time. Unfortunately, as the project slowly moved along, with numerous delays on my part as well as delays as I waited for responses from others, I become more disorganized and frustrated. My insight into this particular situation is that a more reasonable time frame with earlier initiation of certain

tasks that are known to take time would have made the experience less anxiety ridden and smoother. That being said, despite the delays, I cannot help but feel a sense of pride that the project was successfully developed, implemented, and evaluated, as this is ultimately what matters.

Summary

In summary, osteoporosis and fragility fractures are a major health concern in the aging population. It is also known that there is a good amount of research available that describes best practices in assessing, diagnosing, and managing this particular patient population. Unfortunately, this research is not being used successfully or consistently. The purpose of this project was to develop, implement, and evaluate compliance with an evidence-based guideline for the management of the vertebral fragility fracture patient in the acute care setting. This project showed that guidelines can be used successfully, and although there are some areas that need to be worked on and improved, overall the guidelines can be adhered to. This is the only way that health care professionals are going to be able to improve outcomes and prevent secondary fractures in this patient population. The research has been done; now it is time to translate that research into practice and make a difference.

References

Agency for Healthcare Research and Quality. (2013). *Formative evaluation: Fostering real-time adaptations and refinements to improve the effectiveness of patient-centered medical home interventions*. Retrieved from https://pcmh.ahrq.gov/page/formative-evaluation-fostering-real-time-adaptions-and-refinements-improve-effectiveness

Alexander, S. (2016). Scholarship in clinical practice: An update on recommendations for Doctor of Nursing Practice programs. *Clinical Nurse Specialists: The Journal for Advanced Nursing Practice, 30*(1), 58-61. Retrieved from http://www.nursingcenter.com/journalarticle?Article_ID=3256305&Journal_ID=54033&Issue_ID=3256011

Ambrose, A. F., Cruz, L., & Paul, G. (2015). Falls and fractures: A systematic approach to screening and prevention. *Journal of Maturitas, 82,* 85-93. doi:10.1016/j.maturitas.2015.06.035

American Academy of Orthopedic Surgeons. (2009). *Position statement: Recommendations for enhancing the care of patients with fragility fracture.* Retrieved from http://www.aaos.org/uploadedFiles/1159%20Recommendations%20for%20Enhancing%20the%20Care%20of%20Patients%20with%20Fragility%20Fractures.pdf

American Academy of Orthopedic Surgeons. (2016, September). *Position statement: Orthopaedic care of patients with fragility fractures*. Retrieved from http://www.aaos.org/uploadedFiles/PreProduction/About/Opinion_Statements/pos

ition/Position%20Statement-%20Orthopaedic%20Care%20of%20Patients%20with%20Fragility%20Fracture%20-%20Final%20Verision.pdf

American Association of Colleges of Nurses. (2006, October). *The essentials of doctoral education for advanced nursing practice*. Retrieved from http://www.aacn.nche.edu/dnp/Essentials.pdf

American College of Rheumatology. (2017). Fracture risk assessment tool (FRAX). Retrieved from https://www.rheumatology.org/I-Am-A/Rheumatologist/Research/Clinician-Researchers/Fracture-Risk-Assessment-Tool-FRAX

American Nurses Credentialing Center. (2014). Magnet recognition program overview. Retrieved from http://www.nursecredentialing.org/Magnet/ProgramOverview

Amin, S. G. (2001). Control Charts 101: A guide to health care applications. *Quality Management in Health Care, 9*(3), 1-27. Retrieved from http://www.npaihb.org/images/training_docs/NARCH/2010/Amin%20Control%20Charts%20101%20Quality%20Management%20in%20Health%20Care%202001.pdf

AO Trauma (2014, January). *Orthogeriatrics: Clinical support document—Treatment of osteoporosis in fragility fractures.* Retrieved from https://aotrauma.aofoundation.org/Structure/.../AOT_Orthogeriatrics_Osteoporosis.pdf

Aspray, T. J., Bowring, C., Fraser, W., Gittoes, N., Javaid, M. K., Macdonald, H., … Francis, R. M. (2014). National Osteoporosis Society vitamin D guideline summary. *Age Ageing, 43*(5), 592-595. Retrieved from http://www.medscape.com/viewarticle/831094_4

