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## Extraction and Analysis of Data for Fragility Fracture Patients to Help Determine the Likelihood of Follow-Up With a West Michigan Fragility Fracture Service

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Running head: FRAGILITY FRACTURE PATIENT FOLLOW-UP

EXTRACTION AND ANALYSIS OF DATA FOR FRAGILITY FRACTURE  
PATIENTS TO HELP DETERMINE THE LIKELIHOOD OF FOLLOW-UP WITH A  
WEST MICHIGAN FRAGILITY FRACTURE SERVICE

Michael Joseph Lamphere

A Dissertation submitted to the Graduate Faculty of

GRAND VALLEY STATE UNIVERSITY

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For the Degree of

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**Dedication**

This doctoral project is dedicated to my wife and family, the family that was created and continued to expand during the course of my doctoral education. Without their love, support, and sacrifice, the completion of this project would not have been possible.

**Acknowledgements**

I would like to acknowledge the support of Grand Valley State University and the Kirkhof College of Nursing faculty in the creation of this doctoral project. I would like to express a special thanks to the two separate doctoral project chairs I had during the course of this project. Dr. Cynthia Coviak and Dr. Karen Burritt were both integral in the continuation and completion of this project. Their understanding and support throughout this project is like nothing I have ever seen before in academics, and it made all the difference in the outcome of my education. I would also like to thank Dr. Anne McKay and Dr. Alexander Nesterenko for their support during this project. The staff and management of the project implementation site also deserve thanks. Their help made this project flow much more easily than it would have without their supportive efforts.

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### Abstract

Fragility fractures and secondary fractures are a large physical, financial, and emotional drain on the individuals and families affected. Improving post fragility fracture care and increasing follow-up rates with specialty services, such as a fracture liaison service, may promote post-fracture recovery and help prevent future fractures. The purpose of this doctoral project was to increase and improve post osteoporotic fracture care by increasing appropriate referrals and follow-up care. Patient data was retrieved and analyzed on 60 fragility fracture patients referred to a local fracture liaison service. The analysis found that patient gender, fracture site, and history of a previous fracture all played a significant role as to whether the patient would follow-up with a fracture liaison service. The Health Belief Model and the Donabedian model were used to help drive this project and provide structure to the next steps in the project. To make the results relevant to primary care providers, local outcome data was used to provider a presentation to the group. The primary care providers then completed a survey answering questions based on their impression of the patient data presentation. The provider survey response data was then analyzed for trends. Most notably, the vast majority of providers agreed that after the presentation, they had a greater understanding of the patients that were most likely to receive inadequate fragility fracture care or refuse follow-up with a fracture liaison service. This implies that the providers now have a raised awareness about these patients and fewer patients will fall through the cracks when it comes to fragility fracture care and fracture liaison service follow-up. This project format could be applied to other populations to assist in revealing each unique population's characteristics that impact fragility fracture care and fracture liaison service follow-up. Those results could then be

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presented to local primary care providers to raise awareness and improve their local outcomes.

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## CHAPTER 1

### INTRODUCTION

Osteoporosis and low bone mass impact a large portion of America's older population. Through a combination of genetic factors and lifestyle factors, bone loss can occur and impact future health and functioning. According to the National Osteoporosis Foundation (2018), 54 million Americans have osteoporosis and low bone mass. Osteoporosis is known as a silent disease because there are commonly no physical sensations related to the loss of bone mass. Bone loss can progress unnoticed for a long period of time. Physical signs of bone loss can be demonstrated as decreased height or forward curvature of the spine (NOF.org, 2014). The most common sign of bone loss is a low energy fracture, also known as a fragility fracture. The American Association of Orthopaedic Surgeons (2009) defines fragility fractures as, "fractures resulting from a fall from a standing height or less, or presenting in the absence of obvious trauma" (para 1). More than one half of all women and one fifth of men will experience an osteoporotic fracture in their lifetime (Centers for Disease Control and Prevention (CDC), 2014). Each year more than 300,000 elderly people will be hospitalized for a hip fracture (AHRQ, 2016).

Arbeitsgemeinschaft für Osteosynthesefragen (AO) Foundation (2014) gives a very similar definition of fragility fracture stating that, "fragility fractures are low energy fractures that occur from a fall from standing height or less" (para 1). AO Foundation's definition uses the words "low energy" to describe the fracture. In a clinical summary document the organization reports that a fragility fracture implies the diagnosis of

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osteoporosis. The document goes on to explain that any patient with a fragility fracture, regardless of the results of other testing, is defined as having osteoporosis.

Looking at these definitions, it can be said that all fragility fractures are osteoporotic fractures. In the event of fracture, not all osteoporotic fractures are identified by a low energy or atraumatic event. Some fractures are produced by traumatic events that would fracture healthy bone, but weak bone may be recognized through radiologic procedures or during a surgery meant to diagnose or treat a fracture. In this way, a larger portion of individuals with osteoporosis and fracture can be identified for proper treatment. In one article, a physician notes that radiologists need to be aware that the presence fragility fractures on imaging will often change the treatment plan, and that the fragility fractures need to be identified as such (Link, 2012).

Fragility, low energy, and atraumatic fracture all mean that same thing; a fracture that has occurred due to bone strength that ranks below the expected average. For the purpose of this paper we are going to use the term osteoporotic fracture to describe all fractures that have occurred in the presence of osteoporosis, regardless of the event that caused the fracture.

Persons experiencing an osteoporotic fracture are at greater risk for fracturing again later in life. Without proper post-fracture care, these individuals continue to live with an unnecessarily high risk of fracturing again. A single fracture puts an elderly individual at risk for several other ailments. Decreased mobility can increase the risk of infection, pressure ulcers, impaired wound healing, future falls, and can greatly impact a person's emotional state (Xenodemetropoulos et al., 2004). Xenodemetropoulos, Davison, Ioannidis, and Adachi (2004) report that, "osteoporotic fractures result in a significant

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reduction in quality of life and increased mortality” (p.725). The authors go on to explain that only about one third of osteoporotic vertebral fractures come to clinical attention, and despite the fracture’s subclinical nature, there is still a decrease in the Health-Related Quality of Life (HR-QOL). Individuals that survive a hip fracture often experience the greatest decrease in HR-QOL. Siris, Modi, Tang, Gandhi, and Sen (2014) report that in a U.S. managed-care population, one year after being diagnosed with osteoporosis 64.3% of individuals still had not received any pharmacological treatment for their diagnosis.

As recent as 2015, annual medical costs in the U.S. related to falls totaled more than 50 billion dollars (Florence, Bergen, Atherly, Burns, Stevens, and Drake, 2018) Expenditures related to osteoporotic fractures range from 12 to 18 billion dollars per year, with additional billions in indirect costs (Office of the Surgeon General, 2004). Indirect costs can be attributed to personal work loss or time taken from work by family members and out of pocket costs not covered by insurance. In the Michigan Surgeon General’s Healthy People 2010 report (2004), Michigan noted a cost of at least 410 million in direct costs related to osteoporosis. The authors noted a cost exceeding 36,000 dollars for one hip fracture. Also recognized was that in the year 2000, 7,700 people under the age of 65 had an osteoporosis related hip fracture. The indirect costs in this age group were very significant due to lost productivity.

A decrease in mobility and self-esteem and an increase in pain and the need for additional therapies also impacts the individual with osteoporotic fracture at a financial level. Those who were able to work may no longer be able to endure the physical nature of their work post-fracture. Almost one in five hip fractures end up in a nursing home. The additional costs of medications and rehab therapies compound the financial stress.

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Often, for older individuals healing from a fracture, adult children act as caretakers and may need to take time from their own work to provide this care. (Office of the Surgeon General, 2004; Dempster, 2011)

The National Osteoporosis Foundation (2014), National Committee for Quality Assurance (2004), and the Office of the Surgeon General (U.S.) (2004) describe the substantial impact that osteoporosis and osteoporosis related fractures have on the nation. The information from Wisdom and Olszewski and Healthy Michigan 2010 (2004) describe the same osteoporosis related impact on a more local level. These facts support each other and reveal that the issue is not isolated, but can be found throughout the nation and the state of Michigan. Articles with a more recent publication date often cite statistics and findings that predict or report a greater likelihood of osteoporosis and related future fracture for both women and men.

Martin-Martin et al. (2014) report that occupational therapy training can help reduce emotional distress for informal caregivers related to patient mobility, safety, and recovery. Therapy training would be similar to the follow-up education provided by skilled outpatient services educated in mobility and bone health. Siddiqui, Sim, Koh, Fook-Chong, Tan, and Howe (2010) report the stress levels of caregivers of patients with osteoporotic hip fracture. Caregiver stress levels greatly increased at the point of admission for treatment of fracture and continued to be significantly elevated 6 months post-fracture. A significant stressor was financial strain and the authors suggested ensuring adequate resources were available for caregivers in the post-fracture period.

According to the National Committee for Quality Assurance (2012), only 19.1% of female Medicare patients received osteoporosis management after a fracture; therefore

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a large number of persons with osteoporotic fracture are at an increased risk for impaired healing and risk of future fracture. Huntjens et al. (2014) report that after osteoporotic fracture, the utilization of a fracture liaison service resulted in a 35% lower risk of mortality and a 56% lower risk of a non-vertebral fracture. Xenodemetropoulos et al. (2004) report that there are effective therapies available to prevent fractures from occurring, and identifying and treating those individuals at highest risk for osteoporotic fractures is our greatest challenge for reducing the burden of osteoporotic fractures.

The presented information provides strong evidence that osteoporosis and low bone mass have a significant impact on the health and wellbeing of our population. It can also be seen that individuals with an osteoporotic fracture often have an insufficient amount of the follow-up care needed to prevent future fracture. Patients who receive follow-up care from a fracture liaison service exhibit a significantly lowered mortality risk and a significantly lower risk of future fracture (Hunjens et al., 2014). Often, patients with an osteoporotic fracture do not have the opportunity or understanding needed to receive follow-up care for osteoporosis after a fragility fracture. One evidence based treatment model for follow-up is the use of a fracture liaison service. Also, it is not uncommon for primary care providers to fail to understand bone health needs post-fracture, while at the same time telling their patients that there is no need to follow-up with a fracture liaison service (FLS). Larcombe, Lisk, and Yeong (2014) report from their study population that approximately 45% of fragility fracture patients were either assessed or treated for osteoporosis by their primary care provider. This is compared to their report of a 98% assessment and treatment rate for the fracture liaison service.

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Larcombe, Lisk, and Yeong conclude that a FLS greatly increases the capture and treatment rates for fragility fracture patients.

The purpose of this doctoral project is to influence primary care provider behaviors and actions towards osteoporotic fracture patients by presenting patient specific data revealing the types of patients who are least likely to follow-up with the West Michigan BHP. In the next section, the setting and organization for the project are described as a means to understand the context of this quality improvement project.

### **Project Setting**

For the purposes of this project, a West Michigan hospital with a fracture liaison service will be subject of focus. As part of the services offered, this hospital has a fracture liaison service that will be referred to as the Bone Health Program (BHP). Every patient admitted to the affiliated West Michigan hospital for a fragility fracture is automatically referred to the Bone Health Program service. The BHP also accepts referrals from primary care offices and specialty services when there is suspected or proven poor bone health. The BHP assesses patients physically as well as assessing their personal health history, family history and dietary intake. With this information the BHP is able to make recommendations and prescribe the medications needed to improve bone health and increase bone mass. Follow-up appointments for osteoporotic fracture patients are scheduled prior to discharge from the hospital. Follow-up appointments are made six to eight weeks out from discharge to accommodate healing and possible rehabilitation placement post fracture.

Patients that are admitted to the hospital with osteoporotic fractures are identified and referred to the West Michigan hospital's BHP through a number of methods. Upon

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admission or during the inpatient stay, the admitting physician or a consulting physician may recognize that the patient qualifies for the fragility fracture pathway. The fragility fracture pathway is an order set available through the West Michigan hospital's electronic health record (EHR). The fragility fracture pathway contains orders that optimize the assessment, treatment, and healing of a patient admitted with a fragility fracture. Orders such as oral supplements of calcium and vitamin D to promote healing and bone health, labs to test for thyroid dysfunction that may contribute to poor bone health, a referral to care management to talk about and schedule an appointment with the BHP, and a referral to the BHP for further assessment and treatment are included.

The order for referral notifies the clinical staff at the BHP about an osteoporotic fracture patient, and prompts them to mail information to the patient instructing them to schedule an appointment. Due to the healing process and frequent need for inpatient rehab after an osteoporotic fracture, appointment scheduling by the BHP is often not attempted for several weeks after discharge from the West Michigan hospital.

Other ways of capturing the admission of osteoporotic fracture patients include identification by: nurses, care management, or the BHP. When nurses recognize the patient as an osteoporotic fracture, they have the ability to initiate the same fragility fracture order set as the physicians. This initiates the same orders and cues care management to talk with the patient. Care management may independently identify the patient as an osteoporotic fracture and request nursing to enter the fragility fracture order set. BHP identifies the patients by routinely screening admission diagnoses and subsequent chart reviews.



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When care management nurses speak with a patient about the BHP, they offer a brief explanation of the potential benefits. A care manager also attempts to schedule an appointment for the patient with the BHP for six to eight weeks after discharge from the hospital. These appointments are kept on a clipboard in a designated area, and are faxed to the BHP weekly for them to enter into their scheduling system. The final method to capture osteoporotic fracture patients is a review of inpatient census by a worker at the BHP. The BHP nurse practitioner may look at the admitting diagnosis of patients on the orthopedic care floor and identify them as fragility fracture patients in need of additional assessment and care.

Some osteoporotic fracture patients are discharged from the West Michigan hospital of focus with a scheduled appointment with the BHP and a desire to improve bone health. Other patients are at times captured too late in the process, or not at all. A late or missed capture is realized when a patient is discharged and the unit based nurse, care manager, or the BHP realize the proper referral to and scheduling for the BHP has not yet occurred. The patients that are captured late in the process will not be educated about the BHP or have an appointment, but the BHP is still able to be contact these patients to attempt education and attempt to schedule an appointment after discharge from the hospital. Due to the discharge location or impaired communication outside of the hospital, some of these patients never receive the education or follow-up appointment with the BHP.

According to the BHP's nurse practitioner, patients often reschedule their follow-up appointments due to a prolonged rehabilitation stay or a lack of understanding. Some patients cancel their follow-up appointments because they don't believe it is needed, or

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their primary care providers have told them that they will take care of their bone health. The BHP's nurse practitioner reports a follow-up rate of 20 percent of the patient referrals from the West Michigan hospital actually being seen in clinic in 2016. A lack of understanding and a delay in addressing bone health leads to many patients being at higher risk for impaired healing and future fracture.

### **Improving the Situation**

One of the largest hindrances for the West Michigan hospital's Bone Health Program is the low and inconsistent follow-up rates post-fracture. Low follow-up rates means that a large portion of the fracture population in this community are not receiving consistent and adequate bone health care post-fracture. There are several reasons for low and inconsistent follow-up rates. Some reasons are well known to the BHP staff and others have yet to be discovered. With an analysis of patient-specific characteristics, the most prevalent reasons for low follow-up rates may be described. When the reasons for low follow-up rates are known, the BHP and local providers can be proactive in education and treatment of patients at high risk for re-fracturing.

The West Michigan hospital's Bone Health Program keeps a database for all of the referred osteoporotic fracture patients. The information from Bone Health Program's database is de-identified for patient privacy. This database contains a great deal of patient specific information that can be analyzed for trends. Characteristics such as age, gender, race, living situation, fracture site, and primary care provider may have a large impact on the patient's desire or ability to follow-up with the Bone Health Program. With data from analyses, the Bone Health Program and local primary care providers will be able to proactively educate and promote follow-up care for osteoporotic fracture patients. The

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trends seen in the analyzed data will be disseminated to the employees of the Bone Health Program as well as to local primary care providers, in a manner consistent with each office's specific means of staff education and continuing education.

The goal of this project is to influence primary care provider behaviors and actions towards osteoporotic fracture patients by presenting patient specific data revealing the types of patients who are least likely to follow-up with the West Michigan BHP. In order to achieve this the project will proceed in several phases. 1) Accessing the database and analyzing the secondary data will be the first step of this process. 2) The results must then be processed into a presentation format. 3) After this has been accomplished the results will be shared with local primary care providers by site-specific means of continuing education. Results will be shared with providers regardless of their patients' participation with the BHP.

### **Desired Outcome**

The desired outcome of analyzing the osteoporotic fracture patient data is that trends may be revealed and certain patient characteristics may become apparent as barriers to follow-up. This will produce new information that has not been previously produced for the focus population either locally or nationwide. With this information, the BHP and local primary care providers will be able to target patients with specific characteristics to increase education or improve management. Targeted care will help produce greater follow-up rates and better post-fracture care.

### **Synthesis of Findings**

According to Torracco (2005), "synthesizing the literature means that the review weaves the streams of research together to focus on core issues rather than merely

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reporting previous literature” (p. 362). In this action we can see trends formed by the research that might not have been previously obvious and come to conclusions based on those trends. The focus for this topic looks at both the impact of osteoporosis on the community as well as the downfalls of reduced follow-up rates and the influence of patient specific characteristics on follow-up.

Huntjens’ (2014) research has one of the largest impacts on the work for this project and what the outcomes may mean. The research presented in this article greatly portrays the point of this project, and what it attempts to improve. Huntjens’ research demonstrates that a patient’s participation with a fracture liaison service greatly lowers his or her fracture risk as well as mortality risk. In this research, 1,412 participants took part in a FLS and 1,910 participants received “standard” fracture care. Those that received care from a FLS had a 32% decreased risk of mortality, and a 16% decreased risk of subsequent non-vertebral fracture at 12 months and 66% decreased risk at 24 months with a 95% confidence interval that the true values are lying somewhere between 21-47%, -10-36%, and 21-75% respectively. Giangregorio, Papaioannou, Cranney, Zytaruk, and Adachi (2006) support that fragility fracture patients are not receiving adequate osteoporosis management. Articles by Chakravarthy, Ali, Iyengar, and Porter (2008) and Sutcliffe (2008) both highly support the use of a FLS for improved management and treatment of those who are at risk for, and have experienced a fragility fracture. Chakravarthy, Ali, Iyengar, and Porter’s work specifically reports that a FLS made a significant difference in the prescription of vitamin D and calcium, weight bearing advice, fall risk assessments, and dual-energy-x-ray-absorptiometry (DEXA) scans. A FLS improves compliance with current treatment and prevention guidelines.

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Hofflich et al. (2014) report their results that when automatically triggering an endocrine consult for osteoporotic fractures resulted in a significant increase in all parameters except outpatient follow-up.

