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PROVIDER EDUCATION ON NON-PHARMACOLOGIC TREATMENT OF
OSTEOARTHRITIS

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

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PROVIDER EDUCATION ON NON-PHARMACOLOGIC TREATMENT OF OSTEOARTHRITIS

An Abstract of the Scholarly Project by
Brandi Whetzell

Osteoarthritis is an arthritic condition of the joints commonly found in the elderly population. This condition occurs as intra-articular cartilage wears down over time. Most patients present with joint pain. The pain that occurs from joint pain often impedes physical activity, which can ultimately increase pain levels. There are several treatments for osteoarthritis, however, there is no cure. Providers often prescribe non-steroidal anti-inflammatories and other oral analgesics for pain management. Because osteoarthritis typically occurs in the elderly population, adding medications to what often is a long list of medications can cause issues such as drug interactions and medication toxicities. Other non-pharmacologic treatments, such as diet and exercise and physical therapy, should be explored and attempted prior to adding in pharmacologic therapy. The purpose of this project is to educate providers on the need for non-pharmacologic treatment modalities for OA related symptoms and the benefits of non-pharmacologic treatment, as well as increase provider knowledge on non-pharmacologic treatment modalities. Data was collected through means of pre and posttests. Paper tests along with an educational fact sheet were provided to orthopedic and primary care providers within a manila envelope. There were 9 responses with 7 being eligible for participation. A total of 70 points was the highest grade possible on the pre and posttests, with each correct answer being worth 5 points. A nonparametric sample test (related samples test) was used to compare the posttests to the pretests. A statistically significant difference was identified so the null

hypothesis was rejected. Results of this study reemphasized the continuing need for education on the non-pharmacologic treatment options for osteoarthritis.

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Chapter I

Introduction

Joint pain can occur from a multitude of reasons. A common cause of joint pain is osteoarthritis (OA), commonly known as degenerative joint disease (DJD). OA is a condition in which the intra-articular cartilage wears down over time. There are two etiological categories of OA, primary and secondary. According to Sen and Hurley (2020), “Primary OA is the most common subset of the disease and is diagnosed in the absence of a predisposing trauma or disease [...] Secondary OA occurs with preexisting joint abnormality” (para. 3, 4). Obesity is a risk factor for secondary OA and can aid in the “rapid progression of the disease” (Sen & Hurley, 2020, para. 26). OA generally affects older adults ages 60 years old and older. The pain from this condition can be debilitating and disabling. OA affects 3.6% of the global population and is the 11th most debilitating condition worldwide (Sen & Hurley, 2020). Joint pain often precedes physical inactivity, which can cause other symptoms that ultimately increase pain ratings. These symptoms include stiffness and loss of flexibility (Centers for Disease Control and Prevention [CDC], 2020). The treatment of OA varies depending on the provider treating the patient’s condition. Generally, pain management is controlled by lifestyle modifications and non-opioid medications. Surgical intervention by means of total joint replacement(s) is an option for surgical candidates who have late-stage OA. According to

Provenzano & Schwenk (n.d.), “patients can often reduce pain by modifying activities [...] Doctors often prescribe non-opioid medications such as acetaminophen and non-steroidal anti-inflammatory drugs, such as ibuprofen” (para. 2).

Clinical Issue and Significance to Nursing

The issue with prescribing or recommending over-the-counter (OTC) analgesics is that this is not always the safest option for older adult patients. The average number of medications that the older adult is prescribed is roughly six and adding more medications to this list increases the potential for drug interactions (Mann, 2011). Being on multiple medications simultaneously is known as polypharmacy. Adding additional medications contributes to this polypharmacy and places the older adult at risk for other issues.

Older adults experience age-related physiologic changes. In relation to prescribing additional medications, age-related physiologic changes such as decreased renal and hepatic function can be concerning if the older adult has comorbidities such as chronic kidney disease or hepatic disease. Decreased renal and hepatic function can alter the pharmacokinetic components of metabolism and excretion of the administered medication(s).

An adult’s total body fat increases and total body water decreases as they age. As the adult’s body fat increases, there is increased “volume of distribution for highly lipophilic drugs [...] and may increase their elimination half-lives” (Ruscin & Linnebur, 2018b), meaning that medications dissolved by fat are eliminated much faster than intended. Serum albumin in the older adult physiologically decreases as well. Depending on the medication given, this may affect the distribution of the medication.

The liver is the primary organ where the first-pass effect and metabolism occur. This is where medications are converted to their active or inactive form. The mechanism of action for these occurrences is via the P-450 enzyme system. The metabolism of many medications through the P-450 enzyme system decreases with age. For medications affected by decreased hepatic metabolism, the clearance (rate at which the active form of the medications leaves the body) is also decreased by 30-40%. Decreased clearance provides a need for dosages of maintenance medications to be altered, which should be individualized per patient (Ruscin & Linnebur, 2018b).