Bottai, V., Giannotti, S., Raffaeta, G., Mazzantini, M., Casella, F., De Paola, G., … Guido, G. (2016). Underdiagnosis of osteoporotic vertebral fractures in patients with fragility fractures: Retrospective analysis of over 300 patients. *Clinical Cases in Mineral and Bone Metabolism, 13*(2), 119-122. doi:10.11138/ccmbm/2016.13.2.119

Bradshaw, W. G. (2010). Importance of nursing leadership in advancing evidence-based nursing practice. *Neonatal Network, 29*(2), 117-122. Retrieved from www.waldenu.edu/library

Centers for Disease Control and Prevention. (2014). *Building our understanding: Key concepts of evaluation: What is it and how do you do it?* Retrieved from http://www.cdc.gov/nccdphp/dch/programs/healthycommunitiesprogram/tools/pdf/eval_planning.pdf

Centers for Disease Control and Prevention. (2015). *What you can do to prevent falls*. Retrieved from https://www.cdc.gov/homeandrecreationalsafety/pubs/.../brochure_Eng_desktop-a.pdf

Demartini, C., & Trucco, S. (2017). Are performance measurement systems useful? Perceptions from healthcare. *BMC Health Services Research*, 17, 96. doi:10.1186/s12913-017-2022-9

Dionyssiotis, Y. (2010). Management of osteoporotic vertebral fractures. *International Journal of General Medicine, 3*, 167-171.

Donabedian, A. (2005). Evaluating the quality of medical care. *Milbank Quarterly, 83*(4), 691-729. doi:10.1111/j.1468-0009.2005.00397.x

Duke University. (2016). Introduction to evidence-based practice. Retrieved from http://guides.mclibrary.duke.edu/c.php?g=158201&p=1036021

Elvey, M.H., Pugh, H., Schaller, G., Dhotar, G., Patel, B., & Oddy, M.J. (2014). Failure in the application of fragility fracture prevention guidelines. *Annals R Coll Surg Engl*, *96*, 381-385. doi: 10.1308/003588414X13946184601164

Ensrud, K. E. (2013). Epidemiology of fractured risk with advancing age. *Journal of Gerontology: Medical Sciences*, 1-7. http://dx.doi.org/10.1093/gerona/glt092

Gani, L.U., & How, C.H. (2015). Vitamin D deficiency. *Singapore Medical Journal, 56*(8), 433-437. doi: 10.11622smedj.2015119

Gerdhem, P. (2013). Osteoporosis and fragility fractures: vertebral fractures. *Best Practice & Research Rheumatology*, *27*, 743-755. Retrieved from http://ac.els-cdn.com.ezp.waldenulibrary.org/S1521694214000035/1-s2.0-S1521694214000035-main.pdf?_tid=fce35f64-99d1-11e4-8b11-00000aacb360&acdnat=1421008969_2787e73891cbe529853b1b80b7bc70a3

Gillam, S., & Siriwardena, A. N. (2014). Evidence-based healthcare and quality improvement. *Quality in Primary Care*, *22*, 125-132. Retrieved from www.walden.edu/library

Gittoes, N., McLellan, A., Cooper, A., Dockery, F., Davenport, G., Goodwin, V., ... Thurston, A. (2015). Effective secondary prevention of fragility fractures: Clinical standards for fracture liaison services. Retrieved from National Osteoporosis Society: file:///C:/Users/sdrog_000/Downloads/Clinical-Standards-Report%20(1).pdf

Glickman, S.W., Baggett, K.A., Krubert, C.G., Peterson, E.D., & Schulman, K.A. (2007). Promoting quality: The health-care organization from a management perspective. *International Journal of Quality Healthcare, 19*(6), p.341-348. Retrieved from http://www.medscape.com/viewarticle/568115_print

Hodges, B. C., & Videto, D. M. (2011). *Assessment and planning in health programs* (2nd ed.). Sudbury, MA: Jones & Bartlett Learning, LLC.

Hashmi, F.R., & Elfandi, K.O. (2016). Heel ultrasound in detecting osteoporosis in low trauma fracture patients. *Orthopedic Review, 8*(2), 6357. doi: 10.4081/or.2016.6357

Inderjeeth, C.A., Glennon, D.A., Poland, K.E., Ingram, K.V., Prince, R.L., Van, V.R., & Holman, D.J. (2010). A multimodal intervention to improve fragility fracture management in patients presenting to emergency departments. *MJA, 193*(3), 149-153.