The literature does not explicitly state the benefit of a FLS, but supports it indirectly. Current work by Ong, Tan, Sahota, and Marshall (2014) and Gallacher, McQuillian, Harkness, Finlay, Gallagher, and Dixon (2005) both use a FLS as the site for new research. Due to the greater capture rates seen by FLS's, these programs serve as great sites for research and evaluation of trends. Ong, Tan, Sahota, and Marshall used their site to reveal the relationship between obesity and osteoporotic fracture. They also displayed that obese individuals were more likely to experience certain types of fractures and are more likely to fracture with higher bone mineral density (BMD). Gallacher et al. used their program to assess the prevalence of inadequate vitamin D levels as a risk factor for fracture. The FLS sites not only work to improve the health of those at risk and those who have experienced fractures, but also works to better understand the population so treatment and prevention can continue to progress.

Evidence seen in the literature concerning the impact of osteoporosis and osteoporotic fractures as well as the downfalls related to reduced follow-up rates have been displayed. Very little information exists in relation to patient specific characteristics, follow-up rates, and osteoporosis/osteoporotic fracture. Many articles addressing the osteoporosis and osteoporotic fracture population suggest further research to unveil the reason for low follow-up rates, but currently admit a lack of knowledge in this area. The literature does have a wealth of information on this topic for patients with other diagnoses

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and in other care arenas. Because of this, it would be beneficial to be aware of those trends.

For a population of women with cervical and breast cancer, intrapersonal barriers such as insurance coverage and fear were the characteristics that contributed the most to a lack of follow-up (Tejeda et al., 2013). Crandall, Rink, Shaheen, Butler, Unger, and Zollman (2014) report that insurance issues or being insured was a strong predictor of follow-up in their traumatic brain injury population. Chase, Osann, Sepina, Wenzel, and Tewari (2012) report that their inner city cervical cancer population was most likely to follow-up post diagnosis if they were married, English speaking, and privately insured. In patients with standardized access to care, continuous positive airway pressure (CPAP) adherence was associated with race and lower socioeconomic status (SES) (Billings et al., 2011). In a study that looked at the utilization of online health communities by older adults, patients were more likely to participate if they had an informal caregiver, had issues with activities of daily living (ADL), and had a large number of providers (Makai et al., 2014).

Although none of these populations directly mirror the osteoporosis and osteoporotic population of interest, trends can be seen. It appears that patient-specific characteristics that discourage follow-up begin with insurance coverage. Fear and a lack of education seem to follow insurance as the most prevalent issue. Race and SES also have a significant impact on follow-up and compliance with treatment. These are trends currently observed and it is to be seen if they are as significant for the project focus population.

### **Project Purpose**

The purpose of this project was to increase and improve post osteoporotic fracture care by increasing appropriate referrals and follow-up care. This goal was pursued through a variety of objectives and by asking a few clinical practice questions:

- 1) Will the assessment of a FLS and its patients yield the data necessary to improve fragility fracture care?
  - a. What are the characteristics of patients likely to fail to follow up for scheduled appointments?
- 2) Will a presentation of FLS data improve the PCP and FLS actions and care?
  - a. A post presentation survey that will be used to evaluate providers' perception of the presentation's impact on their intention to treat or refer to FLS.

In the next chapter, the literature regarding osteoporosis and its treatment is presented. Then, the theoretical underpinnings for this phenomenon are presented utilizing the Health Belief Model (LaMorte, 2016) along with the Donabedian Model (McDonald et al., 2007) to support the process changes to improve patient care. The final chapter presents the methodology, measures, and analysis plan for this project.

## CHAPTER 2

### LITERATURE REVIEW

In this section, the evidence revolving around osteoporosis, fragility fractures, and patient follow-up will continue to be discussed in relation to patient context. This literature review will cover an introduction to the health problem and will cover the etiology of osteoporosis, screening and prevention, treatment, the primary care provider's role, and the role and impact of the fracture liaison service. Literature will also be reviewed concerning the impact of patient characteristics that affect follow-up and health seeking behaviors. Practice changes in primary care and adoption of practice changes will be addressed as well. Finally, the impact of media and education on providers' actions will be reviewed.

This literature review first reviews osteoporosis and fragility fractures to better understand the social and financial impact that these issues have on the local and national community. Then we will review the roles and tools utilized for screening, assessment, and prevention of osteoporosis. Since the fracture liaison service (FLS) is a particularly important part of prevention and treatment of osteoporosis and osteoporotic fractures; literature concerning a FLS's impact will be reviewed as well. As with any other part of the healthcare system, a provider's ability to help a patient is greatly influenced by the patient's ability or desire to seek care and adhere to recommendations. Treatment of osteoporosis and fracture prevention cannot take place if the patient refuses to take part in it. Because of this, we will also review how a patient's characteristics impact their desire or ability to seek and adhere to treatment recommendations.



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Primary care providers act as the gatekeepers for patient care and referral. At times, they may be a barrier to adequate osteoporosis and osteoporotic fracture treatment. This is why we will also review how care providers adopt and maintain new practices. If it is known how providers best adopt and maintain new practices, education can be targeted to promote care or proper referral for treatment of osteoporosis and osteoporotic fracture. In a similar fashion as to what methods providers adopt new practices, we will review the impact of mass media on a provider's actions. The impact of mass media also influences how a provider determines care and treatment, as well as how the patient seeks and responds to care recommendations. This literature review flows through the topics in a fashion that allows us to expand upon the previous topic, while addressing the issues that have arisen.

### **Background and Introduction to the Problem**

Current and past literature is in agreement over the causes and onset of osteoporosis. Metcalfe (2008) reports that, "osteoporosis is a generalized skeletal disorder characterized by low bone mass and micro-architectural deterioration of bone which leads to fragility and risk of fracture" (p. 51). UpToDate<sup>®</sup> authors Becker and Cohen (2014) echo this characterization of osteoporosis. Metcalfe (2008) also reports many factors that contribute to healthy bones, including: exercise, healthy diet, and adequate intake of both calcium and vitamin D. Healthier bones later in life is also associated with meeting a higher peak bone mass earlier in life, which is also impacted by diet and exercise (Metcalfe, 2008).

In an UpToDate<sup>®</sup> literature review, Manolagas (2018) describes the pathophysiologic process by which impaired bone strength occurs. As Manolagas

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explains, remodeling of bone occurs throughout life. Remodeling is the process in which bone cells known as osteoclasts reabsorb old and injured bone and new bone is formed by osteoblasts. When there is an oversupply of osteoclasts or undersupply of osteoblasts, osteoporosis begins at a cellular level. In current screening for osteoporosis, a low bone mineral density (BMD) is often a hallmark of the disease, but it is not always present in weakened bone. Decreased strength might also be associated with small bone size, unpropitious macroarchitecture (abnormally long femoral neck), disrupted microarchitecture, compromised quality of material, as well as other factors. Old age, sex steroid deficiency, decreased physical activity, and the use of glucocorticoids all have a negative impact on the process of bone turnover and therefore the bones resulting strength.

The University of California, San Francisco (2016) define risk factors as, “either modifiable, meaning you can take measures to change them, or non-modifiable, which means they cannot be changed” (p. 1). Metcalfe, Becker and Cohen, Lane (2006), the National Institutes for Health (NIH) (2012), and the CDC (2014) all agree that non-modifiable risk factors for osteoporosis include gender, age, body size, ethnicity, and family history. Modifiable risk factors include hormonal imbalance, dietary intake and supplementation, medication use, activity levels, cigarette smoking and alcohol intake. Skugor (2010) describes secondary osteoporosis as resulting, “from a variety of the chronic conditions that significantly contribute to bone mineral loss, or it can result from the effects of medications and nutritional deficiencies” (p. 2). Means of secondary osteoporosis include estrogen deficiency, glucocorticoid exposure, and hyperparathyroidism.

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The NIH (2012) explains in more depth that risk factors converge to impact bone on the molecular level. Bone is composed of the protein soft tissue collagen and the mineral calcium phosphate. Bone is constantly turning over and there is a formation and resorption that occurs. As the stated risk factors take their toll, resorption outpaces formation, leading to weak and fragile bones. Much of the literature agrees to this process, but it may occur at different times and in different ways depending on the cause of the bone loss.

The NIH (2012) reports 40 million US citizens with osteoporosis or osteopenia and the National Osteoporosis Foundation (2014) reports 54 million. A 14 million person discrepancy may be attributed to the variations in the dates of publication, and thereby a variation in the prevalence of the disease in the population itself. The National Center for Health Statistics states in a Healthy People 2010 report (2012) that, “The prevalence of osteoporosis among adults aged 50 and over declined 50.0% between 1988–94 and 2005–08, from 12% to 6% (age adjusted), exceeding the Healthy People 2010 target of 10%” (ch. 2 p. 4). The numbers seem to contradict the information reported above, but the numbers presented above did not exclude those under the age of 50. Also, there is a drop in the reported numbers from 2004 to 2012 despite the rapidly rising elderly population in the US.

Literature consistently reports that approximately half of all women will have an osteoporotic fracture in their lifetimes (CDC, 2014; National Osteoporosis Foundation, 2014). However, the fracture statistics for men are not as consistent. The CDC (2014) reports that one out of every five men will break a bone due to osteoporosis while the National Osteoporosis Foundation (2014) reports that one out of every four men will

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suffer an osteoporosis related fracture.

Wisdom and Olszewski, working with Healthy Michigan 2010 (2004) report that 1.5 million adults over the age of 50 in Michigan have osteopenia or osteoporosis and that number is expected to increase to 1.9 million by 2020. Half of all Michigan women and one eighth of all Michigan men age 50 and older will experience an osteoporotic fracture in their lifetime. In the year 2000, people in Michigan sustained 38,614 osteoporotic fractures. Healthy Michigan 2010 reported the prevalence of osteopenia and osteoporosis to be consistent with the rest of the nation, at 15%. Despite harsh Michigan winters and Michigan being the 7<sup>th</sup> cloudiest state by Farmersalmanac.com (2015), which would surely reduce the natural intake of Vitamin D for any of its residents, Michigan has similar osteoporosis rates to the remainder of the country.

Johnell and Kanis (2006) report the global burden of osteoporotic fractures at an estimated 9 million osteoporotic fractures worldwide and the International Osteoporosis Foundation (2017) reports that worldwide, a bone breaks every three seconds due to osteoporosis. Utilizing data from the Global Burden of Disease Study 2010, Sanchez-Riera et al. (2014) found the percentage of low BMD in the total global burden to almost double from 1990 (0.12%) to 2010 (0.21%). Sanchez-Riera et al. (2014) also noted that about one third of falls that resulted in death were credited to low BMD. Europe and the Americas accounted for 51% of the Disability Adjusted Life Years (DALYs) for these fractures. The Office of the Surgeon General (2004) reported that approximately 1.5 million people in the US experience a fracture related to poor bone health. Gullberg, Johnell, and Kanis (1997) reported that the global incidence of hip fracture is estimated to increase 310% for men and 240% for women by 2050.

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When Singer et al. (2015) compared the burden of illness for osteoporosis with other serious diseases in post-menopausal women in the United States; they found the burden of osteoporosis to overshadow all other compared diseases. The authors compared osteoporosis to myocardial infarction, stroke, and breast cancer. They found that osteoporotic fractures accounted for more than 40% of the hospitalizations, and close to a billion more in annual costs compared to next most costly disease.

The National Osteoporosis Foundation (2018) reports that osteoporotic fractures account for 19 billion dollars related costs every year. The International Osteoporosis Foundation (2014) estimates a 50% increase in osteoporotic fractures and the related costs by 2025. This will result in a yearly cost of 25 billion for osteoporosis related fractures by the year 2025. All sources acknowledge additional billions in indirect costs. With such large costs incurred it would be realistic to ask how a portion of these costs could be avoided or prevented. By identifying individuals at risk for fragility fracture, treatment may help prevent initial and secondary fractures.

### **Osteoporosis Screening**

The U.S. Preventative Services Task Force (USPSTF) (2011) recommends osteoporosis screening for women aged 65 years and older, as well as in younger women whose fracture risk is greater than that of a 65 year old white female with no additional risk factors. The task force reports that current evidence is insufficient to make an official recommendation for screening men. The National Osteoporosis Foundation's *Clinician's Guide to Prevention and Treatment of Osteoporosis* (2010) recommends evaluating all postmenopausal women and men age 50 and over for osteoporosis risk and need for bone mineral density testing.

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There are several methods and tools utilized for osteoporosis screening. The Fracture Risk Assessment tool (FRAX), Osteoporosis Self-Assessment tool (OST), Osteoporosis Risk Assessment Instrument (ORAI), Simple Calculated Osteoporosis Risk Estimation (SCORE), and the dual-energy X-ray absorptiometry (DEXA) are some of the most commonly used and most effective methods for evaluating osteoporosis. In the next section, the evidence for each of these tools is reviewed.

### **FRAX**

The American Academy of Family Physicians (AAFP) (2011) reported their adherence to the USPSTF recommendations and further explain the means by which osteoporosis and fracture risk can be evaluated. The AAFP and USPSTF recommend the use of the Fracture Risk Assessment tool (FRAX) for assessment of osteoporosis and fracture risk. The FRAX tool was developed by the University of Sheffield, which hosted the World Health Organization Collaborating Centre for Metabolic Bone diseases at the time of development and release (University of Sheffield, 2011). The FRAX tool estimates a 10-year fracture risk based on clinical information and risk factors. The FRAX tool uses age, gender, height, weight, previous fracture, parent with fractured hip, smoking history, glucocorticoid use, rheumatoid arthritis, secondary osteoporosis, alcohol use, and femoral neck bone mineral density as factors to estimate fracture risk. The listed characteristics of previous fracture, parent with fractured hip, smoking history, glucocorticoid use, alcohol use, and femoral neck bone mineral density were proven through meta-analyses to be valuable predictors of fracture risk. The sensitivity, specificity, and predictive value need to be reevaluated for every new population the tool is to be used with. Pecina et al. (2016) calculated to the FRAX tool's ability to predict

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densitometric osteoporosis in women ages 50 to 64. Pecina et al. found the sensitivity and specificity to be 74 and 42 percent respectively. The FRAX tool is frequently updated and modified to adequately function for differing populations. This tool not only assesses the risk for fracture, but the predictors of poor bone health that will contribute to a future fracture.

### **OST**

Skedros, Sybrowski, and Stoddard (2007) report that the Osteoporosis Self-Assessment Tool (OST) is a tool that calculates osteoporosis risk based on age and body weight alone. Age is subtracted from weight and multiplied by 0.2. The resulting score lands the individual in a low, moderate, or high-risk group. The OST has been validated for Asian and Caucasian women and men (Gourlay, Powers, Lui, and Ensrud, 2008). Pecina et al. (2016) reported the sensitivity and specificity of the OST to be 56 and 69 percent respectively, when predicting osteoporosis in females age 50 to 64. Skedros, Sybrowski, and Stoddard found the OST to be an effective tool in the identification of men with osteoporosis and was simpler and more cost effective than other methods for identifying individuals appropriate for DEXA.

### **ORAI**

The Osteoporosis Risk Assessment Instrument (ORAI) was developed with a cohort of Canadian women and predicts strictly based on age, weight, and estrogen therapy (Gourlay, Powers, Lui, and Ensrud, 2008). The tool produces a number from the age range, weight range, and estrogen therapy question. If the resulting number is over nine, the tool recommends the patient undergo a DEXA scan. Pecina et al. (2016), in the same group of women age 50 to 64, found the ORAI's sensitivity to be 52 percent an

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specificity to be 67 percent. The researchers who originally created the ORAI claimed its sensitivity to be 94.4 percent when selecting women with osteoporosis (Cardette et al., 2000). The creators deemed it an effective tool in identifying women who are likely to have low bone mineral density. The tool's purpose was to identify women at high risk for osteoporosis, so not all women would have to undergo DEXA scans, thereby decreasing time and cost related to evaluation and testing.

### **SCORE**

The Simple Calculated Osteoporosis Risk Estimation (SCORE) is meant to identify post-menopausal women at high risk for low bone density and predicts risk based on race, history of rheumatoid arthritis, estrogen therapy, number of fractures since age 45, age, and weight. The SCORE tool uses these characteristics and calculates a number that places the individual in a low, moderate, or high-risk group. Mühlen, Lunde, Barrett-Connor, and Bettencourt (1999) evaluated the sensitivity and specificity of the SCORE tool using data from 1013 postmenopausal Caucasian women. Sensitivity was found to be 98 percent with specificity at only 12.5 percent. Cadarette, Jaglal, and Murray (1999) report a sensitivity of 90 percent and a specificity of 32 percent. Cadarette, Jaglal, and Murray validated the tool using data from 398 postmenopausal women at least 45 year of age residing within 50 kilometers of Toronto, Ontario, Canada.

### **Comparison of Tools**

Gourlay, Powers, Lui, and Ensrud (2008) evaluated the OST, ORAI, and SCORE tools in a sample of 211 post-menopausal women aged 45 to 88 years. The evaluation found that the OST risk tool had the best discriminatory ability, which was only slightly better than the other two tools. The ORAI and SCORE compared in accuracy to a



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predictor of using only patient weight to predict low bone mineral density (BMD).

Ahmadzadeh et al. (2014) also compared the OST, ORAI, and SCORE in a study involving 211 postmenopausal women age 45 to 88 years. The study concluded that the OST had the highest specificity and SCORE had the highest sensitivity as well as being the best at excluding non-osteoporotic patients for their studied population. Despite any one tool's advantage over the other, the authors also stated that there was no significant difference in these tool's abilities to predict osteoporosis. Gourlay, Powers, Lui, and Ensrud also discuss how in 2002, the USPSTF reviewed cross-sectional studies looking at tools for osteoporosis risk assessment. The authors concluded that further validation of current tools, or development of new tools would be beneficial.

### DEXA

The AAFP (2011), USPSTF (2011), Kleerekoper (2013), Consuelo (2007), and Kling, Clarke, and Sandhu (2014) all agree that the dual-energy X-ray absorptiometry (DEXA) scan is the most popular and effective way of screening for low bone mineral density (BMD). They also agree that screening for low BMD should also include physical examination and laboratory testing. As reported in the NOF's Clinician's Guide (2010), the WHO has designated diagnoses based on BMD levels calculated with DEXA scans. Normal bone mass is within one standard deviation (SD) of a young normal adult, 1.0-2.5 SD below is considered osteopenia, and 2.5 SD below is considered osteoporosis. These values are expressed in t-scores that were adjusted to the normal young adult. The Clinician's Guide also reports that a diagnosis of osteoporosis can be made in at risk individuals based on their history of a low-trauma fracture. Because a DEXA scan is a function of a specialized x-ray machine, one would believe a properly calibrated machine

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would be reliable. But results can vary greatly based on the skill of the DEXA technologist, and the interpretation of the clinician. For this reason, the International Society for Clinical Densitometry recommends DEXA certification for technicians using the equipment and clinicians interpreting the results (2018). Properly educated providers should be able to provide more consistent and reliable results.