The renal system is a major component of pharmacokinetics. According to Ruscin & Linnebur (2018b), “[o]ne of the most important pharmacokinetic changes associated with aging is decreased renal elimination of drugs” (para. 10). Physiologically, creatinine clearance begins to decrease at the fourth decade of life and continues to do so as the patient ages. Glomerular filtration rate (GFR) and tubular function also decrease; however, serum creatinine tends to stay within normal limits, which can be misleading for providers. Decreases in these kidney function levels ultimately decreases the renal elimination of certain medications. The magnitude to which the patient is affected is based off the “extent that renal elimination contributes to total systemic elimination and on the drug’s therapeutic index” (Ruscin & Linnebur, 2018b, para. 11). Medications that are eliminated through the renal system should be altered by lowering the dosage or decreasing the frequency of which the patient is administered these medications.

Ibuprofen (Motrin B, Advil) and oral diclofenac (Voltaren, Cataflam) are common OTC NSAIDs that are recommended for pharmacologic pain management for patients with OA. Ibuprofen and oral diclofenac are medication that are affected by decreased renal

function. The Merck Manual recommends decreasing the initial dosage of ibuprofen and recommends initiating diclofenac at the lowest possible dose and frequency in the geriatric patient. The manual also reports that with an eGFR <60 and concomitant illness that increases the risk for acute kidney injury, ibuprofen should be avoided. Additionally, the Manual reports that ibuprofen should not be administered if the patient has an eGFR of <30 (Ruscin & Linnebur, 2018b). For an eGFR of 30-59, diclofenac should be temporarily discontinued if the patient has a concomitant illness that increases the risk for acute kidney injury. For an eGFR of <30, diclofenac should not be administered (Ruscin & Linnebur, 2018b).

These physiologic changes are significant to nursing for many reasons. Not only does the nurse need to have basic knowledge of appropriate kidney function levels, especially for the aging individual, but the nurse should also be aware of what medications are affected by decreased renal and hepatic function. Nurses should be able to also identify signs and symptoms of medication toxicities. Pertaining to pain management, decreased renal and hepatic function can act as a barrier to providing effective pain management through use of pharmacologic therapy, which is due to decreased renal and hepatic function. Medications typically used for OA pain management may need to be administered less frequently for a patient with decreased renal and/or hepatic function compared to those with normal renal and/or hepatic function. Non-pharmacologic treatment options are important as they can serve as options to provide long-term pain management and are not dictated by renal or hepatic function.

Statement of Purpose

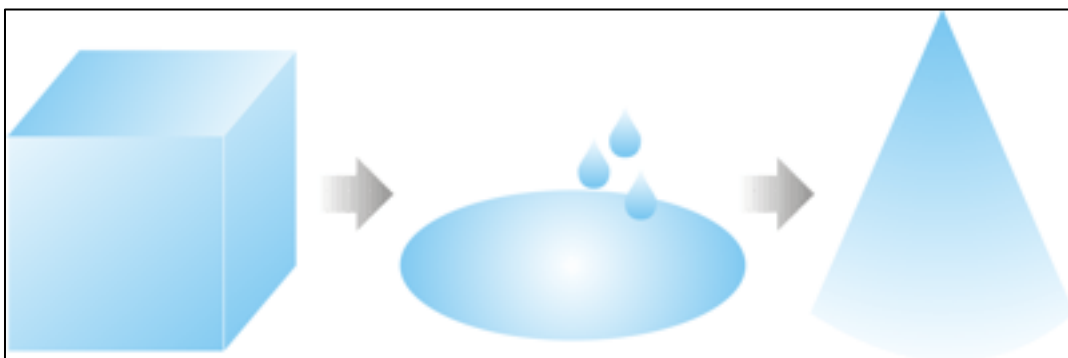
The purpose of this project is aimed towards educating providers on the need for non-pharmacologic treatment modalities for OA related symptoms and the benefits of non-pharmacologic treatment. In addition, the purpose of this project is also to increase provider knowledge on non-pharmacologic treatment modalities. Providers will be educated on the non-pharmacologic treatment modalities that are recommended by evidence-based research and evidence-based practice. Education will occur through the form of a PowerPoint poster that will be delivered via e-mail technology.

Theoretical Framework

A theoretical framework describes the supporting theory for a research problem. The theory used as the theoretical framework for this project is known as Lewin's Change Theory, also known as the Change Management Theory. This theory was created in the 1940's by Kurt Lewin. Lewin compared this theory to a block of ice and how the block of ice changes shape.

Figure 1

Lewin's Change Theory Visual Aid



Reproduced with permission from MindTools.com. (2020). Lewin's Change Management Model. [Online]. Available from:

https://www.mindtools.com/pages/article/newPPM_94.htm. [Accessed: October 21, 2020].