Institute of Medicine. (2011). Clinical practice guidelines we can trust. Retrieved from https://www.nationalacademies.org/hmd/Reports/2011/Clinical-Practice-Guidelines-We-Can-Trust.aspx

International Osteoporosis Foundation. (2012). Capture the fracture: A global campaign to break the fragility fracture cycle. Retrieved from www.iofbonehealth.org

iSixSigma. (2017). A guide to control charts. Retrieved from https://www.isixsigma.com/tools-templates/control-charts/a-guide-to-control-charts/

Kates, S.L., & Mears, S.C. (2011). A guide to improving the care of patients with

fragility fractures. *Geriatric Orthopeadic Surgery & Rehabilitation*, *2*(1), 5-37. doi.10/1177/2151458510397*504.*

Kennel, K.A., Drake, M.T., & Hurley, D. (2010). Vitamin D deficiency in adults: When to test and how to treat. *Mayo Clinic Proceedings*, *85*(8), 752-758. doi 10.4065/mcp.2010.0138.

Klinkenberg, W.D., & Potter, P. (2017). Validity of the Johns Hopkins Fall Risk Assessment Tool for predicting falls on inpatient medicine services. *Journal of Nursing Care Quality,* 32(2), 108-113. Doi 10.1097/NCQ.0000000000000210

Lolascon, G., De Pieto, G., & Gimigliano, F. (2009). Vitamin D supplementation in fractured patient: how, when and why. *Clinical Cases in Mineral and Bone Metabolism, 6(*2), 120-124. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2781221/pdf/ClinicalCases-6-0120.pdf

Lamb, L.C., Montgomery, S.C., Won, B.W., Harder, S., Meter, J., & Feeney, J.M. (2017). A multidisciplinary approach to improve the quality of care for patients with fragility fractures. *Journal of Orthopaedics, 14*, 247-251. doi 10.1016/j.jor.2017.03.004

Liu, S. K., Munson, J. C., Bell, J. E., Zaha, R. L., Mecchella, J. N., Tosteson, A. N., & Morden, N. E. (2013). Quality of osteoporosis care of older medicare recipients with fragility fractures: 2006 to 2010. *Journal of the American Geriatrics Society*, *61*(), 1855-1862. http://dx.doi.org/10.1111/jgs.12507

McConnell, C. T., Wippold, F. J., Weissman, B. N., Angevine, P. D., Fries, I. B., Holly,

L. T., ... Rubin, D. A. (2013). ACR Appropriateness criteria management of, vertebral compression fractures. *National Guideline Clearinghouse*. Retrieved from www.guideline.gov

McDonald, K.M., Sundaram, V., Bravata, D.M. (2007). Closing the quality gap: A critical analysis of quality improvement strategies. *Agency for Healthcare Research and Quality, 7.* Retrieved from http://www.ncbi.nlm.nih.gov/books/NBK44008/?report=printable

Mitra, P., Chaudhury, T., & Ali, S.A. (2011). Fragility fractures in the elderly: Evolving approaches in the NHS. *Trauma, 14*(1), 39-46. http://dx.doi.org/10.1177/1460408611405143

National Bone Health Alliance. (2012). Secondary fracture prevention initiative. Retrieved from http://www.nbha.org/projects/secondary-fracture-prevention-initiative

National Institute for Health and Care Excellence. (2012). *Osteoporosis: assessing the risk of fragility fracture*. Retrieved from https://www.nice.org.uk/guidance/cg146/resources/osteoporosis-assessing-the-risk-of-fragility-fracture-35109574194373

Old, J. L., & Calvert, M. (2004, January 1). Vertebral compression fractures in the elderly. *American Family Physician, 69*(1), 111-116. http://dx.doi.org/Retrieved from

Panda, A., Das, C. J., & Baruah, U. (2014). Imaging of vertebral fractures. *Indian Journal of Endocrinology and Metabolism, 18*(3), 295-303.

http://dx.doi.org/10.4103/2230-8210.131140

Peek, N., Goud, R., & Abu-Hanna, A. (2008). Application of statistical process control methods to monitor guideline adherence: A case study. *AMIA Annual Symposium Proceedings Archive,* 581-585. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2656072/pdf/amia-0581-s2008.pdf