Each of these tools for osteoporosis screening has their place. As previously mentioned, the DEXA is one of the most common methods, yet it is still recommended to be accompanied by a physical exam and lab testing. No one tool alone will be able to tell the full story or undoubtedly predict the outcome of the osteoporosis. Tools such as FRAX become even more beneficial when working with patient populations that would not be able to access or afford DEXA. Other tools such as the OST, ORAI, and SCORE become more useful and reliable specific to the race, gender, or life stage (post-menopausal) characteristics of the patient being assessed.

After appropriately assessing patients for osteoporosis, actions need to be taken to prevent avoidable bone loss as well as treat existing osteopenia or osteoporosis. In the next section we will present methods for osteoporotic fracture prevention and methods for treatment of osteoporosis. Research evidence and professional opinion will also be presented as to which providers and by what means treatment actions should be guided.

### **Synthesis of Fracture Prevention and Osteoporosis Treatment Literature**

Findings from Åstrand, Nilsson, and Thorngren's (2012) research state that when patients with fractures were screened for osteoporosis, they had a 42% lower risk of re-fracturing. Åstrand, Nilsson, and Thorngren's interpretation of these results was that the act of screening resulted in treatment that prevents fractures. Recknor, Grant, Recknor,

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and MacIntyre (2013) evaluated patients using the Safe Functional Motion (SFM) test, which was authored by IONmed Systems (2012). Information was used from a retrospective chart review of an osteoporosis specialty clinic in northeast Georgia between 2004 and 2009. During this time period, 847 men and women had adequate data available in their charts and that information was utilized in the analyses. Those who scored higher (higher score designates safer motion during daily activities) were significantly less likely to have a history of fracture or injury from a fall.

Drozdowska, Wiktor, and Pluskiewicz (2013) report the benefit of the Timed Up and GO (TUG) or Stand Up and GO (SUG) tests for evaluating balance, strength and functionality in patients at risk for osteoporotic fracture. Participants in their study included 618 postmenopausal women age 55 and greater. They determined in their research that those patients with poor scores were much more likely to sustain an injury and possible fracture related to a fall. Tan, Price, Briffa, Dhaliwal, Day, and Singer (2008) found similar results in their testing with the TUG test, which assessed 104 community-dwelling women with a mean age of 71.3 years. They also suggest its use for evaluation of at risk individuals in the community setting.

Treatment and prevention of osteoporosis has many levels, and guidelines continue to change and improve. Most research from the recent past, as well as current research and guidelines suggest treatment should be based on the results of a thorough physical, laboratory, and possible radiographic examination. Florence et al. with the U.S. Department of Health and Human Services (2006), the AAFP (2011), and the NOF (2010) encourage lifestyle counseling and fall prevention. Lifestyle counseling includes exercise, smoking cessation, alcohol restriction, dietary counseling, weight management,

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and modifying environmental factors to help prevent falls. These authorities also encourage vitamin D and calcium supplementation. There are a large number of pharmacological agents that can be utilized for treatment of osteoporosis, depending on patient characteristics. After a pharmacological intervention, follow-up BMD testing is recommended to evaluate changes.

In relation to the lifestyle factors, exercise provides varied weight bearing to the skeleton, helping to prevent age-associated fragility. Exercise also increases muscle strength, coordination, and balance, which help prevent falls and therefore fall related fractures. (Russo, 2009) According to the National Institute of Health (NIH) (2016), the link between low bone density and smoking has been known for decades. The NIH also notes that excessive alcohol intake increases the risk for falls that would lead to a fracture, as well as interferes with hormone production and nutrient absorption that have a protective effect on bone. The International Osteoporosis Foundation (2017) states that there are several foods, vitamins, and nutrients that promote bone health and help prevent osteoporosis. The dietary intake that promotes bone health and prevents osteoporosis goes far beyond calcium and vitamin D. Much of the older research suggest that increased body fat protects bone health, but after adjusting for the mechanical loading effects of body weight on bone mass, Zhao et al. (2007) found fat mass to have no beneficial effect on bone mass. Additionally, increased fat mass frequently inhibits physical activity and increases the risk for falls (Mitchell, Lord, Harvey, and Close, 2014).

A FLS is organized to provide or properly refer for every one of the noted lifestyle factors. The provider at a FLS will suggest exercise frequency and provide a patient with printouts of beneficial exercises. Based on the provider's physical

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assessment, he/she may also make a referral to physical or occupational therapy to help increase strength, safety, and independence. The provider will discourage smoking and alcohol intake, as well as offer support and education to assist in reduction or cessation attempts. FLS providers perform an extensive dietary evaluation so they may make proper recommendations on dietary changes that would optimize patient bone health, as well as prescribe medications, or recommend supplements that will assist in further improving bone health. Dietary management will also assist in weight management, which will assist in improving bone health and preventing fractures.

Florence et al. (2006) set guidelines for diagnosis and treatment of osteoporosis. They list the intended users of these guidelines to be providers from endocrinology, family practice, geriatrics, internal medicine, obstetrics and gynecology, preventive medicine, and rheumatology. Eng Keong, Goff, Tan, and Loh (2017) report that the findings of their qualitative study to show that hospitalist physicians believe it is the responsibility of the outpatient physicians to work towards preventing secondary osteoporotic hip fracture. Kleerekoper (1998) reported that the primary care physician's responsibility to detect and treat osteoporosis has increased along with the growing numbers and burden of osteoporosis. Kleerekoper noted this growing burden of osteoporosis over twenty years ago and the burden is further recognized by authors like Shipman, Doyle, Arden, Jones, and Gittoes (2017), who cite a continually growing life expectancy and elderly population as part of the cause. Much of the current literature reports that primary care as well as many specialties should be responsible for osteoporosis care, but they also acknowledge that primary care providers are usually the main entity and gatekeeper for osteoporosis care. Current healthcare processes often

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require a patient to receive a referral from their PCP prior to being able to be seen by a specialist, and the PCP would be the only provider of osteoporosis treatment if a specialist were not already involved.

Sabin and Sarter (2014) report that, “despite proven strategies to prevent osteoporosis, primary care providers do not provide adequate osteoporosis prevention education” (p. 749). Because of this, Sabin and Sarter created an evidence based intervention project to increase osteoporosis prevention education by providers. At the time of their publication data was still being analyzed, but data appeared promising and the authors were optimistic that efforts would reduce osteoporosis related morbidity and mortality. Primary care providers will continue to be an important initiator and gatekeeper for osteoporosis prevention and treatment, but a new model has been formed that has proven to be much more productive and beneficial in treating fracture patients and preventing secondary fractures.

Elliot-Gibson, Bogoch, Jamal, and Beaton (2004) performed a systematic review identifying 37 studies over seven separate databases. Looking at the current status of investigation and diagnosis of osteoporosis in men and women with fragility fractures, the rates of post-fracture treatment, and the barriers to identification and treatment. They found the largest barriers to secondary fracture prevention in routine clinical care were the cost of therapies, time and cost of resources needed for diagnosis, concerns about medications, and the lack of clarity as to which provider bears the responsibility to provide this care.

When referring to bone fractures, secondary prevention is a term used to describe the methods used to prevent a second fracture after a first major fracture caused by poor

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bone health, otherwise known as a fragility fracture (Drew, Judge, Cooper, Javaid, Farmer, Goberman-Hill, 2017). Literature about secondary fractures shows us that without secondary prevention, the risk of secondary fracture increases as well as the risk of increased health costs and decreased quality of life.

In Ganda, Schaffer, and Seibel's (2015) 7-year prospective study, they determined the most prevalent factors related to secondary fracture. Information was used from 234 individuals who had experienced a previous fracture and were currently being managed with some form of secondary fracture prevention program. The authors used Cox proportional hazards model to analyze the predictors of sustaining a secondary fracture. The authors found that over the course of their study almost 21 percent of the subjects had re-fractured. The risks that promoted this included significant co-morbidity, corticosteroid use, and low hip BMD. A medication possession ratio of less than 50% and a low body weight were also related to a higher risk of re-fracture.

To further complicate the prevention of secondary fractures, Sale et al. (2016) reports from their qualitative study that messages about fracture risk are confusing to patients. In a group of 27 adults, all remember being told that they were high risk but weren't sure what that meant. The authors suggested that care providers should attempt to modify their messages to better inform the patients and suit their needs.

### **Primary Care Provider as a Barrier to Treatment**

Blazkova et al. (2010) report their findings that examined the behavior of Czech general practitioners (GP) related to osteoporosis. With a 38 percent response rate they analyzed the responses of 570 GPs. The GPs reported financial barriers and lack of authorization to prescribe specific osteoporosis medications as the main barriers to

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treatment and referral. However, the GPs reported that they would address a median number of only five patients per month about osteoporosis care, and make a median number of only five referrals per quarter to a specialist.

Fradgley, Paul, and Bryant (2015) performed a systematic review to reveal the barrier to optimal outpatient care for individuals with prevalent chronic diseases. Seventy-four studies were included in their review. The majority of studies (75.7%) reported acceptability barriers, which they described as “the relationship between patients’ attitudes to personal and practice characteristics of existing providers and alternatively, provider perceptions of patients’ characteristics” (Fradgley, Paul, and Bryant 2015, table 1). They also indicated inadequate needs assessment (25.7%) and inadequate health communication (20%) as other common barriers. This information displays how the patients readiness for treatment, the providers perception of the health issue, the lack of thorough assessment and the lack of communication between patient and provider leads to a significant delay or complete absence of treatment or referral.

Many times, patient specific characteristics may act as a barrier to referral. Switzer, Jaglal, and Bogoch (2009) address these barriers in their program aimed at capturing more osteoporosis patients for proper post-fracture care. These barriers include age, dementia, medical comorbidities, polypharmacy, lack of adherence with treatment, alcohol abuse, postoperative delirium, language barriers, inadequate social support, and socioeconomic status. Any one of these barriers could act alone or as an additional distraction to prevent primary care providers from fully addressing osteoporosis care post-fracture.



### **The Review Process**

#### **Aim of the Review Process**

The aim of this integrated literature review was to explore the link between patient specific characteristics and the likelihood of adhering to follow-up care. It was also to look at how new practices are adopted by healthcare providers, and to what degree media impacts provider actions.

#### **Objectives**

The objectives of this review were to (a) identify published information and research on the link between patient specific characteristics and follow-up / healthcare compliance, how new innovations are adopted by healthcare providers, and the impact of media on provider actions; (b) conduct an appraisal of studies of the link between patient specific characteristics and follow-up / healthcare compliance, how new innovations are adopted by healthcare providers, and the impact of media on provider actions, and (c) identify underlying themes in the studies that improve the understanding of the relationship between patient characteristics and likelihood of follow-up and also the adoption of new practices by providers and impact of the media on provider actions.

#### **The Design**

To survey the current knowledge and produce an integrative literature review, the methods of review as described by Whitemore and Knafl (2005), were utilized. Whitemore and Knafl's (2005) method for integrative literature review utilizes five stages that include problem identification, literature search, data evaluation, data analysis, and presentation.

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### Search Methods

The literature search was solely conducted using electronic databases. These databases included Cumulative Index to Nursing and Allied Health (CINAHL), EBSCO Host, UpToDate, Google Scholar, and PubMed. Supporting background information was also retrieved in this method, but was not always subjected to the year 2000 or later publication requirement, as was required of the integrative literature review articles.

Key search terms utilized to retrieve results included individually or in partnership were: “osteoporosis”, “fragility fracture”, “fracture liaison service”, “patient characteristics”, “patient specific”, “patient specific characteristics”, “follow-up”, “patient follow-up”, “patient compliance”, “patient compliance with follow-up”, “follow-up compliance”, “follow-up adherence”, “patient adherence”, “appointment adherence”, “provider adoption”, “new methods”, “new implementation”, “implementation methods”, “new provider methods”, “media’s impact”, “media influence”, “barriers to referral”, “provider decisions”, and “provider actions”.

### Search Outcome

The vast majority of articles retrieved with these broad search methods and terms were deemed irrelevant to the project, and therefore were not utilized. Relevance was determined based on population, clinical problem, variables of interest, and concept. Broad individual terms, such as “patient characteristics”, when not used in partnership with other terms often produced over ten thousand results. When used in conjunction, terms such as “patient characteristics” and “patient compliance” produced 2,240 results. Articles were included if they were qualitative, quantitative, mixed research, systematic review, expert opinion, or a case study. Article topics relating to patient specific

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characteristics, follow-up appointments, health compliance, implementation of new innovations, and media influence were included when methodology and framework were appropriate.

### **Appraisal**

The retrieved articles were appraised with the methods provided by Whitemore and Knafl (2005). Articles were included as supporting evidence for the project when they provided supporting information specific to the project focus. Some articles based on case studies, surveys, and expert opinions were included due to their rich insight into the project topic.

### **Data Abstraction and Synthesis**

Data abstraction and synthesis were done in accordance with Whitemore and Knafl's method. The table produced provided organization and simplified comparison and interpretation of articles. Significant separation was necessary due to the three separate focuses of the project, which include patient characteristics and follow-up, provider adoption of new innovations, and media's influence on providers.

### **Results**

The review focused on several areas important to the project. Initially, a review of osteoporosis, fragility fractures, and Fracture Liaison Services was performed to provide a basis on which to display the burden of osteoporosis on individuals and the country, as well as methods with which it is managed.

### **Fracture Liaison Service**

The Fracture Liaison Service (FLS) is a special model of care and prevention “designed to identify, investigate, and initiate appropriate treatment for patients who are at high risk for secondary fractures because of compromised bone health” (Miller, Lake, and Emory, 2015, p. 4). Fracture Liaison Service programs are often composed of an advanced practice nurse coordinator, a physician champion, and a navigator. Miller, Lake, and Emory go on to explain that when comparing the FLS to other osteoporosis management models, the FLS models results in higher rates of diagnosis and treatment as well as less attrition during the post-fracture care period.

As an integral benefit, the FLS model also requires interdisciplinary communication and care coordination, which results in improved outcomes and prevention of secondary fractures. Miller, Lake, and Emory also report that prior to implementation of FLS modeled programs, secondary prevention after a known fragility fracture ranged from 2% to 25%. After implementation of FLS modeled programs, regions recorded increased treatment, improved treatment adherence, decreased risk of secondary fracture, decreased mortality, and cost savings as compared to previous models for post-fracture treatment. The research performed by Huntjens et al. echoes these claims with findings of significantly lowered risk of mortality and non-vertebral fracture as compared to patients who did not take part in a fracture liaison service (2014). Consecutive patients with an age of fifty years or older and presenting with a non-vertebral fracture were included in their work. Huntjens et al.’s research included data from 3322 patients, 1412 of which were part of a FLS and 1910 underwent standard fracture care. In these groups 73.2% and 69.8% were women with an average age of 71.7

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and 69.5 years respectively. Characteristic between groups were analyzed with Pearson chi-square test for dichotomous variables and independent-samples t test for continuous variables. The data was adjusted for age, sex, and baseline fracture location using Cox regression analyses. After this, they found a lower mortality risk with a 0.65 hazard ratio with a 95% confidence interval. The lower mortality risk means that the individuals in the FLS group were almost half as likely to die after experiencing a non-vertebral fracture. Huntjens et al. also found a hazard ratio of 0.84 at 12 months and 0.44 at 24 months for subsequent non-vertebral fracture risk in the FLS group.

The authors addressed their studies weaknesses in comparison to stronger randomized control studies, while also noting the strength of their study was the inclusion of all consecutive patients that presented and meet criteria. This process allowed for a truer picture of the situation without a significant influence on results by actions like participant selection.

Moriwaki and Noto (2017) performed a model-based cost-effectiveness analysis of utilizing an osteoporosis liaison service using drug therapy for prevention of secondary fracture as compared to no drug therapy. The model focused on post-menopausal women in Japan who had experienced a prior hip fracture. Their model came to the conclusion that secondary fracture prevention through a directed service was cost-effective and less expensive as compared to high-risk groups receiving no prevention therapy.

Kern et al. (2005) performed a study with the objective “to determine whether population-based screening for osteoporosis in older adults is associated with fewer incident hip fractures than usual medical care” (pg. 173). A cardiovascular health study was utilized to recruit 3,107 patients for a non-concurrent cohort study. Bone density

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scans were performed for 1422 participants and 1685 participants received usual care. Participants were selected using age and sex stratified random sampling in four separate communities across the United States (US). Individuals with a history of osteoporosis, hip fracture, or bisphosphonate use were excluded. Participants in two communities received DEXA scans while the participants in the two other communities did not. Statistical analysis included t-tests for continuous variables (age) and chi-square tests for categorical variables (sex, race). Separate Cox models were used for different sub groups. Screening was associated with a statistically significant lower hazard of hip fracture as compared to the usual treatment cohort. The incidence of hip fracture was found to be 4.8 per 1000 for the scanned group and 8.2 per 1000 for the un-scanned group. Bone density screening for osteoporosis was associated with 36% fewer incident for hip fracture over a 6-year period. Stratifying participants for age, sex, and race allowed for better comparison of results.

Actions like this seem to be an attempt to make up for performing interventions and comparing results of individuals in communities with great geographic and cultural differences. Groups were similar for 17 out of 31 characteristics, which included demographics, medical history, medications, and physical exam results. The authors noted limitations related to the extent of time between initial data collection for a previous study and their DEXA data and other results, as well as several other limitations. The presented results are useful and significant, but must be properly interpreted and do not have as large of an impact as it could have had with a higher level of evidence. We can see significant differences between groups that receive a service and those that don't,

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but several factors, including patient characteristics, help determine whether those services can or will be received.

### **The Influence of Patient Characteristics**

The proposed project seeks to look at patient specific characteristics to determine whether these will have an impact on the likelihood of follow-up with a West Michigan fragility fracture service. Since the fracture liaison service is a relatively new model of bone health care, the impact of patient specific characteristics on follow-up will be gleaned from other research and areas of care. Hospitals, primary care providers, and other healthcare establishments can offer a wide variety and high quality of patient care, but if the patient is not willing to take part in the care, the results will not be positive.

Crandall, Rink, Shaheen, Butler, Unger, and Zollman (2014) performed a study that was “undertaken to identify the factors that influence follow-up for patients with mild traumatic brain injury (MTBI)” (pg. 489). Their study included 199 consecutive MTBI patients at a trauma center. Bivariate statistics were calculated to help determine patient specific characteristics that impacted that decision to pursue specialty care. Patients who followed-up were routinely older (>40yrs: OR=2.48) and had longer hospital stays (LOS>3days: OR=2.99). A lack of insurance significantly decreased the likelihood of follow-up (OR=0.76). In this study, patient age, length of hospital stay, and insurance coverage had a large impact on the likelihood of follow-up.