This theory works in three stages: unfreeze stage, change stage, and freeze stage. The unfreezing stage refers to providers recognizing the need for change for long-term management of OA. The change stage refers to providers changing their thoughts, feelings, behaviors, or a combination of the three. The freezing stage refers to providers incorporating a non-pharmacologic bundle/protocol into their practice for treating OA related pain. The freezing stage is crucial to patients and providers alike. Without permanently incorporating recommended changes, it is easy for providers to regress back to comfortable practices, which ultimately affects patient outcomes.

Project Hypothesis

For this project topic, one hypothesis was created.

- Educating providers on non-pharmacologic treatment modalities for OA related symptoms will increase knowledge of the need for non-pharmacologic treatment and non-pharmacologic treatment options.

Research Questions

1. What are the demographics of the participants?
2. What is the knowledge level of the participants on the pretest?
3. What is the knowledge level of the participants on the posttest?
4. Is there a statistical difference of knowledge level of participants between the pre and posttest?

Key Terms and Variables

Key Terms

- Beers criteria – Guideline of evidence-based recommendations of medication prescribing for the geriatric population
- Health literacy – the ability of patients to understand health information to make informed and appropriate health care decisions
- Non-pharmacologic treatment options – physical therapy, physical activity, strength training, Tai Chi
- OA – the most common form of arthritis, often called degenerative joint disease or “wear and tear” arthritis (CDC, 2020)
- Pharmacokinetics – the characteristic interactions of a drug and the body in terms of its absorption, distribution, metabolism, and excretion (Merriam-Webster, 2020)
- Polypharmacy – concurrent use of multiple medications simultaneously
- Proprioception – Awareness of self-movement and position of the body
- Provider – orthopedic specialists, primary care physicians, nurse practitioners
- Self-efficacy – the confidence in one’s ability to manage pain
- Self-management – making healthy choices and learning to manage physical and emotional effects of osteoarthritis

Variables

Independent

An independent variable is the variable in which the researcher has total control over. This variable can be changed and manipulated as the researcher sees fit. Education about the non-pharmacologic options for treating OA serves as the independent variable.

Dependent

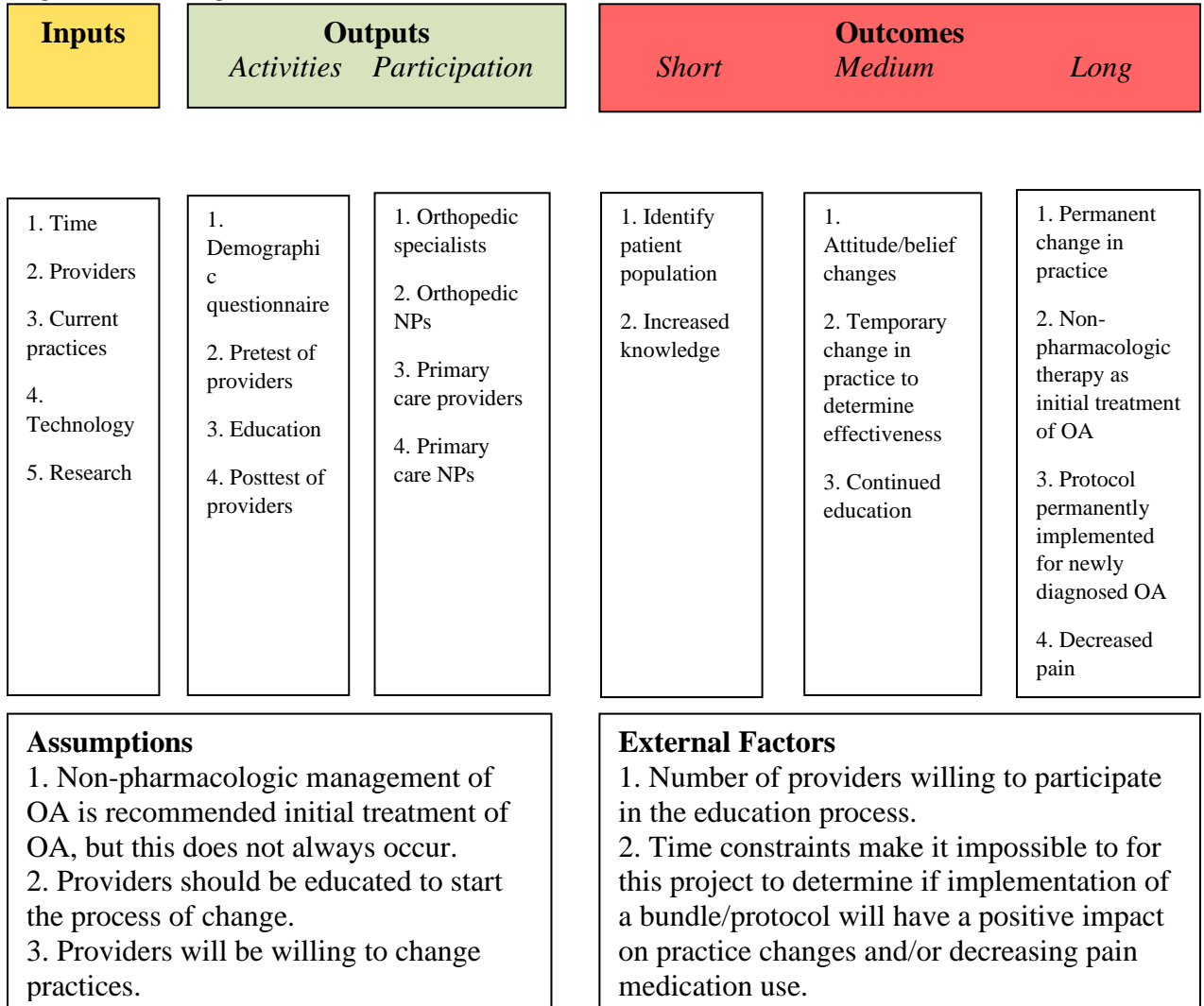
The dependent variable is the variable in which the researcher is testing or observing. This variable is dependent on the independent variable. For this project there is one dependent variable: the level of provider knowledge regarding the use of non-pharmacologic treatment for OA.