Pisani, P., Renna, D., Conversano, F., Casciaro, E., Paola, M. D., & Quarta, E. (2016). Major osteoporotic fragility fractures: risk factor updates and societal impact. *World Journal of Orthopedics, 7*(3), 171-181. http://dx.doi.org/10.5132/wjo.v7.i2.171

Rosen, H. N., Walega, D. R., Rosen, C. J., & Mulder, J. E. (2015). July 20. *UpToDate*. Retrieved from www.uptodate.com

Rosswurm, M. A., & Larrabee, J. H. (1999). A model for change to evidence-based practice. *The Journal of Nursing Scholarship, 31*(4), 317-322. Retrieved from www.waldenu.edu/library

Schaffer, M. A., Sandau, K. E., & Diedrick, L. (2012). Evidence-based practice models for organizational change: Overview and practical applications. *Journal of Advanced Nursing, 69*(5), 1197-1209. http://dx.doi.org/10.1111/j.1365-2648-2012.06122.x

Smeltzer, S.C. (2014). Practical implications for nurses caring for patients being treated for osteoporosis. *DovePress Review, 2014(4),* p 19-33. http://dx.doi.org/10.2147/NRR.S36648.

Stevens, K. R. (2012). ACE star model of EBP: Knowledge transformation. Retrieved from www.acestar.thsca.edu

Stevens, K. R. (2013). The impact of evidence-based practice in nursing and the next big ideas. *The Online Journal of Issues in Nursing*, *18*(2). http://dx.doi.org/10.3912/OJIN.Vol18No02Man04

Suzuki, N., Ogikubo, O., & Hansson, T. (2008). The course of the acute vertebral body fragility fracture: its effect on pain, disability and quality of life during 12 months. *European Spine Journal, 17*, 1380-1390. http://dx.doi.org/10.1007/s00586-008-0753-3

Titler, M.G. (2010). Translation science and context. *Research and Theory for Nursing Practice: An International Journal, 24*(1), p.35-55. doi: 10.1891/1541-6577.24.1.35.

Zaccagnini, M.E., & White, K.W. (2011). *The doctor of nursing practice essentials: A new model for advanced practice nursing.* Sadbury, MA: Jones & Bartlett Publishers.

Appendix A: Vertebral Fragility Fracture Management Guideline

Texas Health
Harris Methodist Hospital
FORT WORTH

Vertebral Fragility Fracture Management Guidelines

Purpose: To provide guidance on the management of patients admitted with vertebral fragility fractures. ***Fragility fractures are defined as fractures resulting from a fall from a standing height or less, or presenting in the absence of obvious trauma.***

Population: All patients admitted to the Neurosurgical unit with diagnosis of vertebral fracture from ground level fall. Fragility fractures do not need a bedside scan as this is already diagnostic of osteoporosis.

Nursing:

1. Educate on cessation of tobacco smoking and avoidance of excessive alcohol intake.
2. Fall risk assessment and education as warranted
3. Osteoporosis and fracture education through EMMI and Lexicomp

Neurosurgeon/PA/APRN:

1. Consult Bone Health for inpatient counseling and coordination of outpatient follow-up in an osteoporosis clinic for fragility Fractures as appropriate.
2. Order appropriate labs (see below)

Laboratory Tests:

1. Vitamin D 25-Hydroxy
2. Calcium

Bone Health Consult:

1. Send letter to patients PCP regarding patients osteoporosis consultation and treatment.
2. Educate the patient/family about the need to decrease the risk for future fractures, and treatment options available.
3. Follow up with appropriate patients in outpatient osteoporosis clinic.

Reference:

Akesson, K., Marsh, D., Mithcell, P.J., McLellan, A.R., Stenmark, J., Pierroz, D.D., Kyer, C., & Cooper, C. (2013). Capture the fracture; A best practice framework and global campaign to break the fragility fracture cycle. *Osteoporosis International,* 24, 2135-2152. DOI: 10.1007/s00198-2348-z.

Freedman, B.A., Potter, B.K., Nesti, L.J., Giuliani, J.R., Hampton, C., & Kuklo, T.R. (2008). Osteoporosis and vertebral compression fractures – continued missed opportunities. *The Spine Journal,* 8, 756-762. DOI 10.1016/j.spinee.2008.01.013