In a “study aimed to identify sociodemographic and disease-specific factors associated with follow-up in an inner city multiethnic colonoscopy clinic” (pg. 345), Chase, Osann, Sepina, Wenzel, and Tewari (2012) find that 50% of their appointments during the study period are attended. These appointments focused on patients referred for

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abnormal cervical cytology and/or high-risk Human Papillomavirus infections. Of those remaining, 458 patients who were given a 14 month or less follow-up time were included. Appropriately timed repeat testing was accomplished by 54% of patients and 46% failed to return within the 14 month time period. Univariate and multivariate analysis was performed. With univariate analysis, some characteristics showed a decreased likelihood of follow-up, but lacked statistical significance. In multivariate analysis, referral from an outside clinic, being single, self-pay or government funded insurance, and Spanish-speaking were all significantly associated with non-compliance.

The medication compliance literature can describe a great deal about a patient's willingness, knowledge, and ability to maintain a healthcare routine and attend necessary follow-up appointments. Gomes, Costa-Paiva, Farhat, Pedro, and Pinto-Neto (2011) performed a cross-sectional study that looked at postmenopausal women with osteopenia or osteoporosis and their ability to follow a medication treatment plan. A total of 227 women from a menopause clinic were included in the study. Adequate ability to take medications was evaluated by a questionnaire and was deemed adherent at 80% or greater. The factors most significantly associated with an inadequate treatment were being older than 70 years of age (OR=5.62), being illiterate (OR=10.14), use of other medications (OR=0.33), and shorter length of use of medication (OR=5.67).

Rolnick, Pawloski, Hedblom, Asche, and Bruzek (2013) performed a study where the objective was "to assess patient characteristics associated with medication adherence across eight diseases" (pg. 54). With 31,636 patients meeting the inclusion criteria, bivariate associations between drug adherence and patient characteristics (age, sex, race, education, and comorbidity) were performed using contingency tables and chi-square



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tests. Logistic regression was also performed to examine predictors of adherence from patient characteristics. Statistical analysis looked at patients with one disease and one medication, as well as those with any number of their eight diseases and any number of medications. Adherence was calculated using a medication possession ratio (MPR), where adherent was considered an MPR score of 80% or greater. Higher adherence rates were seen for whites and those living in higher SES areas. Those with lower income and education had lower adherence. Specific to disease, males had higher medication adherence rates for hypertension, diabetes, and hyperlipidemia. As a rule, medication adherence decreased as comorbidity increased. Specific to condition, the lowest adherence was seen for diabetes (51%) and asthma (33%), whereas hypertension, hyperlipidemia, osteoporosis, and cancer all had greater than 75% of patients considered adherent. Adherence decreased with an increased number of comorbidities. This research displays how those individuals with a lower SES and a greater number of comorbidities will be less likely to adhere to medication treatments. This could be also influence the likelihood of following up with specialty care services, and adherence to their treatment plans.

A mixture of patient specific and healthcare specific barriers frequently determines patient adherence and compliance with prevention plans. When a patient becomes a short or long term resident of a skilled nursing facility (SNF), healthcare and organization specific barriers may play a greater role in medication and follow-up compliance. In a cross-sectional survey, Colón-Emeric et al. (2004) surveyed medical directors and directors of nursing at long-term care facilities. Respondents answered a 24-item survey using a five-point Likert scale. At least 40% of the respondents identified

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multiple patient comorbidities, reimbursement issues, length of stay, and regulatory oversight as barriers to providing osteoporosis care. Patient and family concerns, staff time and self-efficacy, and concerns about bisphosphonate safety were not significant barriers to osteoporosis care. Perceived barriers did moderately differ among medical directors and directors of nursing. These results show that adherence to follow-up or a treatment plan can be highly influenced by organizational barriers.

As part of some osteoporosis treatment programs and FLSs, continued education and communication with the patient is performed prior to the initial follow-up for bone health management. Persell, Friesema, Dolan, Thompson, Kaiser, and Baker (2011) performed a prospective observational study of a quality improvement intervention. Persell et al. compared their results to a non-randomly assigned group. Persell et al.'s intervention was a standardized outreach to patients who had previously refused a service for screening for colorectal cancer, breast cancer, cervical cancer, osteoporosis, or the refusal of a pneumonia vaccination. The outreach intervention utilized a care manager who mailed brief educational materials and brochures on the relevant topic, attempted telephone contact 3 times, and left a call back number. When telephone contact was successful, the care manager would attempt to identify and resolve any barriers to receiving the service and provide further education. The outreach cohort included 407 patients and the care manager performed 214 hours of outreach. After 6 months, 6.1% of the outreach cohort had received previously refused services as compared to 4.8% of the non-intervention cohort. The authors deemed this as a “not promising strategy for improving preventative services” among patients who had previously refused (Persell et al., 2011, p. e249).

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Patient specific characteristics may help determine the likelihood of initial follow up and compliance. Similar patient characteristics may have an impact on the desire for a second opinion. Payne, Singh, Meyer, Levy, Harrison, and Graber (2014) conducted a systematic review of literature looking at patient-initiated second opinions in radiology. Thirteen articles met inclusion criteria. It was revealed that patient-initiated second opinions lead to a significant (10-62%) change in diagnosis, treatment, or prognosis. Patient characteristics and motivators for second opinion included confirmation of diagnosis and treatment, dissatisfaction with prior consultation, desire for more information, or persistent symptoms or treatment complications. It appears that patients that are self-motivated are more likely to seek second opinions and follow-up with care. Since osteoporosis is commonly viewed as a silent disease, persistent symptoms would not likely be present to be a motivator for follow-up.

The financial impact of patient follow-up and compliance specific to bone health have become more important in research. Modi, Siris, Tang, and Sen (2015) completed a retrospective analysis of a US claims database identifying women who initiated osteoporosis medication 2002-2009. Patients included were greater than 55 years old and had greater than one pharmacy claim for a bisphosphonate or non-bisphosphonate medication. Compliance was rated at a Medication Possession Rate (MPR) of greater than or equal to 80% with non-compliance being less than 80%. MPR measures the percentage of time a patient has access to their medication. This was measured using medication refill counts. Outcomes were modeled using logistic regression for presence of a fracture, Poisson regression for healthcare utilization rate, and Gamma regression for healthcare costs. Of the 57,913 women that met inclusion criteria, 40.5% were compliant

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with their osteoporosis medication. Non-compliance was associated with a 20% (OR: 1.20) higher risk of any fracture, an increase incidence rate of utilization of inpatient services (IRR: 1.26) and a decreased incidence rate of utilization of outpatient services (IRR: 0.97). Noncompliant patients incurred 13% (CR: 1.13) higher medical costs than compliant patients.

It is apparent that patient characteristics have an impact on the likelihood of follow-up and compliance. Different characteristics play a role depending on the patient population, environment, and the disease(s) present. The characteristics that influence the target population for the current project are still to be evaluated.

### **Provider Adoption of New Methods**

The methods by which providers adopt new innovations must be identified and appraised as the next step in the proposed project. If the methods by which providers adopt new innovations are understood, we will be able to focus their education. Targeted education presented in a way that allows for easier adoption will maximize understanding and reception, thereby helping increase and sustain adoption rates.

As part of their research, Kolowitz et al. (2014) implemented a healthcare social networking technology termed Unite. The purpose of the technology was to break down communication barriers between providers by using social networking technology. Modeling it after familiar social networking technologies thereby enhancing provider familiarity and comfort with the new system encouraged adoption of this new communication method. Observation of the effectiveness of the technology was addressed in a case study that noted its moderate success and its potential to breakdown communication barriers between providers.

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In the 2015 Health Care Management Review article *Huddle Up!*, Department of Veterans Affairs (VA) patient centered medical homes (PCMH) were assessed to reveal the benefits and participation in team “huddles” where a regular opportunity for learning and feedback becomes available. A mixed-methods approach was used analyze team member interviews from 418 clinical staff members. Most (85%) reported huddles were occurring. Primary Care Providers (PCPs) were the least likely to report routine huddling occurring. The primary barriers reported to huddling were operational constraints and time barriers. This shows that adoption of new innovations may be better achieved by breaking down or adjusting perceived barriers. This example of provider adoption of new methods is important to our focus population because it displays how PCPs were less likely to adopt to the new measures. PCPs act as the gatekeepers and have a large impact on the initiation and course of treatment for osteoporosis and intervention post fragility fracture. If PCPs are not as likely to adopt new measures, this is an important feature to observe when trying to educate or implement new measures.

Vimalananda et al. (2017) initiated a quality improvement program to reduce the overtreatment and risk of hypoglycemia in veterans with diabetes. A provider report and clinical reminder was created to help identify at risk patients and prompt providers to adjust treatment accordingly. In the year of 2014, 2,830 patients were screened and 9.6% had their treatment de-intensified. Of the 261 patients that reported hypoglycemia, 37% had their treatment de-intensified, and an even higher percentage when reported symptoms were severe. The number of patients in the screened group that was considered to be high risk declined by 18% at 6 months and 22% at months. The researchers concluded that a clinical reminder helps providers identify and reduce over-treated

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patients. The researches also noted the high numbers of patients that did not receive de-intensified treatment and suggested that a reminder be combined with education, national guidelines, and performance measures. Vimalananda et al.'s work shows us that providers need reminders and continued education to focus on certain topics. Also, we can see that a patient population that has perceivable symptoms and is able to report them receive better adjusted care. This is not the case with osteoporosis, since the symptoms are often few to none prior to a fracture.

Hye-Young, Unruh, Kaushal, and Vest (2015) studied physician participation in meaningful use of electronic health records (EHRs). Between the years of 2011 and 2012 there was a 15.8% increase in the use of the Medicare incentive program and a 2.4% increase for the Medicaid incentive program. The authors found that prior EHR use, access to financial resources, and organizational capacity were physician characteristics associated with participation in meaningful-use. These characteristics show that topic familiarity, and structural and financial organizational support encourages adoption of new initiations and strategies.

Friedberg, Van Busum, Wexler, Bowen, and Schneider (2013) researched shared decision-making between provider and patient on healthcare decisions. During an effort to implement this form of action at eight primary care sites, they interviewed representatives from each site. They found that the administrative leaders, primary care physicians, nurses, and specialty-trained coaches perceived the greatest barriers to this strategy were overworked physicians, insufficient provider training, and inadequate clinical information systems. Methods that promoted adoption of this strategy included automatic triggers for shared decision-making and engaging team members other than

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physicians in the process. Adoption of this process was determined to be highly dependent on provider training and information systems.

Zisblatt, Kues, Davis, and Willis (2013) completed a study that sought to improve the osteoporosis screening of patients at risk for osteoporosis through continuing medical education (CME). Thirteen providers as well as other clinical workers completed the education intervention. The CME program was designed to increase appropriate osteoporosis screening and consisted of eight one-hour educational sessions over a nine-month period. Their CME and quality improvement intervention increased the ordering and performing of osteoporosis screening significantly during the period of the education, and screening continued to increase well after the completion of the education. BMD testing increased as part of the osteoporosis screening as well.

The research and articles looking at adoption of new methods and innovative strategies by providers carry a few core themes. The organization itself and process by which it functions can often be one of the greatest barriers to implementation. Educating providers and staff prior to adoption is necessary to promote success. Utilizing familiar education and structure techniques may also increase provider acceptance. In a similar way that Kolowitz et al. (2014) found modeling after current social networking technology may improve success, it must be taken into account how providers exposure to the media impact acceptance or rejection of proposed new methods.

### **Media's Influence on Providers**

The media has a massive effect on daily life. It often influences actions and decision making for everyone, including providers. This is important when considering the current project, because media may cause a provider to disregard the significance and

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impact of a disease. But media may also be able to be utilized to shine a light on the effects of osteoporosis and fragility fractures. Unveiling to what degree and which types of media impact providers and patients the most may allow for better targeted education and advertisements to promote prevention and care.

Sturmberg and Pond (2009) research the impact of medical news on women's health and hormone replacement and the media's coverage of it. They surveyed 169 general practitioners and received a 67.5% response rate. They found that the understanding of the health news and the media's coverage of it greatly impacted the decision making of providers immediately after the news as well as two years later. Recommendations of hormone therapy changed from 43.8% to 5.9% immediately after and 1.8% two years later. Media sensationalizing was blamed for having a large impact on the change.

Articles by De Jesus (2013) and Neugent (2014) both looked at the impact on patients of mass media health care coverage. De Jesus found mass media to have the greatest impact on decision-making and medical advice seeking behavior in the Hispanic population. The PEW 2007 Hispanic Healthcare Survey was used to reveal this. Neugent cited research by the American college of cardiology, discussing that the media's impact on patients often caused them to discuss or request new and different topics with their provider. This often led the provider to a decision to change treatment plans. Both of these articles show an indirect impact of media on provider's interactions and decision making with patients.

The impact of the media is everywhere and while some themes remain constant, many others change daily. Healthcare is a large business that requires revenue to continue



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to grow and provide. As a direct cause of healthcare advertising, or by the effect of mass media reporting on healthcare concerns and news, media is constantly bombarding both patient and provider.

### Summary

This doctoral project looks at both the osteoporotic fracture population and the providers that oversee their care. Osteoporosis is a significant disease that often goes undertreated both prior to, and after, osteoporotic fracture. The physical and financial burden of osteoporotic fractures is immense for the individual and on a global scale. The burden of these fractures continues to grow with time. There are several means by which to test or assess for osteoporosis. Most of the assessment methods are useful, but none of them are able to fully assess a patient's status independently. Effective care after an osteoporotic fracture depends heavily on the assessment and management of the patient's physical status as well as diet, activity, and medication. Primary care providers would often be providers of this management, and gatekeepers for more specialized care. We also see that when a primary care provider independently manages post-fracture care, outcomes struggle and secondary fracture rates are higher as compared to when specialty services are involved. Research shows us that effective care after an osteoporotic fracture and a reduced secondary fracture rate occurs when a FLS is involved with the patient's care. Adherence to the post-fracture recommendations of a PCP or FLS is highly influenced by each specific patient's characteristics.

We can see that many patient characteristics may influence the likelihood of seeking or maintaining care and treatment for osteoporosis. Frequent trends that decreased adherence and positive outcomes included a lack of insurance, low SES, older

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age, and a greater number of comorbidities. PCPs need to be aware of any potential patient characteristics that could influence adherence to recommendations and treatments. When PCPs aren't able or willing to provide sufficient post-fracture care, they need to involve a specialty group such as a FLS that will be able to provide the needed care. PCPs can adopt the new routine of referring to a FLS to help provide better post-fracture care. New innovations and routines are often adopted by PCPs through continuing education and frequent reminders. At times, mass media and their sensationalizing of findings or events influence a PCP's actions. Media also has a large impact on patient actions, and how they address concerns with their PCP.

This doctoral project has presented the problem that is osteoporosis and its impact on an individual, national, and global scale. Patient characteristics have also been reviewed in relation to adherence. Presenting this information to local PCPs as a means of continuing education, and a reminder of the availability of FLS services, may increase appropriate treatment or referral in the post osteoporotic fracture population.

## CHAPTER 3

### CONCEPTUAL FRAMEWORK

The purpose of this project was increase and improve post osteoporotic fracture care by increasing appropriate referrals and follow-up care. This goal was pursued through a variety of objectives and by asking a few clinical practice questions:

- 1) Will the assessment of a FLS and its patients yield the data necessary to improve fragility fracture care?
  - a. What are the characteristics of patients likely to fail to follow up for scheduled appointments?
- 2) Will a presentation of FLS data improve the PCP and FLS actions and care?
  - a. A post presentation survey that will be used to evaluate providers' perception of the presentation's impact on their intention to treat or refer to FLS.

The Health Belief Model (HBM) was selected as the conceptual framework to frame the patient specific factors related to care and follow-up with a BHP. The Donabedian model (DM) was selected to help frame the rest of the process for this doctoral project that would involve the healthcare organization, primary care provider, and outcomes. This chapter will discuss how the HBM and DM were utilized to assist in forming this project. There are several factors that discourage appropriate provision of care or proper referral. The presented models will assist in describing the patient, provider, and organizational process as well as pointing out some potential opportunities for improvement.

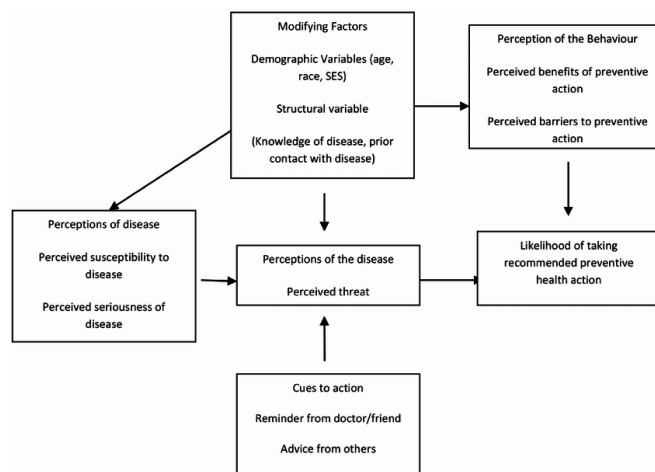
**Description of the Health Belief Model**

The Health Belief Model was created by social scientists at the US Public Health Service in the 1950’s (LaMorte, 2016). It was developed to help understand why people frequently choose not to take part in disease prevention or screening activities.

Rosenstock (1974) later wrote about the health belief model’s history and origins. The HBM works on the premise that a person’s perceived threat of personal illness or injury in conjunction with that person’s perceived effectiveness or benefit of a health behavior will predict whether that person will take part in the health behavior (Janz & Becker, 1984).

The Health Belief Model was developed from psychological and behavioral theory. This functions on the basis that the two main factors of health-related behavior are the desire to avoid illness or get well, and the belief that a specific health behavior can prevent or cure illness. The HBM has six original constructs with the last two added as the model evolved (LaMorte, 2016). They include perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cue to action, and self-efficacy.

Figure 1. The Health Belief Model



(Rosenstock, 1974)

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Perceived susceptibility refers to a person's perception of the risk of developing disease or illness. Perceived severity is the person's beliefs on the severity of developing a disease or illness. Perceived benefits refer to the person's belief in how much a treatment or health action will do to prevent, treat, or cure a disease or illness. Perceived barriers refers to the persons feelings on what obstacles lie in their way of perusing a health behavior such as cost, duration, discomfort, and many others. Cue to action or motivation refers to the person's driving internal (e.g. pain) or external (e.g. magazine article) cue that leads to the decision making process for a health behavior. Self-efficacy refers to the person's confidence in their ability to perform a health behavior. (LaMorte, 2016) (Potter & Perry, 2001)

LaMorte notes that there are several limitations to the HBM. The HBM does not account for other attitudes or beliefs (i.e. cultural, religious, social, etc.) that may influence decision making outside of the barriers to an action or the actions efficacy. The model does not account for economic factors that may be an unbreakable barrier. The model assumes that information on disease and illness is widely available, and that cues to action are prevalent, with the health behavior being the main goal in the decision making process. These are notable limitations related to this model.