Logic Model

A logic model is a diagram of how the chosen implementation is proposedly going to work. There are many components associated with a logic model, including purpose, context, inputs, activities, outputs, and effects.

Figure 2

Logic Model Diagram



Logic models help readers understand the relationships between inputs, outputs, and outcomes. The inputs are the raw materials and/or resources that will be utilized for this project. The output is made up of activities and participation. Activities encompasses what will be implemented during this project and participation encompasses those who will participate in this project. There are three tiers of outcomes: short-term, mid-term, and long-term. Short-term outcomes are immediate outcomes that result from the intervention. Mid-term outcomes are the are the outcomes that intermediate, they do not

occur right away, but they also may not last long-term. The long-term outcomes are the ultimate outcomes. These outcomes tend to last for a longer period. The logic model created above very briefly highlights the key points of the main components, which are discussed in further detail below

Purpose

OA most commonly affects the older adult, which poses a concern considering the age-related physiologic changes and considering that many older adults are affected by polypharmacy. Guidelines recommend that non-pharmacologic treatment options such as physical therapy and strength training be implemented, but this does not always occur. Continuing education should be provided to providers on the safest way of treating OA while maintaining pain management for the patient.

Context

Continuing education could be provided by means of facility learning platforms. Considering each facility has a different platform in which education is provided, a specific platform cannot be noted. The bundle (or protocol) that this project recommends providers implement in the future will align with current practice by incorporating a step-wise approach to treatment. As previously mentioned, non-pharmacologic therapy is the recommended initial treatment for OA. Step one would include recommending diet changes to patients. Step two would be to recommend an exercise program. Step three would be incorporating physical therapy (if needed) as well as bracing (for knee OA if needed). Incorporating medications such as over-the-counter (OTC) NSAIDs and acetaminophen would be considered step four. A competing factor that may hinder this project is the use of OTC analgesics. OTC analgesics expedite pain control in the short-

term and may be more appealing to those who are in pain (related to OA) because of the quick onset.

Inputs

There are many inputs that can and will affect this project. Time is a large factor affecting this project. Because of the time constraint, this researcher will focus on education of the need vs. implementing a bundle/protocol. Orthopedic and primary care providers are the primary populations that this researcher will focus on for this project. There is one important factor that may be a constraint to this project – current provider practices and willingness of providers to change their practice. Some providers may not feel the need to change the way they practice or may not be comfortable changing their practice. As mentioned above, OTC pain relievers act much quicker than incorporating forms of non-pharmacologic therapy. Technology will be utilized to conduct research for delivery of a demographic questionnaire, pre and posttests, as well as delivery of an educational piece. This will be further discussed under the component “Activities.”

Activities

Technology, such as computer software and search engines, will be utilized to conduct research on the need for non-pharmacologic treatment of OA and the effectiveness of these treatments. The pretest and posttests include the same questions; however, the pretests contained an additional section covering demographics of the participants. The pretests, educational fact sheets, and posttests were all delivered at the same time. The participants were called by the primary researcher one week prior to the deadline to provide a reminder to complete the paperwork. All pre and posttests were collected on or before March 01, 2022.

Outputs

The evidence of activities being performed as planned will occur by evaluating the pre and posttests from both the orthopedic and primary care providers. In the end, statistics will show if an increase in knowledge over non-pharmacologic osteoarthritis treatment occurred. Statistical analysis was provided with the expert assistance of Dr. Greg Belcher.

Effects

Effects of this project represent the outcomes. There are three tiers to consider. The first tier, short-term, includes outcomes such as identifying the provider populations and increasing knowledge of current CPGs. Medium-term outcomes are those such as attitudes and/or beliefs of providers regarding changing practice(s). Additionally, temporary change in these practices and by the providers will give this population group the chance to evaluate the temporary changes to determine if the change has been beneficial and if this should be made a long-term change. Lastly, the third tier is long-term outcomes. These outcomes include permanent changes to provider practice(s). Providers will incorporate a step-wise approach to treating OA, beginning with non-pharmacologic treatment as first-line treatment options. The hope of this researcher is that implementation of a non-pharmacologic protocol/bundle will be permanently implemented as the initial treatment for OA and that there will be a decrease in use of pain medications.

Summary

OA is the most common cause of arthritis, typically occurring from “wear and tear” damage. This condition most often affects the older adult population. OA presents

itself in the form of joint pain, stiffness, and lack of mobility in the affected joint(s). This condition is one of the most common causes of disability worldwide. There is no cure for OA, but there are many treatment options. Prescription or recommendation of OTC pain medications is a common form of treatment of OA related pain. This practice is not the recommended first-line treatment nor is it always the safest treatment for patients.

Older adult patients go through physiologic changes. Changes of concern occur within the renal and hepatic systems. The liver is the primary site of the metabolism and the first-pass effect. As adults age, the metabolism of medications through the P-450 enzyme system decreases over time, leaving more amounts of medication within the body. Additionally, as the adult ages, kidney function also decreases, which also leaves larger amounts of medications in the patient's system, which can ultimately lead to toxicity.

Non-pharmacologic treatment options for management of OA related pain should be the first-line treatment option for patients. This will reduce the chance of contributing to polypharmacy and potentially causing medication toxicity in older adult patients. Practice changes by both the provider and the patient should occur to provide for a safer treatment plan for the patient. This can occur by following Lewin's Change Theory.

Chapter II

Review of Literature

The purpose of this literature review is to a) better understand causes and effects of OA, b) discuss treatment options for OA and provide evidence-based research for non-pharmacologic vs. pharmacologic OA treatment, and c) discuss the why non-pharmacologic measures for OA treatment are preferred. Clinical practice guidelines for non-pharmacologic treatment options will also be discussed.

Review of Parameters

A systematic search of literature was conducted using the electronic databases of CINAHL, PubMed, Summon, and UpToDate. Key terms used to conduct the search include, but are not limited to, the following:

- Degenerative joint disease
- Degenerative joint disease treatment
- First-line osteoarthritis treatment
- Non-pharmacologic DJD treatment
- Non-pharmacologic osteoarthritis treatment
- NSAIDs in elder adults
- Opioids in elder adults
- Osteoarthritis

- Osteoarthritis clinical practice guidelines
- Osteoarthritis treatment.

Evidence

The following review of literature will provide evidence over the causes and effects of OA, available treatment options for OA based on evidence-based research, and provision of an explanation for why there is a need to rely on non-pharmacologic options as primary OA treatment.

Causes and Effects of Osteoarthritis

To understand the causes and effects of OA, it is important to understand the components of the bone that are affected. Important components include the intra-articular cartilage, subchondral bone, synovium, chondrocytes, and osteophytes. The intra-articular cartilage is the cartilage that resides within a joint space. The subchondral bone is the area of bone, located within the joint, that sits beneath the intra-articular cartilage. The synovium is connective tissue that lines the area between the ligaments and joint capsule. This secretes synovial fluid which allows for lubrication that aids in smooth articulation of the joint. Chondrocytes are the cells that make up the cartilage. The chondrocytes are the only cells identified in healthy cartilage. Osteophytes, otherwise known as bone spurs, are abnormal bony growths that commonly occur in OA.

OA is a prevalent disorder characterized by degradation of the intra-articular cartilage with secondary alterations to osseous matter. This disorder takes its stake as the 11th leading cause of disability worldwide. OA was once thought to be from “wear and tear” and given the alias of degenerative joint disease (DJD). OA is considered an inflammatory disorder without common inflammatory markers within the synovial fluid.

With OA, chondrocytes proliferate and form clusters. The bony matrix becomes damaged and chondrocyte death becomes prominent. The subchondral bone becomes thickened and osteophytes and cysts form. The synovium of the affected joint(s) becomes inflamed and sometimes thickened. The soft tissues (tendons, ligaments, and cartilage) are also affected with OA. The extracellular matrix of the soft tissues is damaged, and autophagy occurs (Loeser, 2020).

There are many risk factors for developing OA. These risk factors include aging, obesity, joint injury, genetics, gender, and specific anatomical factors. It is important to note that the most significant factor related to aging is the aging of the joint tissues. These age-related changes include “thinning of the articular cartilage with age, reduced hydration, and an accumulation of proteins containing advanced glycation end-products” (Loeser, 2020, para. 20). Other factors such as development of chondrocalcinosis and cellular changes, such as mitochondrial dysfunction, contribute to age-related development of OA (Loeser, 2020).