### **Description of the Donabedian Model**

The Donabedian model is a conceptual framework created to assess quality and quality improvement in health care (Donabedian, 1988). Named after the physician who created it, this model is based on three measures: structure, process, and outcomes (ahrq.gov, 2011). This model and its three intuitive concepts are appropriately broad and

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flexible to allow the model to be applied to a variety of situations (McDonald et al., 2007).

Figure 2. The Donabedian Model



(McDonald et al., 2007)

The concept of structure refers to the physical and organizational aspects of the healthcare setting, which determines their ability to provide quality healthcare. The structure could include such things as the types of facilities, equipment, and personnel the healthcare setting has at their disposal, as well as the financial support of medical care (McDonald et al, 2007). An example of something that would fall under the structure concept would be whether the facility used an electronic health record (EHR) or the ratio of patients to providers (ahrq.gov, 2011).

The processes concept depends on the resources provided by the structure concept. The structure provides the resources needed to perform healthcare activities. Processes are the activities performed to improve health, whether it be by improving function, promoting recovery, improving survival, or improving patient satisfaction (McDonald, 2007). Examples would include the percentage of people who received preventative services such as immunizations or percentage of diabetics who had their blood sugar tested and controlled (ahrq.gov, 2011).

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The outcomes are the result of the healthcare that has been delivered, and of course, dependent upon to two prior concepts. McDonald (2007) notes that outcomes are not only the result of the care delivered to the patient, but also to the patient's underlying characteristics. Examples of outcomes could include the rate of surgical complications or, for the purposes of this paper, the rate of secondary fractures in a given period of time.

The Donabedian Model has two main criticisms. One being that the framework is far too linear and only allows for unidirectional interaction of the concepts (Mitchell, Ferketich, Jennings, 1998). The other criticism being that that model does not account for preexisting characteristics, like patient characteristics or environmental factors, which may have a large impact on outcomes (Coyle, Battles, 1999). The second criticism does not impact this project since the HBM will be independently accounting for patient characteristics.

### **Project Application**

The Donabedian model and Health Belief model were chosen to cover the wide variety of factors that affect this projects topic. Patient specific factors can be accounted for by the HBM. Patient characteristics and environmental factors such as the perceived severity of an osteoporotic fracture or perceived risk of a secondary fracture and the insurance, time, or pain related to an illness or treatment. This is one of the aspects of healthcare that the Donabedian Model does not account for. However, the DM accounts for practically every other potential aspect of healthcare delivery inside and outside the scope of this project. The organizational structural and process measures of the DM allow us to look at the organization and healthcare providers responsible for delivering care to the osteoporotic fracture patients that are the focus of this project.

### **The Health Belief Model**

The Health Belief Model, as it applies to this project, helps to explain our patient phenomena; the patients that do not follow up after referral and PCPs that don't refer.

Patients that do not follow up after referral, in one way or another, are failing or refusing to follow up due to some aspect of their characteristics. This project looks to review data collected on these patients and determine what characteristics may have the largest impact on the likelihood of following up with a BHP after an osteoporotic fracture.

Patient characteristics include those outside of, as well as directly related to, the healthcare system. Not all concepts of the HBM will be addressed in this project. The data retrieved will not allow us to fully assess the population in relation to concepts such as perceived susceptibility, perceived severity, and perceived benefits. But this project can infer that patient characteristics associated with higher follow up rates are associated with a greater perceived susceptibility, severity, threat, benefit, and self-efficacy.

Perceived barriers will be partially accounted for by patient characteristics of insurance coverage. Schrimshaw et al. (2011) found insurance to be a perceived barrier in a population of African American adults seeking dental care, even when 71% of the sample had insurance coverage. Motivating factors and cues to action can be various, but the type of fracture may play a role in the perceived severity and therefore the strength of the cue to action. Fall, Izaute, and Chakroun-Baggioni (2018) found in their research that intention and motivation could predict a large portion (51%) of variation in behavior when looking at university students and influenza vaccination. The intention and motivation in Fall, Izaute, and Chakroun-Baggioni's research was guided by and embodied by the perceived threats and motivation of the HBM. A cue to action exists for



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every one of these patients in the form of a recent fracture or surgery. The perceived threats related to this population would be the risk for additional fractures and financial expenses.

All patients referred to the BHP from the West Michigan hospital either have had an osteoporotic fracture, or have been identified by an orthopedic surgeon or hospitalist physician as having poor bone health. The majority of these patients have had an osteoporotic fracture. With most patients, a recent fracture may seem like a sufficient cue to action when considering follow-up after referral, but patients may require several cues to action or a health professional framing their situation to find adequate motivation.

As an example of perceived susceptibility, a male patient may believe the stigma that osteoporosis is a female disease, and he will require no further treatment. As Robb-Nicholson (2010) of Harvard Health Publishing suggests, many men aren't concerned about osteoporosis. The number of previous osteoporotic fractures may also have an impact on perceived susceptibility. This is because repeat fractures may reinforce and multiply the individual's perceived susceptibility. When considering perceived barriers, the stress and financial/insurance-based concerns induced by potential osteoporosis medications and treatment may prevent follow-up in a patient that is already struggling financially post osteoporotic fracture. Similar to the work of Crandall, Rink, Shaheen, Butler, Unger, and Zollman (2014), where the lack of insurance significantly decreased the likelihood of follow-up after discharge from an inpatient facility for patients with mild traumatic brain injuries. A patient may not believe that adhering to a follow-up appointment or osteoporosis treatment may be important. The International Osteoporosis Foundation (2005) reports that 41 percent of physicians believe that the best way to

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motivate patients to adhere to treatment is to remind them about the risks and complications of a fracture if they don't adhere to treatment. Not all of the factors that create these decisions will be directly assessed, but we will look at patient characteristics that heavily influence these decisions.

### **The Donabedian Model**

The DM provides us the process by which to assess the situation and improve quality and outcomes. The DM begins with the concept of structure, and as it relates to this project, will assist in assessing the facilities, resources, and personnel available to the West Michigan hospital. For this project it would apply to structural components such as a BHP, a specialty bone health nurse practitioner, and access to appropriate lab testing and DEXA scanning. The West Michigan hospital has all of these structures in place to assist in providing care. The West Michigan Hospital also utilizes EHRs and partners with local orthopedic practices to provide better care.

Donabedian's processes concept encompasses much of this project. The processes concept involves how an osteoporotic fracture patient is appropriately captured and referred to the BHP. Appropriate capture also entails the scheduling of a follow-up appointment with the BHP, which is currently the primary means of pursuing proper post-fracture care for osteoporotic fracture patients. For the West Michigan Hospital, physicians, nurses, and care managers can capture osteoporotic fracture patients. Care managers are responsible for the scheduling of a follow-up appointment with the BHP. The processes concept also helps evaluate the measures taken by the healthcare team after the patient discharges from the hospital to further pursue follow-up and treatment. After discharge from the West Michigan hospital, patients are mailed educational

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information and appointment reminders as well as receive phone calls as appointment reminders.

A measure of the processes as it applies to this project may be the percentage of patients that discharge from the hospital with an appointment to meet with the BHP post-osteoporotic fracture. Another measure may be the change in PCP referral rates for osteoporotic patients. This concept helps us view the influence and actions of PCPs as it relates to the osteoporotic fracture patients. As a measure resulting from PCP actions or lack of action, the processes may show where PCP's are coming up short in either providing or referring for proper osteoporosis care.

Donabedian's final concept of outcomes would be seen in this project as improved follow-up and referral rates. Impacting the processes concept by improving capture rates and PCP referral rates would accomplish improved outcomes. Pulling in the HBM's patient specific considerations will further assist in impacting the processes concept and improving outcomes. The rates discussed are not something that will be assessed within the scope of this project, but still follows the structure of the Donabedian Model. Following the DM, outcomes will improve if structures or processes are improved upon.

The DM and HBM was utilized to structure and guide this project. Aspects of each model compliment this project and each model will make up for the others deficits as they apply to this project. There are several factors that impact the likelihood that a patient will follow-up with a BHP post-osteoporotic fracture. The HBM assisted with the patient problem and a part of the provider problem. The DM will assist with the provider problem as well as the structuring of the project. With the help of these models, this

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project seeks to reveal many of those factors, and then present them to a group of local PCPs to help change the process and improve patient outcomes.

CHAPTER 4

METHODOLOGY

The purpose of this chapter is to describe the detailed plan that guided the implementation and evaluation of this DNP project. The projects design, data collection and processing, and strengths and limitations are discussed. The action of taking this data and presenting it to a local group of providers is also discussed.

The purpose of this project was increase and improve post osteoporotic fracture care by increasing appropriate referrals and follow-up care. This goal was pursued through a variety of objectives and by asking a few clinical practice questions:

- 1) Will the assessment of a FLS and its patients yield the data necessary to improve fragility fracture care?
  - a. What are the characteristics of patients likely to fail to follow up for scheduled appointments?
- 2) Will a presentation of FLS data improve the PCP and FLS actions and care?
  - a. A post presentation survey that will be used to evaluate providers' perception of the presentation's impact on their intention to treat or refer to FLS.

Retrospective FLS data will be obtained from a Midwestern community hospital in order to determine the factors which predict failure to follow up fragility fractures. Once this data is analyzed and local factors are determined this data will be used to modify provider perceptions regarding osteoporosis and osteoporotic fracture care. The providers will be encouraged to either provide evidence based fracture care in their office or refer to a specialty osteoporosis service. The main method that will be utilized to help

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modify provider perceptions is data presentation. Data retrieved from a Bone Health Service (BHS) focusing on a group of osteoporotic fracture patients will be evaluated to display situations and patient characteristics that put patients at higher risk for inadequate post-osteoporotic fracture care.

### **Plan**

The overall plan for this project was to improve the number of healthcare providers who address fracture related bone health or to properly refer for osteoporosis and post-osteoporotic fracture care. In the first two chapters, osteoporosis and osteoporotic fractures were shown to be harmful and costly. Osteoporosis and osteoporotic fractures were also shown to be frequently under addressed and undertreated by primary care providers. Data from a local BHP was be utilized and the characteristics of osteoporotic fracture patients were evaluated and processed. The statistical results were then be presented to a group of local healthcare providers as a means to help change perceptions and encourage better identification od and care for osteoporotic fracture patients. The Health Belief Model and Donabedian Model were utilized to guide the approach to patient data as well as the presentation to healthcare providers.

### **Setting**

Two settings are utilized in this project. Data retrieved from the West Michigan Bone Health Program represents the first setting. The second setting is within the primary care setting. The presentation will be provided to multiple primary care offices through electronic format. The offices are local practices that oversee the care of many patients local to the West Michigan hospital. The primary care offices are affiliated with

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the West Michigan hospital and are comprised of physicians, nurse practitioners, and physician assistants as providers.

### **Project Plan**

In this quality improvement project a two-step process was used to increase referrals and follow-up care. First the data was first collected and analyzed for themes related to patient follow-up. Secondly, the data was presented in an electronic format to a group of local care providers and the providers will be surveyed to evaluate the impact of the presentation on their own personal practice.

### **Design for Evidence Based Initiative**

The design for this evidence-based initiative is a quality improvement methodology. Retrospective data from the BHP was analyzed to help the primary care providers understand the factors associated with poor follow up. Existing data for this project has already been collected by the organization for other means. The BHP database is maintained by the West Michigan Hospital and contains a variety of data point regarding fragility fractures such as date of birth, referral date, referring physician, fracture site, and accepted or refused appointment and treatment. Other data will be available through a targeted chart review.

The design for the second objective of this project will also use quality improvement methodology. The outcome data from the BHP database will be utilized to prepare a presentation for the primary care offices most closely associated with the BHP. Provider perception data will be collected, based on the Health Belief Model in order to determine whether there are changes in the provider belief about fragility fracture care.

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### **Data Sampling / Measurement**

Data was sampled by chart review. Patients were pre-identified as appropriate by osteoporotic fracture parameters and referral to the BHP in the year of 2016. Patient specific data collected included patient age, sex, race, insurance coverage, primary language, date and physical location of injury, and primary care service. The student attempted to avoid bias by including all post-osteoporotic fracture patients in the given time period, thereby eliminating data selection bias. This data was evaluated based on each patient specific characteristic collected. Descriptive statistics and correlational analysis were completed to determine which factors were related to failure to follow up on fragility fractures.

After viewing a presentation on osteoporotic fractures and the results of the BHP data analysis, a group of local primary care providers were electronically surveyed regarding their perceptions related to the presentation and their belief about fragility fracture care. A review of the literature did not reveal an evidence based provider survey regarding fragility fracture care, therefore a survey was developed using Likert scale questions (See Appendix A). In order to incorporate the HBM fully, the questions were based on the main concepts of this model. These survey questions will specifically assess provider perceptions on osteoporotic fracture care and treatment as well as the impact of the presentation on their decision-making.

### **Project Implementation and Evaluation**

Data was retrieved from the existing BHP dataset. After retrieval, the data was processed and analyzed for trends and overall themes. The results of the analysis were then worked into a format that will allow for presentation of the findings to a larger



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group. PowerPoint® was utilized to aid in presenting the data in a pleasing format. It was laid out in a measure to allow the provider a thorough understanding of the background for and significance of the data. See figure 3 for an example presentation. The complete presentation can be seen in Appendix B.

Figure 3. Provider Presentation Example



The presentation was then distributed to 2 groups of PCPs. Local PCPs act as gatekeepers to several levels of care and have one of the largest impacts on providing or properly referring for post-osteoporotic fracture care. Included within the presentation was a link to a brief online survey. The survey was utilized to evaluate the provider perceptions on how the presentation will impact their future practice. The information was offered to all members of the two participating sites. Physician, Nurse Practitioner

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and Physician's Assistant providers were included in the survey due to each specialty's advocacy and impact on patient care. Surveying providers in these three roles also increased likelihood of achieving an appropriate sample size. Electronic format surveys were linked at the end of the presentation. Electronic format is more cost effective and allows for almost immediate results, while assessing the provider's immediate impression of the presentation content. Responses to the survey were collected and analyzed for overall themes. Following the analysis of survey information, a final impression will be made as to the effectiveness of this process.

A survey was created to assess the provider perceptions for several reasons. Very few publicly available surveys exist that are meant to assess provider perceptions. Even fewer exist to assess provider perceptions after an educational presentation. Those that were found and evaluated were too nonspecific and focused on the presenter's skill verses this specific educational content. Questions from a custom survey could also better assess provider perceptions specific to the presentation content.

Questions for the survey were developed by keeping in mind the goals of this project and the theoretical underpinnings of the HBM. With the purpose of this project being to increase and improve post osteoporotic fracture care by increasing appropriate referrals and follow-up care, the survey questions focus on the practitioner's perceived competence and the potential impact of the presentation on their decision-making. The questions also assess each provider's perception of their competence and treatment or referral practices prior to the presentation and after the presentation. The survey questions were created while keeping in mind the project's support from the Health Belief Model (HBM). Because of this, many of the questions were focused on perceived knowledge,

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competence, or efficacy on the part of the provider themselves or the community of healthcare providers.

### **Ethics and Data Protection**

This project utilized existing data previously collected for treatment purposes. There was no direct patient involvement with this project. The data collected was utilized for advancement of treatment and care and was not utilized for any other purpose. As acknowledged by the organization overseeing the BHP, this project was a retrospective data analysis, and therefore is not considered research. The letter of agreement can be seen in appendix C.

Data was retrieved from an onsite secure electronic database. All data was de-identified at the source, prior to entering into any other program or format that may leave the overseeing organization. Utilizing encrypted, secure and password-protected devices will further protect data by preventing theft, tampering, or misuse of data that has already been de-identified. These measures ensured that even data that had been stripped of the main identifying characteristics was still protected.

Data was also be retrieved from the provider surveys using Survey Monkey. This survey did not require names and only collected the title or working license and years of professional experience. This information is not considered to be directly identifying data. Surveys were collected electronically in a secure and confidential format and did not contain any identifying information at its source or after analysis. These actions abate many of the ethical and data protection related concerns that occur when dealing with surveys or questionnaires.

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### **Budget**

The expenses for this project are related to two separate items. Any cost associated with secure storage of de-identified data was the first expense. The second cost was associated with creating, distributing, and collecting results of a survey. All other aspects of this project did not require financial support and were otherwise encouraged and made possible by supportive individuals and organizations lending time and resources free of charge.

### **Sustainability**

This project as presented came to completion with the final analysis of survey data, interpretation of results, and reflection on the process. Sustainability of the motives and initiative of this project can be completed through several means. With one of the goals of the project being to impact provider decision-making, repeated actions often need to be taken to form a habit or sustain a change in provider practice. A structure, process, and set of relationships has been created with providers and management that will support a repetition or addition to this project. Employees of the BHP will be able to continue this process to evaluate their effectiveness and present the results to other local providers. Frequently presenting this information to and reeducating local providers will allow for consistent reinforcement of current, and provision of new, knowledge related to osteoporotic fractures and the patient population. Consistent reinforcement with providers will allow for a sustained impact of the original project. This structure has also been created in a way that following DNP students will have the opportunity to utilize and add to the process to help maintain or add to the impact of the current project.

### CHAPTER 5

#### RESULTS

The purpose of this doctoral project was to influence primary care provider behaviors and actions towards osteoporotic fracture patients and to increase and improve post osteoporotic fracture care by increasing appropriate referrals and follow-up care. This goal was pursued through a variety of objectives and by asking a few clinical practice questions:

- 1) Will the assessment of a FLS and its patients yield the data necessary to improve fragility fracture care?
  - a. What are the characteristics of patients likely to fail to follow up for scheduled appointments?
- 2) Will a presentation of FLS data improve the PCP and FLS actions and care?
  - a. A post presentation survey that will be used to evaluate providers' perception of the presentation's impact on their intention to treat or refer to FLS.

To make this goal possible, this project worked with two separate data sets and analytical results. The first data set and results looked at a local fragility fracture population and the likelihood of patient follow-up with a bone health program based on each patient's individual characteristics. The first data set and results were retrieved and analyzed with the sole purpose of presenting the results to local primary care providers (PCP). The second data set and results exist as a result of the first being presented to local PCPs and then the PCPs being surveyed based on their impressions. The presentation sent to the providers can be found in appendix A.

### **Description of Data Set**

The first data set retrieved information from an existing bone health program data set and from chart reviews. Patient information retrieved included age, gender, race, primary care provider and their office, referring physician, fracture site, insurance type, number of comorbidities, number of previous fractures, and whether or not the follow-up with the bone health program was accepted. Whether or not the follow-up was completed is the primary variable and it was important to show what patient characteristics, if any, impacted follow-up. The results of this analysis would work to influence the local primary care providers to better address or more frequently refer out their patient's bone health needs.