The extensive pathogenesis of OA results in unpleasant symptoms for those affected with this disorder. Symptoms are not standard for each person affected with OA. Symptoms range from pain to limited mobility and function. Pain is the most common symptom of OA, and the characteristics of the pain vary from person to person. Pain is most often worse in late afternoon and with activity but can be relieved with rest. Pain can be the cause for limited mobility and function, but other sequelae of OA can be associated with limited mobility and function, such as joint instability, bony swelling, deformity (Doherty & Abhishek, 2019), as well as having an emotional impact. Pain and/or the inability to carry out daily tasks can become burdensome on the individual

suffering from OA and can lead to psychological symptoms, such as depression and anxiety.

Treatment Options for Osteoarthritis Based on Evidence-Based Research

There are multiple modalities for treating OA, including pharmacologic and non-pharmacologic options. Pharmacologic options include over-the-counter (OTC) medications such as acetaminophen and non-steroidal anti-inflammatories (NSAIDs) such as ibuprofen, intra-articular injections, and prescription medications. Opioids are not indicated for management of pain related to OA. According to Deveza (2021), providers should “prioritize therapies that are safer before considering drugs that can potentially cause harm” (para. 22). For this scholarly project and literature review, the focus will be on non-pharmacologic options. Non-pharmacologic treatment options for OA are considerably vast and seemingly endless. All non-pharmacologic treatment options should be paired with education on OA. Options that will be focused on for this literature review include education, physical activity (PA) and exercise, healthy weight management, and self-management techniques

Education

Those who learn they have OA may not understand what it means to have this diagnosis. It is important to provide education on what OA is, potential causes, potential sequelae, and that having this diagnosis does not mean that they will be unable to perform activities they enjoy. These individuals should also be educated on treatment options, particularly remaining physically active and controlling modifiable risk factors. According to Hansson et al. (2010), “patient education is feasible and valuable in terms of improvements in quality of life, function, well-being and improved coping” (para. 6).

There are many components to OA for which education is needed when the diagnosis is made, which include self-management, exercise programs, and often a combination of self-management and exercise programs. Hansson et al. (2010) also report that it is recommended to use “education as a core treatment for osteoarthritis” (para. 6). The knee is one of the most common sites for development of OA. As reported, pain is the most common symptom. Patient education programs for those with knee pain has been shown to reduce the number of office visits for knee pain in the primary care setting (Hansson et al., 2010).

It is important for those with OA to have health literacy abilities. Individuals with OA need to understand their disorder and treatment options so that they are able to participate in their care as well as understand the importance of treatment. According to Larson et al. (2019), “healthcare providers must offer learning processes not only from the perspective of their own expertise, but also from the persons’ experiences of being in a situation where they need understanding the consequences of the diagnosis” (p. 744). It is part of the role of the provider to offer education, but in a way that is understandable and ties into the patient’s personal experience(s).

Physical Activity and Exercise

Though pharmacologic options can provide quick, short-term relief, non-pharmacologic options tend to provide longer-term relief from pain. According to BPAC (2018), “Appropriate exercise and staying active is a key aim for all patients with osteoarthritis, irrespective of age, co-morbidity, pain severity or disability. Exercise interventions have been shown to reduce pain and medicine use while improving physical functioning, muscle strength, balance, mood, and quality of life” (para. 7).

Physical activity and exercise cannot be standard for every individual with OA. Though the World Health Organization recommends that all adults perform at least 150 minutes of PA weekly, an exercise regimen must be personalized to the individual. According to Deveza and Bennell (2021), “exercise choice should be also based on patient's mobility, specific impairments [...], and preferences” (para. 15). It is not uncommon for those with OA who live a sedentary lifestyle to report having high pain ratings. In a study conducted by Skou et al. (2018), decreased pain ratings for those with knee OA were associated with increased physical activity levels. Within the OA community (providers and patients), there has been some concern that PA with high-impact exercises can increase progression of this disorder. According to Kraus et al. (2019), “evidence suggests that up to 10,000 steps per day of activity does not accelerate OA progression in individuals with preexisting OA” of the knee and/or hip (p. 1335). There are many forms of PA and exercise. PA and exercise are not limited to just jogging and running. Other forms include those such as cycling and physical therapy, however, there currently is no single exercise, intensity of exercise, or frequency of exercise that is considered best treatment for OA.

Strength training has been proven to be beneficial for those with OA by increasing muscle strength, increasing proprioception, and decreasing muscle stiffness. There is lack of studies regarding proprioception training however, this form of physical activity has the potential to help individuals “detect position and motion of limbs and joints, but also provides sensation of force generation to allow for better regulation of force output” (Lin et al., 2009, p. 450). Both strength training and proprioceptive training are forms of non-weight-bearing interventions. These forms of PA could be options for

individuals who have advanced OA and those that may not be able to tolerate high-impact weight-bearing physical activity that applies excess stress and load to weight-bearing joints.

Not only do PA and exercise decrease pain and disability and increase quality of life, PA and exercise also contribute to weight loss. Weight loss has been proven to be beneficial for those who are overweight/obese and suffer from OA of weight-bearing joints.