The first data set also reveals the relationship between patient specific characteristics and the likelihood of follow-up. These relationships better display the local impact and trends related to fragility fractures, allowing meaningful local data to be presented to local providers. The provider survey allows us to best assess whether or not the goal of influencing local providers has been met within the context of this project.

The second data set comes from the responses provided by the primary care providers who completed a post information survey. The survey collected factors about the provider such as working license and approximate number of years of experience. The remainder of the survey questions were guided by the Health Belief Model (LaMorte, 2016) and assessed either the provider's own, or the provider's perception of the patient's perceived barriers, susceptibility, threat, benefit, and self-efficacy. The responses to this survey allow us to assess the impact that the presentation had on the

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primary care provider's and the likelihood that they will either better address, or more frequently refer out for appropriate bone health care.

### **Bone Health Program Data**

The data from the local bone health program's (BHP) data set was used to identify appropriate patients to include in the analysis. The BHP's data set identified where these patients were referred from, their primary care provider, their age, and whether or not they accepted an appointment with the BHP. A chart review was used to retrieve the patient's gender, race, fracture site, insurance type, number of previous fractures and number of comorbidities. Of the 369 patients in the BHP's referral data set, information from 60 of them applied to this project because those patients were referred after admission to the hospital due to a recent fragility fracture. The other patients in the referral data set that were not included, were referred to the bone health program based on lab values, disease state, a non-acute history of fractures, or recent radiological evidence of poor bone health.

The variable from this data set that we were most interested in was the accepted follow-up, meaning whether or not a patient attended the follow-up appointment with the BHP after the referral during an inpatient hospital stay. It was assessed as to whether any of the other patient characteristics retrieved had an impact on the likelihood of follow-up with the BHP. In all, the variables collected for the fragility fracture patient data set were age, gender, race, primary physician or PCPs office, referring physician, fracture site, insurance type, accepted follow-up, number of comorbidities, and number of previous fractures.

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Among the 60 patients, the age ranged from 50 to 92 with a mean of 75 (SD= 11.25). There were 42 females and 18 males. Race was collected for three categories with there being 56 white non-Hispanic, three Hispanic, and one Asian. Three sites of fracture were identified: hip fracture (n=25: 41.67%), spine or vertebral fracture (n=22: 36.67%), and any other site (n=13: 21.67%). The patient's PCP was collected and analyzed as the PCP's office. Five main office categories were identified: the PCP group affiliated with the local hospital (n=17: 28.34%), the local PCP offices affiliated with the largest healthcare provider not affiliated with the local hospital (n=15: 25%), the small local PCP offices with no affiliation (n=10: 16.67%), the PCP offices that were not local (n=4: 6.67), and patients without PCPs (n=14: 23.34%).

There were 10 different referring providers split into three groups with the provider for the bone health program referring the greatest number of patients (n=36; 60%), providers from the local orthopedics office coming in second (n=19: 31.67%), and providers from the local neurosurgery office referring the fewest number of patients (n=5: 8.34%). Insurance type was grouped into two categories: Medicare or Medicaid (n=50: 83.34%) and private insurance (n=10: 16.67%).

Accepted follow-up was a yes or no category with 42 (70%) of patients accepting follow-up and 18 (30%) refusing follow-up. The number of major comorbidities ranged from zero to 10 with a mean of 3.35 (SD= 2.23). The number of previous fractures for each patient was counted at zero previous fractures (n=48: 80%), one previous fracture (n=8: 13.34%), two previous fractures (n=3: 5%), and three previous fractures (n=1: 1.67%).



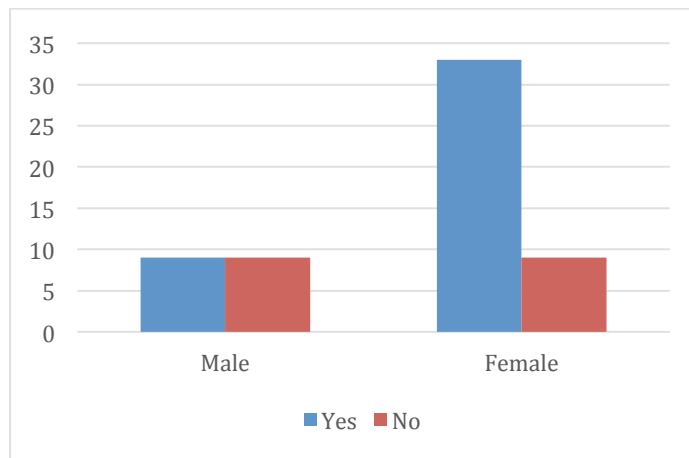
## FRAGILITY FRACTURE PATIENT FOLLOW-UP

### Follow-up Rates

After statistical analysis, several of the variables were determined to have little or no effect on the primary variable of accepted follow-up. Whether each factor affected follow-up rates was determined by the differences in percentage of each group based on whether or not they followed-up. Due to the number of patients included in the analysis, a considerable percentage difference was determined to be an acceptable means of determining the impact of each variable. The gender variable resulted a p-value of 0.0269 when analyzed with the follow-up variable. This p-value shows a high level of significance. The patient's insurance type, age, number of comorbidities, and race were determined to have no impact on follow-up rates for this population.

Gender, fracture site, PCP's office, and occurrence of a previous fracture all played a role in a patient's likelihood of following up with the bone health program. In respect to gender, only 50% of males accepted follow-up where as 78% of females accepted follow-up. Males accounted for only 30% of referrals, but were responsible for 50% of failures to follow-up. This is visually represented in Figure 1 below where yes represents an accepted follow-up and no represents a failure to follow-up.

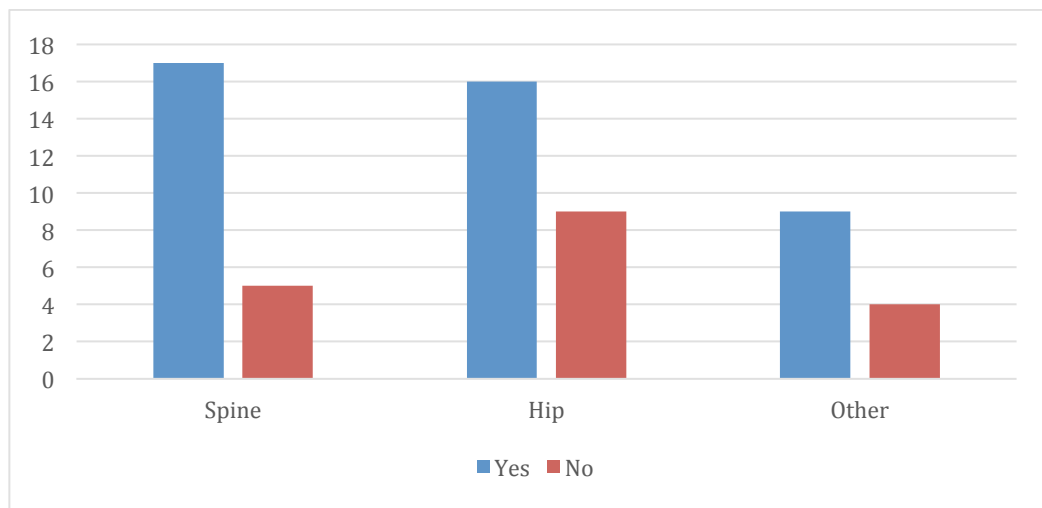
Figure 4. Male and Female Follow-up Rates After Fragility Fracture



## FRAGILITY FRACTURE PATIENT FOLLOW-UP

When looking at fracture site, patients with hip fractures accounted for the highest rate of failure to follow-up; 36% of patients did not follow-up with the bone health program. Hip fractures were the most common to fail follow-up, with a 36% failure rate. Vertebral fractures were the patients least likely to fail to follow-up, with a 23% failure rate. All other fracture sites combined accounted for the second lowest rates of failure to follow-up with a bone health program at 31% of those patients failing to follow-up. Please see figure 2.

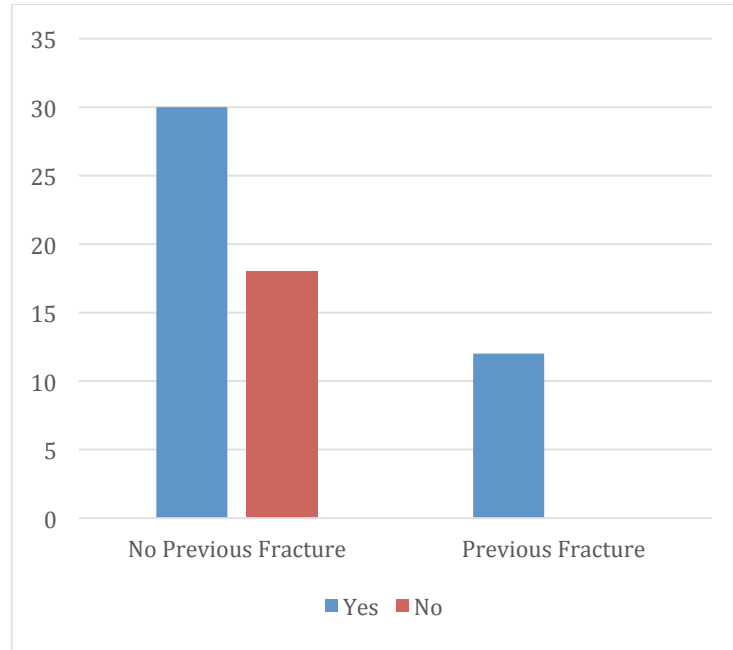
Figure 5. Fracture Site and Follow-up After Fragility Fracture



When a referred patient had previously experienced a fracture they would follow-up 100% of the time. Without a previous fracture, only 62% of patients would follow-up with the BHP. See figure 3 below.

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Figure 6. Previous Fracture and Follow-up



Also of note, 70% of the patients came from one of two PCP offices, with the patient numbers from each office being very similar. With one office, 93% of their patients accepted follow-up, and with the other office, only 65% of their patients accepted follow-up.

### Using the data to develop the PowerPoint

In order to meet the goal of this project, the data analysis results were used to develop a meaningful, brief way for the provider to understand the issue. The PowerPoint presentation distributed to the providers was created to display national and local data on fragility fractures and to emphasize the need for improved post-fracture care. The purpose of the presentation was explained and then followed-up in the next slide by national data on fragility fractures. The national data slide included information that stated the number of Americans with osteoporosis, financial cost related to falls, the

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improved outcomes when a fracture liaison service is utilized, as well as other points showing the impact of fragility fractures.

The national data was followed by the local data. It was explained where the local data came from and what variables were analyzed, along with the results of that analysis. An interpretation of the analysis was offered revealing what characteristics had the largest potential impact on the likelihood of follow-up, and how the providers could use these results to improve patient outcomes. The final slide of the presentation included a hyperlink and QR scan code that would bring the providers to online survey. The PowerPoint can be seen in appendix B. After the PowerPoint presentation was prepared, it was emailed to the office managers of each PCP office, who then emailed it to each provider. The data from the completed surveys is discussed in the next section.

### **Provider Survey Data**

Surveys were distributed and collected through an online survey tool. The survey was distributed to 29 providers and received 10 responses for a 34% response rate. Providers who responded answered all survey questions. The office managers as well the VP of the medical group were asked to help remind and encourage the providers to view the presentation and complete the survey. Office managers were asked on two separate occasions to remind providers as the deadline for the survey neared.

Basic data regarding the providers was collected which included working license and years of experience. The remaining of the questions were answered on a 1 to 5 Likert scale where 1 represented strongly disagree, 3 was neutral, and 5 represented strongly agree. The mean years of experience for the providers was 12.4 years (SD=7.29). The distribution of years of experience can be seen in figure 5. Six of the responses came

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from either nurse practitioners (NP) or physician's assistants (PA) and four of the responses came from either a medical doctor (MD) or a doctor of osteopathy (DO).

Figure 7. Provider Response Numbers by Working Title

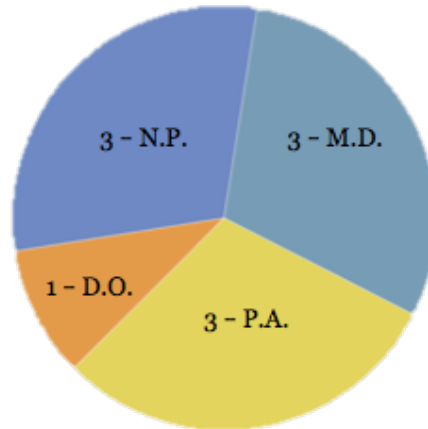
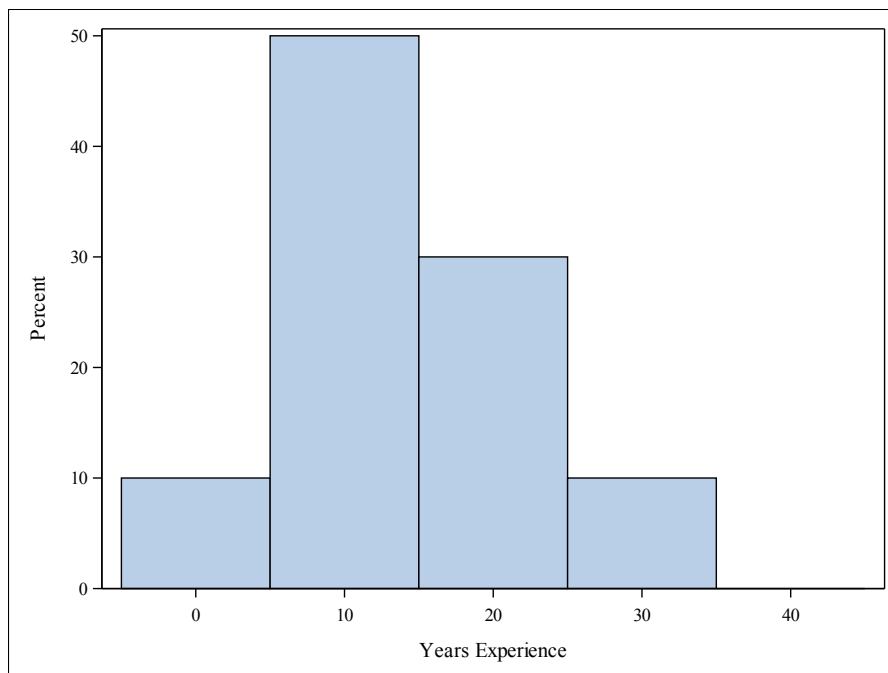


Figure 8. Distribution of Years of Experience Among Providers

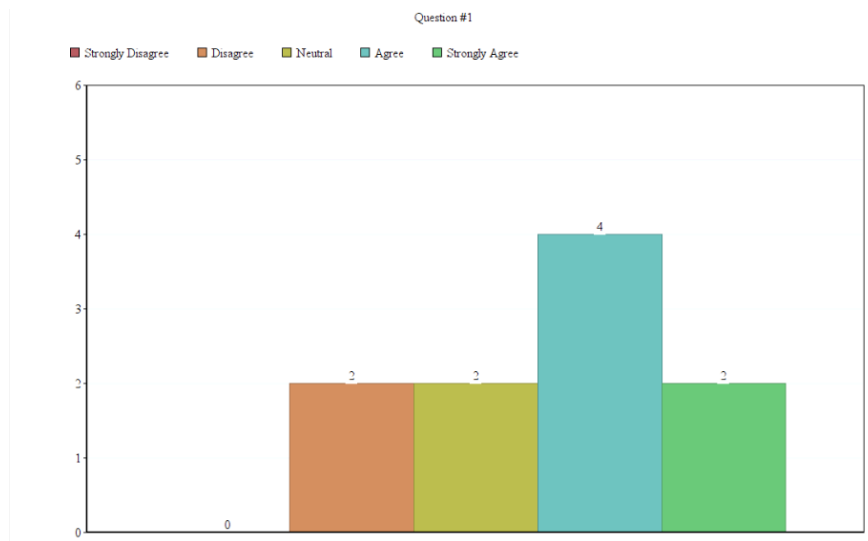


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In the survey, the providers were asked to answer how much they agreed or disagreed with the statements using the 1 to 5 likert scale. With 3 representing a neutral response, most of the survey questions averaged just above a 3 meaning the providers either were neutral or somewhat agreed to the statement on average. The survey can be viewed in appendix A.

The first question addresses the providers' perception of the current adequacy of care for fragility fractures. The range of responses was 2 to 5 with a mean of 3.6. Sixty percent of providers agreed or strongly agreed that current care was adequate.

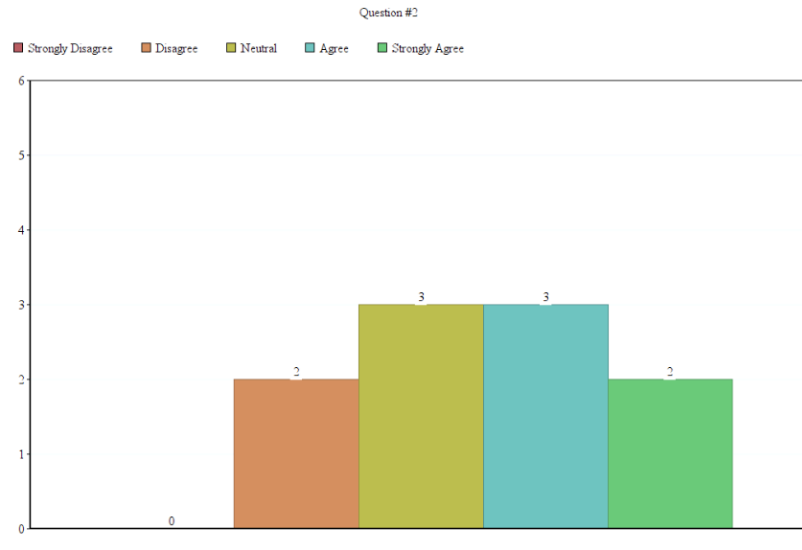
Figure 9. Distribution of Provider Responses to Question One



In question two, the provider was asked whether their perception of the severity of disability from a fragility fracture was changed following the presentation. The responses ranged from 2 to 5 with a mean of 3.5. Fifty percent of providers agreed or strongly agreed that their perception of the severity of disability caused by a fragility fracture was changed following the presentation.

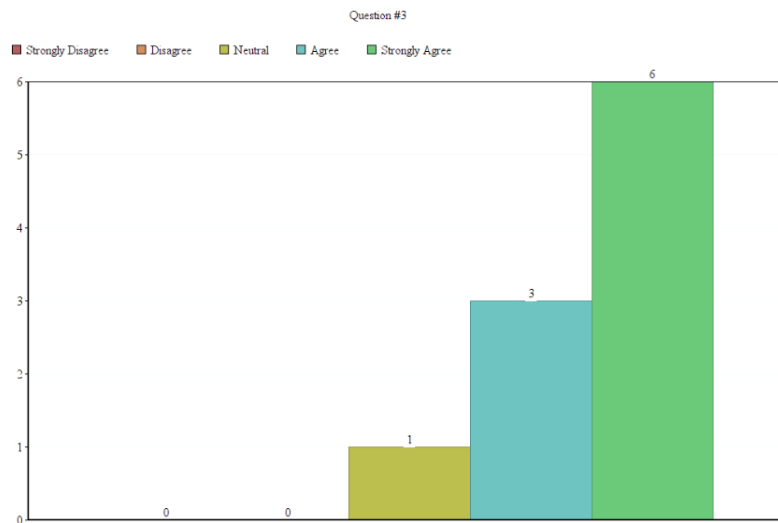
## FRAGILITY FRACTURE PATIENT FOLLOW-UP

Figure 10. Distribution of Provider Responses to Question Two



Question three asked whether the providers had a better understanding of the patients that are less likely to follow-up after fragility fracture. The responses ranged from 3 to 5 with a mean of 4.5. On this survey question, 90% of providers either agreed or strongly agreed that they had a better understanding of the patients that are less likely to follow-up after fragility fracture. Sixty percent strongly agreed and 30% agreed with this question. The remaining response was neutral.

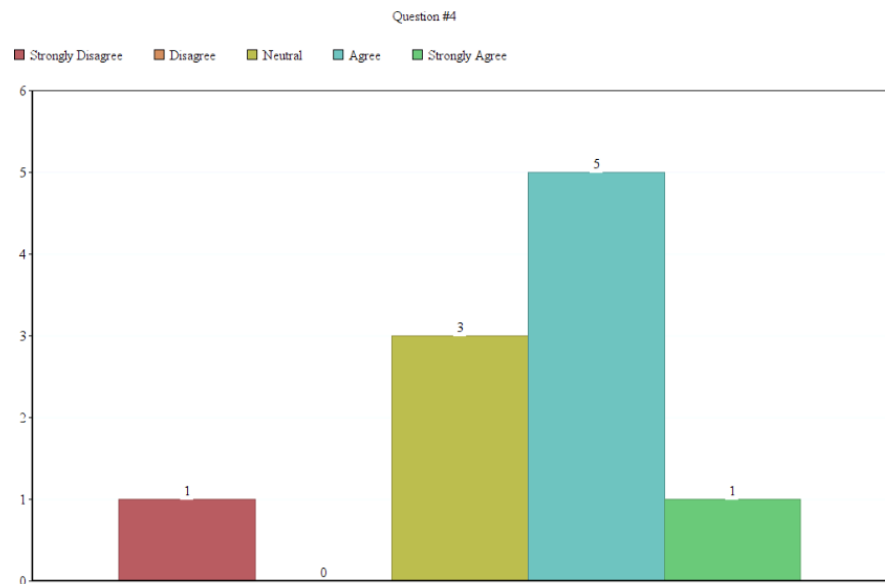
Figure 11. Distribution of Provider Responses to Question Three



## FRAGILITY FRACTURE PATIENT FOLLOW-UP

Question four asked whether the provider felt confident in treating osteoporosis and performing post-osteoporotic fracture care. The responses ranged from 1 to 5 with a mean of 3.5. Sixty percent of providers agreed or strongly agreed that they felt confident in treating osteoporosis and performing post-osteoporotic fracture care.

Figure 12. Distribution of Provider Responses to Question Four

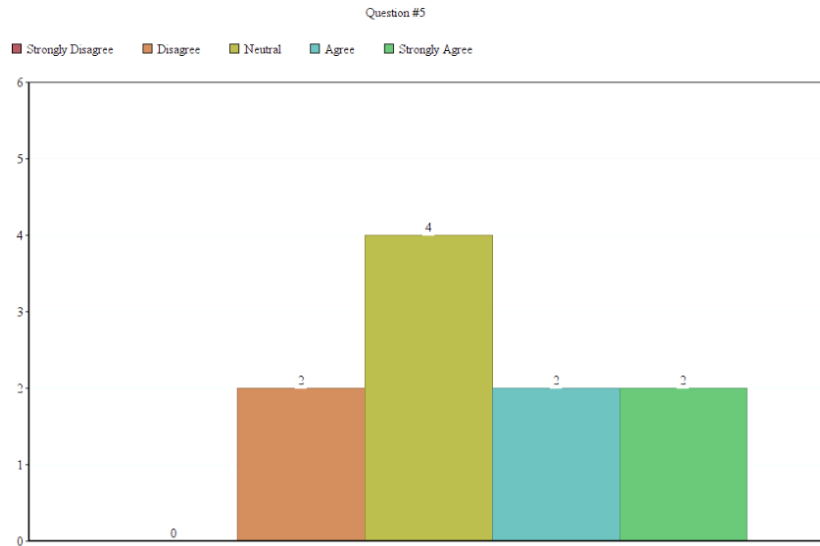


In question five, the providers were asked if the presentation would impact their referral practices for osteoporosis and fragility fracture patients. The responses ranged from 2 to 5 with a mean of 3.4. Forty percent of providers agreed or strongly agreed that the presentation would impact their referral practices for osteoporosis and fragility fracture patients.



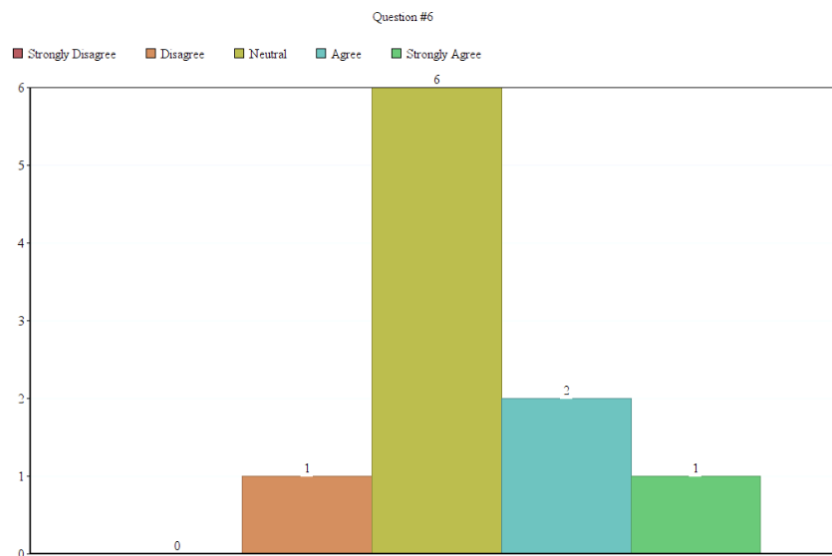
## FRAGILITY FRACTURE PATIENT FOLLOW-UP

Figure 13. Distribution of Provider Responses to Question Five



The final question assesses whether the presentation will influence how the providers care for their osteoporosis and fragility fracture patients. The range of responses was from 2 to 5 with a mean of 3.3. Thirty percent of the providers agreed or strongly agreed that the presentation will influence how the providers care for their osteoporosis and fragility fracture patients, while 60% answered neutral.

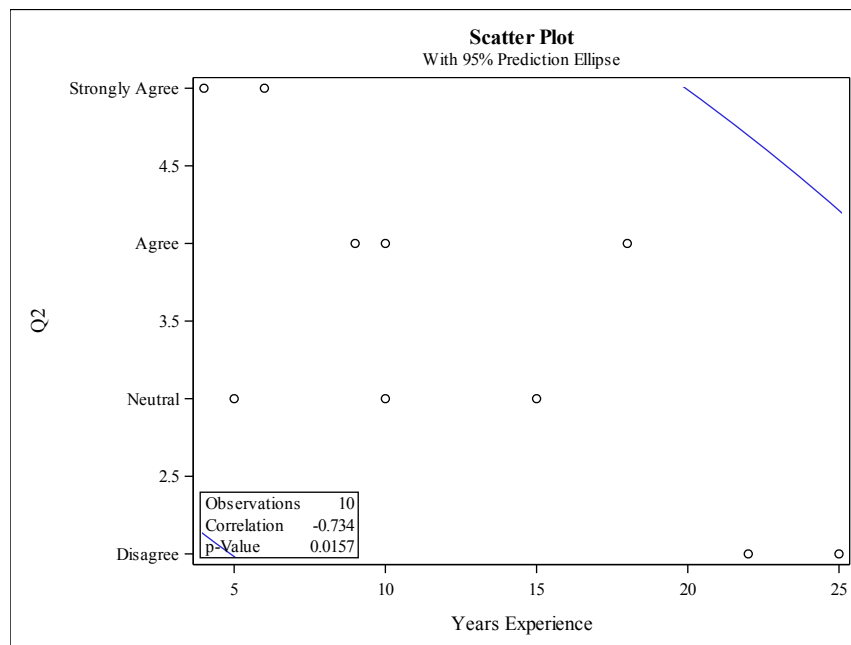
Figure 14. Distribution of Provider Responses to Question Six



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In order to determine whether years of experience impacted how providers responded to the statements, a scatterplot was developed. With a value of 0.60-0.79 representing a strong relationship, question two (provider change in perception) showed the strongest relationship between statement response and years of experience with a Spearman correlation coefficient of -0.6962 and seen in the scatterplot in Figure 7. Questions five (impact referral practices) and six (influence care) showed a moderately strong relationship with a Spearman correlation coefficient of -0.4307 and -0.4538 respectively. All other relationships between years of experience and provider response were weak or very weak.

Figure 15. Question Two Provider Response and Years of Experience Scatterplot



Further analysis was done by splitting the provider responses into separate groups based on working license. Physicians (MD and DO) were grouped together, and NPs and PAs were kept as their own individual groups. The group comprised of four physicians, three NPs, and three PAs. For question one (current care adequate), three of the four

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physicians agreed or strongly agreed with the statement that, “I believe that the local care provided for secondary fragility fracture prevention is adequate”. Two of the three NPs agreed or strongly agreed with this statement and only one of the three PAs agreed with this statement.

Question two showed only one of the four MDs or DOs responding with agree or strongly agree. Both the NPs and PAs responded with two of the three from their respective groups either agreeing or strongly agreeing to the statement, “this presentation has changed my perception of the severity of disability that can occur from fragility fracture”. Question three resulted with three of the four MDs or DOs and every NP and PA responding with agree or strongly agree to the statement, “after this presentation, I have a better understanding of the patients in my practice that are likely to have no follow up or poor outcomes from fragility fracture”.

Question four resulted with two of the four MDs or DOs and all of the NPs responding agree or strongly agree to the statement, “I feel confident in treating osteoporosis and performing post-osteoporotic fragility fracture care”. One of the three PAs responded with agree or strongly agree. With question five, two of the four MDs or DOs disagreed with the statement, “this presentation will impact my referral practices for osteoporosis and osteoporotic fragility fracture patients”. One of the three NPs strongly agreed with this statement and two of the three PAs agreed.

The final question received one agree or strongly agree from the MDs or DOs and one agree or strongly agree each from the NPs and PAs. The statement for question six was, “this presentation will influence how I care for my osteoporotic and osteoporotic

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fragility fracture patients”. Due to the lower number of survey responses, larger trends were not as apparent. Each survey question needs to be addressed on an individual scale.

Both the bone health program data set and the provider survey data set revealed a great deal of information that helps to better describe these groups. The bone health program data set revealed that being male, having a hip fracture, or the absence of a previous fracture all decrease the likelihood of following-up with a bone health program. There were small trends in the provider survey data related to years of experience and provider title. The results of the provider survey data analysis show us that 90% of the providers surveyed believe that the presentation gave them a better understanding of the patients that are likely to have no follow-up or poor outcomes from a fragility fracture. The provider survey data also showed us that on average, providers with less experience agreed that the presentation changed their perception of the severity of disability that can occur from a fragility fracture, while providers with more experience disagreed with this statement.

CHAPTER 6

DISCUSSION

The purpose of this doctoral project was to influence primary care provider behaviors and actions towards osteoporotic fracture patients and to increase and improve post osteoporotic fracture care by increasing appropriate referrals and follow-up care. This goal was pursued through a variety of objectives and by asking a few clinical practice questions:

- 1) Will the assessment of a FLS and its patients yield the data necessary to improve fragility fracture care?
  - a. What are the characteristics of patients likely to fail to follow up for scheduled appointments?
- 2) Will a presentation of FLS data improve the PCP and FLS actions and care?
  - a. A post presentation survey that will be used to evaluate providers' perception of the presentation's impact on their intention to treat or refer to FLS.

The purpose of this chapter is to discuss this doctoral project in context of the literature review, conceptual framework, methods, and data analysis that occurred. This chapter will also discuss advantage of using the literature review and chosen theories as well as the educational and healthcare implications. Sustainability of this project and its strengths and limitations will also be discussed. The Doctor of Nursing Practice essentials (AACN, 2006) will be discussed in reference to how they correspond with the actions and efforts of this project.

### Literature Review

The literature review provided substantial guidance and support for this doctoral project. The literature review not only supported why this project was important and that this problem needed to be addressed, but also revealed some of the most effective ways to accomplish project goals. A lack of osteoporosis care, fragility fracture care, and secondary fracture prevention in the traditional setting, were all documented in the reviewed research. When a fracture liaison service was involved, patient outcomes, secondary fracture prevention, and mortality all improved due to the additional care provided (Huntjens et al., 2014). From the literature review, we could see that increasing the local population's follow-up rates with a fracture liaison service, would also improve the local population's outcomes.

The articles included in the literature review often identified the patient's primary care provider (PCP) often as being either the main obstacle or facilitator of post osteoporotic fracture care (Fradgley, Paul, and Bryant, 2015). PCPs are commonly referred to as the gatekeepers, matching care with patient needs and being the first contact prior to a referral to a specialty care service. Focusing on the PCP as part of the project was supported by the literature review. The provider at the local bone health program also noted that local PCPs were at times telling their patients they didn't need specialty bone care, or that the PCPs themselves would address that care. Due to their standing as gatekeepers, the local PCPs could also work and communicate to their patients the need to follow-up with specialty bone health services.

Once it was established, though the literature review, that fragility fractures and secondary fracture prevention was an issue, and that PCPs may be the best group to

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address this issue with, the literature review then looked at how it should be addressed. Most literature found stated that educational interventions, done in a continuing education format, were most effective in influencing and sustaining a change in practice with PCPs (Zisblatt, Kues, Davis, and Willis, 2013). Observing this in the literature review meant that we knew that creating a presentation in an educational format would be that best approach for this project. Creating a survey was also seen as a necessity after the literature review. When searching for a survey that was structured and formatted to assess providers, there were none that properly assessed provider perception of their own intent or abilities. There was also a lack of surveys found to assess providers in relation to osteoporosis, fragility fractures, or secondary fracture prevention.

### **Theory**

Because this project managed and analyzed two separate data sets in two different ways, two separate theories were utilized to help span the content and goal of the project. This project could have been partially covered by many different theories, but it would have been overly specific or too complex for the goals and purpose of this project. The Health Belief Model (HBM) (LaMorte, 2016) and the Donabedian Model (DM) (McDonald et al., 2007) were both chosen to structure parts of this project.

For the purposes of this project, the HBM helped to explain the patient phenomena about how patients do not follow up after referral. The HBM also brought in some of the provider's impact on follow-up. The DM provided us the process by which to assess the situation and improve quality and outcomes. The structure of the DM assisted in assessing the facilities, resources, and personnel available to the West Michigan

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hospital. These two theories together worked to explain the situation as well as view the larger healthcare structure and process.

The Health Belief Model was one of the best options because many of the concepts dealt directly with the source of the issues in this project. When patients chose to ignore follow-up with a bone health program, it could be explained by one of the HBM's concepts applying to the patient or the provider. Not all of the concepts in the HBM fell within the scope of this project, but most every finer aspect of the project could be better explained or assessed with the help of the HBM. The DM addressed the aspects of this doctoral project that could not be explained or helped by the HBM.

The DM could explain and structure the parts of the project that the HBM couldn't by looking at the entire local healthcare system, instead of the individual. The broader view of the DM allowed the project to see if there were any other shortcomings in the healthcare system that was discouraging follow-up with a bone health program. The assessment of the local healthcare system showed that there were no major shortcomings contributing to decreased follow-up.

At the time the data was collect for the bone health services database, the process for capturing appropriate patients, providing education, referring to specialty care, sending reminders for appointments, and planning lab and radiographic testing were all well established. Resources may not have been endlessly abundant, but any dip in time or resources did not play a significant role in discouraging follow-up. The DM also had an outcomes concept. For the impact of this project on the healthcare system, that would mean increased follow-up or increased referral rates by the providers that viewed the



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presentation and filled out the survey. However, this aspect of the DM does not fall within the parameters of this doctoral project.

### **Summary of the Findings**

There were two sets of findings. One from the patient data set and one from the provider survey data. Both revealed helpful information on the issue as a whole and help characterized the local patient population while seeing what impact that information would have on providers.

### **Patient Data**

The data analysis from the patient data showed us a few trends that were quite strong, while others that seemed more significant in the literature, had little impact on this population. True to the literature, males were far less likely to follow-up after a fracture, showing a 50% follow-up rate, versus females following-up 78% of the time. In the project population, patients who had sustained a hip fracture experienced the largest rates of failure to follow-up at 36%. The final significant point in the patient data was that patients who had previously had a fragility fracture followed-up 100% of the time, while those that hadn't had a previously fragility fracture only followed-up 62% of the time. These results were often reflected in the national data, but often not all in the same resource. Often, several articles would need to be referenced to point out one or two of these issues. On the other side of the spectrum, several issues that were often pointed out by national data or research articles were not found to be significant in the focus population. Although the racial makeup of the area surrounding the West Michigan hospital is predominantly white, there is a large Hispanic population as well (U.S. Census

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Bureau, 2018). Despite this, so few individuals identifying as non-white were part of the data set, no statements could be made regarding race and likelihood of follow-up.

There were a variety of insurance types in this population. They were splint into groups of no coverage, Medicare or Medicaid, Medicare with supplemental insurance, and private insurance. This was a variable that often impacted follow-up in a variety of populations in research articles. The insurance variable had no significant impact on follow-up for the project population. Age of the patient at time of fracture also appeared to play no significant role in likelihood of follow-up. One variable that did seem to play a measurable role in follow-up was which local PCP office the patient was associated with. Strangely enough, the PCP group associated with the West Michigan hospital, and thereby associated with the local bone health program, had a patient population from the data set that were far less likely to follow-up with the bone health program. This is when compared to the next largest local PCP office that was not directly associated with the West Michigan hospital. The affiliated PCP group had a 65% follow-up rate, while the unaffiliated PCP group had patients with a 93% follow-up rate.

Some of these findings reflected what was seen in the research and national data quite well. Some of the other variables didn't come close to showing a significant difference. The statistical results from this data set were not analyzed with the intent of being generalized to any other population. Also, as the characteristics of the local population change over time, this projects results become less applicable to the same local area.