Healthy Weight Management

Maintaining a healthy weight helps decrease load and stress on weight-bearing joints, which can further contribute to decreased pain. According to Anandacoomarasamy et al., (2007), “both mechanical and metabolic factors may be responsible for the link between OA and obesity [... and] being overweight is associated with increase in cartilage turnover biomarkers” (p. 212). It is a well-known fact that obesity is a major risk factor for developing OA. For those who are at risk for developing OA and are considered overweight or obese, it is imperative that weight loss of 5-20% (dependent on BMI) of total body weight is achieved and a healthy weight is furthermore maintained to decrease extraneous risk of developing OA, especially in the lower limbs. According to Coggon et al. (2001), the “risk is particularly high among obese people who also have other risk factors for the disease” (p. 625).

For those who already have been clinically diagnosed with OA, it is possible to slow the progression by maintaining a healthy weight. According to Gersing et al. (2016), “[p]revious studies suggested a link between obesity and progression of OA and demonstrated that weight gain was strongly associated with increased and >10% [weight

loss] was associated with slower progression of cartilage degeneration” (p. 1131). By decreasing weight, and ultimately stress and load on weight-bearing joints, symptoms of OA such as pain and limited function and mobility can decrease and provide for a better quality of life.

Self-Management Techniques

Self-management is an important aspect of conservative OA treatment. This teaches those affected by OA to “build skills such as goal setting, decision-making, self-monitoring, and problem-solving [...and] have shown positive outcomes in self-efficacy [...]); self-rated health; aerobic exercise; cognitive symptoms management; and patient-reported outcomes for pain, function, fatigue, and mood” (Schlenk and Shi, 2019, p. 26). Teaching those with OA self-management techniques can help these individuals feel empowered and more comfortable with being autonomous with their own care.

Reasoning for Non-Pharmacologic Treatment

Safety is the main reason for the need to use non-pharmacologic therapies as first-line treatment options. Previously mentioned, there is alteration in pharmacokinetics, such as decreased renal and hepatic function, in the older adult, which could put older individuals at risk for drug toxicity. Opioids are not recommended for pain management of OA; however, opioids are still commonly prescribed. Opioids were added to the Beers Criteria in 2019, particularly under the drug-drug interactions category. The addition of opioids to the Beers Criteria is relevant since “opioid-related deaths in older adults have increased over the years” (Holman, 2019, para. 8). Opioids can cause increased sedation effects as well as increased respiratory depression when paired with benzodiazepines and gabapentinoids (Holman, 2019). Opioids alone can cause many issues, especially in the

older adult population. According to Ruscin & Linnebur (2018a), “[c]linicians are often reluctant to prescribe opioids for older patients [...], typically because of concerns about adverse drug effects (e.g., sedation, constipation, delirium) and development of dependence” (para. 27). When opioids are prescribed, they are usually prescribed at a dose that is often ineffective.

Due to their potential adverse effects, NSAIDs are also not the safest option for the older adult population. This is especially true for those with co-morbid conditions like gastrointestinal, cardiac, or renal disease. Most NSAIDs are absorbed within the gastrointestinal tract and can cause gastrointestinal bleeding by lessening the protective functions of the gastrointestinal mucosa. NSAIDs are also associated with a plethora of cardiovascular conditions. This class of medications contributes to congestive heart failure and hypertension. Though renal side effects from the use of NSAIDs are an uncommon occurrence, nephrotoxicity can occur. According to Wongrakpanich et al., (2018), “advanced age puts patients at higher risk of developing nephrotoxicity from NSAIDs. NSAIDs cause inhibition of prostaglandin and thromboxane synthesis leading to renal vasoconstriction and consequently reduced renal perfusion and aberrant renal function” (p. 145).

Clinical Practice Guidelines for Non-pharmacologic Treatment

There are several entities that have created clinical practice guidelines (CPG) for the treatment of OA. Entities such as the American College of Rheumatology/Arthritis Foundation (ACR/AF), Osteoarthritis Research Society International (OARSI), and the American Academy of Orthopaedic Surgeons (AAOS) have created CPGs for osteoarthritis treatment. Most of these CPGs include both pharmacologic and non-

pharmacologic treatment, as well as list them in a hierarchy of evidence that is strongly or conditionally recommended for, and strongly or conditionally recommended against. For this literature review, the CPG created by the ACR/AF will be discussed in detail.

The ACR/AF are two separate entities that worked together to create one CPG for OA treatment that would be standard for both organizations. The ACR/AF created a CPG known as the “2019 American College of Rheumatology/Arthritis Foundation Guideline for the Management of Osteoarthritis of the Hand, Hip, and Knee.” This CPG is recommended for guidance of treatment for those with OA of the hip, knee, and/or hand. This CPG follows a hierarchy of interventions that the ACR/AF have strongly or conditionally recommended for or against based off the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) method of evidentiary rating. Interventions include both non-pharmacologic and pharmacologic management options, but the focus for this scholarly project is non-pharmacologic. Non-pharmacologic interventions such as exercise and self-management are strongly recommended interventions for OA management. The only non-pharmacologic intervention listed that is strongly recommended against is the use of transcutaneous electrical stimulation (TENS) units. According to Kolasinski et al. (2020), “[s]tudies have demonstrated a lack of benefit for knee OA” regarding TENS units (p. 156). See Table 1 for further breakdown of interventions.