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### **Provider Survey Data**

The provider presentation and survey was sent to approximately 29 providers over four separate affiliated offices. There were 10 responses to the survey for a 34% response rate. Of those providers that responded, their collected characteristics and survey responses were so varied that few trends arose. Years of experience and working title were the only identifying characteristics collected from the providers. Only one survey question (question two) showed a strong correlation between years of experience and survey response. Two other questions, five and six, showed a moderate correlation between years of experience and survey response.

Question two of the survey stated, “this presentation has changed my perception of the severity of disability that can occur from fragility fracture”. With this question, two of the three providers with the fewest years of experience answered strongly agree, while the two providers with the most years of experience disagreed with this statement. Every other provider either responded agree or neutral. This result could be explained directly by the personal experiences in that number of years worked. The provider presentation included data on the severity of disability as well as the financial impact. This information may not have been surprising or new to a provider that has worked multiple decades and seen several patients over the years significantly impacted by fragility fractures. Providers with fewer years of experience may not have seen as many or any patients with fragility fractures that experienced significant disability post fragility fracture.

In a similar fashion, the responses from statements five and six received moderately strong negative correlations. This could possibly be attributed to the same

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reasons question two received a strong negative correlation. Questions five and six asked whether the provider presentation would have an impact on referral or care practices for fragility fracture patients. Those providers with a greater number of years of experience disagreed on average with those statements, and those with fewer years of experience agreed on average. It is possible that providers with more experience have well-established referral and care practices for fragility fracture patients, and providers with less experience were more greatly impacted by the presentation and felt a need to change or improve their practices. There is also the possibility that the providers with a greater number of years of experience have less of a desire to change their practices and therefore responded negatively to those statements. There is no way to prove that within the scope of this project, so there seems no strong reason to believe the latter possibility.

The results for the survey specific to the provider's working title were very specific to each question. Question two held a similar trend with working title as it did with years of experience, showing that an MD's or DO's perception of the disability caused by fragility fracture was not impacted by the provider presentation. This is a result of the two respondents with the greatest number of years of experience both being MDs, meaning that years of experience and working title respond the same because they are the same in this case.

The most unanimous response from the providers as a whole was to Question three. This was very encouraging because of all the other survey statements; this one seemed to hinge most heavily on the education provided by the presentation. All but one of the providers responded with agree or strongly agree to question three stating that, "after this presentation, I have a better understanding of the patients in my practice that

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are likely to have no follow up or poor outcomes from fragility fracture”. This was taken as encouraging for the outcome of the survey and overall project because all but one of the providers agreed that they are now better equipped to identify patients who are in greater need of osteoporosis care and fragility fracture prevention. This means that even if referral practices and treatment practices don’t change, identifying a higher number of patients in need will result in a higher number of referrals and properly treated patients.

### **Study Strengths and Limitations**

The greatest strength for this project was that it focused on a population and question that was not addressed in current literature and research. There is a great deal of literature showing that fracture liaison services greatly improve post fracture outcomes as compared to traditional care. A variety of literature also links certain patient characteristics with poor follow-up rates and poor medication compliance, but there were not any articles that looked at patient characteristics specific to follow-up after fragility fracture. As seen in the results of the patient data, research from other areas of practice or other regions of the country cannot always be generalized locally. Having local data and results showed providers and this project the true characteristics that impacted the local fragility fracture population. Without local data, providers may be educated to focus more on insurance type, race, or age specific to patients at risk for poor follow-up or increased risk of secondary fracture.

Another strength of this study is that it directly assessed the provider’s perceptions of the educational presentation. Direct feedback from the providers in the form of a survey gave the true impact the presentation had on the providers. Using a purpose built survey also improves the quality and usefulness of the feedback by being

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able to be more precise and specific with questions. Many of the premade surveys meant to assess providers were very generalized and did little to assess the provider impressions on the actual content of an educational presentation. The survey created for the purposes of this project was short and simple, but direct and focused on the main points of interest. In the end, the survey results showed that the presentation made the providers more aware of their patient population.

Accompanying this study's strengths were several limitations. One limitation might be that the data set representing the local fragility fracture population was created in 2016. This makes the data three years old and possibly less applicable to the current population, means of capture, or referral processes.

Two of the other limitations fall under the same portion of the project. The survey was beneficial in the way that it assessed providers, but the survey and overall study could not assess whether referral rates or treatment practices changed with the providers. The main outcome that could be assessed within the scope of this project was the impact that the educational presentation had on the providers. This indirectly impacts the potential referrals and treatment practices for fragility fracture patients, without actually being able to see the real treatment and referral outcomes. The sample size and number of responses that were received also limited the survey. The ten survey responses allowed the project to see some broad trends with the provider's responses, but few trends could be seen specific to years of experience or practicing title.

### **Organizational Strengths and Limitations**

The organizations at which this project was implemented are composed of well-educated, experienced, and productive healthcare providers working in reasonably staffed

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and equipped facilities. The West Michigan hospital was readily willing to allow structured and secure access for data retrieval. The practitioner for the local BHP was very accommodating and assisted with information retrieval and acted as a point of contact and reference for bone health information and practices as well as a guide in the organizations structure. The unit manager for the main unit at the West Michigan hospital where the fragility fracture patients were admitted was also very helpful. The manager assisted in IT support, time management and provided PCP office information. The manager also communicated readily with physician management to encourage distribution and acknowledgement of the provider presentation as well as successful completion of the survey. The office managers for each individual PCP office were very receptive to the idea of the provider presentation. They communicated effectively about the distribution of the survey and were helpful in reminding providers to address the presentation and survey. Overall, the affiliated Hospital, bone health program, and PCP offices were all very welcoming and freely gave their time and efforts to see the successful completion of this project.

One limitation of the organization relating to this project was the funding or resource distribution to the bone health program. Osteoporosis care and fragility fracture prevention is not one of the large money making portions of the healthcare system, therefore time and resources were not heavily distributed to this department. The bone health program functioned very well with their funding, but more funding for provider and clerical time may have meant a more robust and thorough collection of data and a more complete capture of the fragility fracture patients. Also, the overall smaller size of

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the organization and local population limits the number of patients coming through the healthcare system, thereby limiting the fragility fracture data pool.

### **Working with the Organization**

Interaction with the West Michigan hospital's bone health program began with experiencing the clinical setting. After initial impressions of the organization were made, a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis was performed to help aid in project planning and management. The initial plan for the project was to utilize a bone health program data set for the fragility fracture patient data analysis. For a short period of time prior to data retrieval, the source and focus of the data was in flux. This was due to the fragility fracture patient data set possibly being inaccessible. While that aspect was being researched, the bone health program's practitioner helped research other avenues and sources for patient data. Ultimately the bone health program's patient fragility fracture data was made available for retrieval and analysis.

After analysis of the data and creation of the presentation, offices managers were contacted to request help with distribution of the presentation and completion of the survey. The office managers were also asked to distribute reminders to the provider staff to complete the survey after viewing the presentation. After initially very low response rates and the survey deadline nearing, another one of the organization's managers helped further encourage the providers to complete the survey and the goal of at least ten responses was achieved.

The SWOT analysis was helpful, but only pointed out what was already apparent by interacting with the organization. The smaller well-knit organization was willing to help and motivated to see the success and completion of this project. The helpfulness of



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staff and smooth communication across offices and focuses spoke highly to the efficiency and effectiveness of the organization as well as their desire to see others succeed.

### **Implications for the Future**

#### **Future Implementation**

This project was not intended to be generalized to other populations, whether it be the fragility fracture patient population or the PCP population. Because of this, the project could be implemented in the same setting or a new setting, knowing that the results would be unique to that situation. Implementing this project in a new setting may be more productive depending on the environment. In an area with a larger population and healthcare system, there should be more patient data and a potential for more survey responses. A more diverse fragility fracture patient population and PCP population may help provide more robust data with stronger analytical results.

Implementation of this project in the same or a very similar format with the same organization would be much more difficult or impossible without changes in the current system. Since collection of the fragility fracture patient data in 2016, a dedicated data set has not been kept concerning the types of referrals to the bone health program. The data could be retrieved by chart review, but would require a drastic increase in time committed to data retrieval. Management and the bone health program's practitioner have also changed since the original data collection. This fragments the structure that was previously there to assist with future implementation. Despite the changes in the program, future implementation of this project is not impossible. The underlying structure of the project still remains, but much of the data retrieval process would have to change. The

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implementation at the PCP offices would be able to be enacted without a significant change to the original process.

This project could also be implemented with additional measures. One of the weaknesses of this project was that actual treatment or referral rates after the educational presentation were not assessed, since this was not within the scope of this project. An expanded version of this project could look at the change in referral or treatment rates after and educational intervention, which would reveal the true impact of the intervention. To accomplish this, the project could be implemented in a very similar fashion, but more extensive data retrieval would be needed prior to and after the intervention.

### **Implications in Practice**

The goal of this project was to influence primary care provider behaviors and actions towards osteoporotic fracture patients, thereby increasing appropriate referrals and follow-up care. Within the scope of this project, we were unable to assess referral and follow-up rates. However we were able to assess the influence of the educational presentation through the results of the survey.

The most unanimous response to a survey questions was that 90% of providers agreed or strongly agreed that after the presentation they have a better understanding of the patients that are likely to have no follow-up or poor outcomes from fragility fracture. This project and presentation raised the awareness with the providers. This presentation, or one similar to it, would be beneficial for any PCP practice in the local area. An implementation of this project in a different geographic region, but with a similar osteoporosis and fragility fracture population would still be able to raise provider

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awareness about fragility fracture patients. Increased awareness means that fewer of these types of patients will fall through the cracks unnoticed.

### **Sustainability**

The project as it was implemented in the same setting has a very low potential for sustainability at this time. Due to changes in the bone health program's location, structure, and primary provider, the project would be much more difficult to complete with the appropriate data. Changes could be made to the data types and requirements to abate these issues, but data retrieval would still be far more extensive and time consuming than what this project required. The sustainability of this project in a different organizational or geographic setting has a better potential. The separate setting needs to have a structure that refers fragility fracture patients to a fracture liaison service after admission to the hospital. It would also be helpful for the fracture liaison service to keep a dedicated record of the referrals it receives. Other than those requirements, the sustainability of this project in a different setting would be quite high. It would also provide a unique local and system specific view of the fragility fracture and PCP population in that given area. This would be more productive than finding results that were produced to be generalized to a population and hoping that the characteristics of the populations are close enough.

### **Doctor of Nursing Practice Essentials**

The Doctor of Nursing Practice (DNP) essentials are curricular and competency based elements required of all DNP programs (American Association of Colleges of Nursing, 2006) and important to successful and productive practice after completion of the DNP degree. There are eight DNP essentials that encompass the provider's education

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and practice. This is done in a manner that emphasizes the advancement of care and improvement of outcomes while utilizing technology and multidisciplinary collaborative efforts.

The American Association of Colleges of Nursing lists the essentials as scientific underpinnings for practice (essential 1), organizational and systems leadership for quality improvement and systems thinking (essential 2), clinical scholarship and analytical methods for evidence-based practice (essential 3), information systems/technology and patient care technology for the improvement and transformation of health care (essential 4), health care policy for advocacy in health care (essential 5), interprofessional collaboration for improving patient and population health outcomes (essential 6), clinical prevention and population health for improving the nation's health (essential 7), and advanced nursing practice (essential 8). All of the essentials were addressed throughout the course of this project, but as the AACN (2006) states, "the depth and focus of the core competencies will vary based on the particular role for which the student is preparing" (p. 8).

This project began with observations and reports of a problem. Researching the surrounding issues, osteoporosis and fragility fractures were found to have a significant scholarly article base that supported further inquiry (essentials 1,3,4). The Fragility fracture population was chosen as the focus of this project. After a great deal of additional research, the project came to shape with the help of a couple healthcare theories (essentials 1,3,4). Research was a constant need for each portion of the project to either form the underpinnings, guide the implementation, or explain and discuss the

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results. Research in several areas of the project provided the support needed to make the project successful and productive.

After structuring the methods for the project, data retrieval has to take place. This process involved accessing electronic databases and electronic patient charts. It was also necessary to communicate and collaborate with nursing leadership and the organization's IT professionals to gain safe and secure access to the data (essentials 2, 3, 4, 6). With data retrieved and organized, further collaboration was needed to process the data. A statistician was available and helped with analysis and interpretation of the results.

The patient data analysis results, along with national data, were then worked into an education presentation format. This measure not only sought to distribute the information, but to also to raise awareness and advocate for those patients who were not receive the appropriate care after fragility fracture. The presentation was distributed electronically to medical doctors (MD), doctors of osteopathy (DO), nurse practitioner (NP), and physician's assistant (PA) (essentials 3, 4, 5, 6, 7, 8). A focused survey was created to assess the providers' perceptions related to the educational presentation. An original electronic survey was created using research about healthcare based surveys and surveys that sought to question healthcare providers. A link to the survey was electronically distributed alongside the educational presentation (essentials 1, 3, 4, 6).

The results of the survey were collected and once again the skills of a statistician were utilized to analyze the results. The interpretation, framing, and reporting of the results were done with the help of the statistical analysis and research on the topic. The Brought together, all of these actions and efforts create a doctoral project that demonstrates every DNP essential at some point throughout its expanse.

### Summary

Fragility fractures and secondary fracture prevention are significant problems in the healthcare system. It was also found that very little research exists about what influences a patient's likelihood of following-up with a fracture liaison service. The purpose of this project was to influence primary care provider behaviors and actions towards osteoporotic fracture patients. This was pursued through patient data retrieval and presentation to local PCP offices. After implementing the project, retrieving patient data, and analyzing the data, it was found that gender, fracture site, history of a previous fracture, and the patient's PCP office all had an impact on the likelihood of following up with the fracture liaison service that these patients were referred to.

When the results of the patient data analysis were presented to local PCPs, they were also surveyed for their opinion on the presentation. The results of the survey were limited due to a low number of survey responses, but it could be seen that the vast majority of providers agreed that the presentation had given them a better understanding of the patients that are likely to have no follow up or poor outcomes from fragility fracture. Despite the several limitations of this project, raising the awareness of local PCPs was a favorable result for this project. During the course of this project, the student was able to exhibit all of the DNP essentials in a manner that aided the project, the educational process, and the student's future practice. Despite its difficulties, this project has the potential to be put into effect once again and further educate providers, thereby improving health outcomes.

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## Appendix A

Title/Working License \_\_\_\_\_ Approx. Years of Practice \_\_\_\_\_

### Osteoporotic Fracture Presentation Survey

I believe that the local care provided for secondary fragility fracture prevention is adequate.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

This presentation has changed my perception of the severity of disability that can occur from fragility fracture.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

After this presentation, have a better understanding of patients in my practice that are likely to have no follow up or poor outcomes from fragility fracture

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

I feel confident in treating osteoporosis and performing post-osteoporotic fragility fracture care.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

This presentation will impact my referral practices for osteoporosis and osteoporotic fragility fracture patients.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

This presentation will influence how I care for my osteoporotic and osteoporotic fragility fracture patients.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

## FRAGILITY FRACTURE PATIENT FOLLOW-UP

<https://www.surveymonkey.com/r/VFDB2J2>





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## Appendix B

### Osteoporotic Fracture Data from a West Michigan Bone Health Program

MICHAEL LAMPHERE RN, BSN  
GRAND VALLEY STATE UNIVERSITY

### Purpose of this Presentation

- This presentation helps the provider understand the national and local data related to fragility fractures.
- The data in this presentation will display patient attributes that identify patients at a greater need for post fragility fracture care and secondary fracture prevention.

### National Data on Fragility Fractures

- 54 million Americans have osteoporosis and low bone mass (National Osteoporosis Foundation, 2018)
- Each year more than 300,000 elderly people will be hospitalized for a hip fracture (AHRQ, 2012).
- In 2015, the medical cost related to falls exceeded 50 billion dollars. (Florence, Bergen, Atherly, Burns, Stevens, Drake, 2018)
- In a U.S. managed-care population, one year after being diagnosed with osteoporosis 64.3% of individuals still had not received any pharmacological treatment for their diagnosis. (Siris, Modi, Tang, Gandhi, and Sen, 2014)
- After an osteoporotic fracture, the utilization of a fracture liaison service resulted in a 35% lower risk of mortality and a 56% lower risk of a non-vertebral fracture. (Huntjens et al., 2014)

### Local Data on Fragility Fractures

- In 2016 there were 369 referrals to Holland Hospital's Bone Health Program
- 60 fragility fracture patients were admitted to the hospital setting.
- Of those 369 referrals, about 24% refused follow-up with a specialty bone health service.
- Patients referred from the hospital setting represented 16% of the patients referred, but accounted for 21% of the refusals to follow-up.

### Characteristics of Patients Referred from the Hospital Setting

- Females represented 70% of the referrals
- 93% identified as white, non-Hispanic
- Almost 42% of referrals were for hip fractures, with vertebral fractures following close behind at 37%

### Characteristics of Patients Referred from the Hospital Setting

- 80% of patients reported no previous fracture
- 75% of patients were solely insured on Medicare
- The mean age of patients was 75 years
- Age, insurance type, and number comorbidities did not play a significant role in this data set

### Impact of Patient Characteristics

- Only 50% of males accepted specialty follow-up care, while 78% of females accepted care.
- Patients referred after hip fracture accounted for the highest rates of refusal to follow-up at 36%, with vertebral fractures representing 23% of the refusals.

### Impact of Patient Characteristics

- 62% of patients with no previous fracture accepted follow-up, while 100% of patients with a prior fracture accepted follow-up.
- 93% of patients with a Spectrum Health affiliated PCP accepted follow-up, while 65% of patients with LHP affiliated PCPs accepted follow-up.


### Using the Results

- Males, hip and spine fractures, and patients with no previous fracture, all appear less likely to follow-up with a bone health specialty service.
- Local PCPs can use this information to identify patients at greater risk for failure to follow-up and also at a higher risk for secondary fracture due to a lack of or sub-therapeutic treatment.

### Survey

Please complete a very short 7 question survey by clicking the link below, copying and pasting into a web address bar, or scanning the QR code.

THANK YOU for your time and help!  
<https://www.surveymonkey.com/r/VFDB2J2>



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# FRAGILITY FRACTURE PATIENT FOLLOW-UP

## Appendix C

[REDACTED]

[REDACTED]

January 18, 2018

...

[REDACTED]

To Whom It May Concern,

Michael Lamphere will be completing a doctoral project at [REDACTED] in the coming year with our [REDACTED]. He will be utilizing existing, de-identified data points to explore the patient characteristics of fragility fracture patients, with the goal of identifying characteristics that may be correlated with a likelihood to complete scheduled follow up. Upon review of the proposed project, we have determined that this is a retrospective data review and analysis. As such, we do not consider this to be research.

You are welcome to contact me with any further questions.

Sincerely,

[REDACTED]

Professional Development Specialist

[REDACTED]

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