Table 1

Recommendations of interventions for OA management with GRADE evidence.

	Strongly recommended	Conditionally recommended	Strongly recommended against	Conditionally recommended against
Hip:	<ul style="list-style-type: none"> • Exercise • Weight loss • Self-efficacy and Self-management programs • Tai Chi • Cane use 	<ul style="list-style-type: none"> • Balance training • Cognitive behavioral therapy 	<ul style="list-style-type: none"> • TENS unit 	<ul style="list-style-type: none"> • Lateral/medial wedged insoles • Massage therapy • Manual therapy
Knee:	<ul style="list-style-type: none"> • Exercise • Weight loss • Self-efficacy and Self-management programs • Tai Chi • Cane use 	<ul style="list-style-type: none"> • Balance training • Yoga • Cognitive behavioral therapy 	<ul style="list-style-type: none"> • TENS unit 	<ul style="list-style-type: none"> • Modified shoes • Lateral/medial wedged insoles • Massage Therapy • Manual therapy • Pulsed vibration therapy

Adapted from 2019 *American College of Rheumatology/Arthritis Foundation Guideline for the Management of Osteoarthritis of the Hand, Hip, and Knee*.

Strongly recommended interventions for knee and hip OA are identical. Because OA is a leading cause of disability, PA is crucial to enhancing the mobility and decreasing the pain ratings in these patients. Kolasinski et al. (2020) note that even though there is not one exercise program that is recommended over another, it is crucial for these patients to remain physically active as this can determine their symptoms and quality of life. Physical activity can also be incorporated into self-management education and self-management programs. Self-management programs begin with skill-building, critical thinking, and most importantly, learning about the disorder (Kolasinski et al., 2020). Self-management potentiates feelings of empowerment for OA sufferers to take control of their disorder and become involved in their care. As previously mentioned,

obesity and weight loss are significant to the progression of OA. Kolasinski et al. (2020) report that a decrease in body weight by 5-20% is needed to decrease excess stress and load off weight-bearing joints.

Tai Chi is a form of mind-body practice that focuses on meditation, deep breathing, and slow, controlled movements. The purpose of Tai Chi is to return strength to the muscle(s) surrounding the affected joint(s) and increase joint stability (Kolasinski et al., 2020). Walking aids can also be beneficial for those with OA. However, the use of walking aids is typically recommended in those with polyarticular involvement rather than monoarticular involvement (Kolasinski et al., 2020).

For both knee and hip OA, The ACR/AF strongly recommends against the use of TENS units. This is due to there being lack of benefit noted in studies. The ACR/AF have also conditionally recommended against the use of manual therapy for knee and hip OA. According to Kolasinski (2020), “manual therapy can be of benefit for certain conditions, such as chronic low back pain, limited data in OA show little additional benefit over exercise alone for managing OA symptoms” (p. 126). More studies need to be conducted to determine if manual therapy alone is beneficial for OA sufferers or if it should be used in conjunction with physical activity.

Summary

OA is the 11th leading cause of disability worldwide. There are many risk factors to developing this order. Two of the most common risk factors include injury to the affected joint(s) and overweight/obesity. Through evidence-based research, those who are at risk for or how a clinical diagnosis of OA and are overweight or obese are highly encouraged to achieve weight loss of 5-20% of their total body weight. The pathogenesis

of OA is extremely involved and results in cell autophagy, osteophyte formation, and development of cysts. These alterations to normal anatomical makeup result in signs and symptoms such as pain, limited mobility and function, deformity, and alterations to the osseous matter. Though there are many signs and symptoms of OA, not every individual with this disorder will exhibit every sign and/or symptom.

Non-pharmacologic treatment modalities are the preferred treatment options when compared to pharmacologic options. This is based on evidence that OA typically involved the older population and with aging, our body's go through age-related changes, such as decreased renal and hepatic function. This puts older adults at risk for issues such as drug toxicity, nephrotoxicity, and even congestive heart failure. Non-pharmacologic options such as PA and exercise, weight loss, and self-management techniques are recommended.

Chapter III

Methodology

Chapter three discusses the method and plan utilized to conduct this scholarly project. This project was constructed to assess current practice for treating OA, as well as educate providers on non-pharmacologic treatment of OA and reassess knowledge, if any, after education was given. This chapter discusses the project design, sample population and recruitment, inclusion and exclusion criteria, protection of human subjects, instruments utilized, procedure, outcomes and evaluation plan, and plan for sustainability.

Project design

This project utilized a quantitative and qualitative approach with a quasi-experimental design. This design was chosen since research subjects self-select to be a part of this study. This project utilized a pretest to measure the participants level of knowledge of using non-pharmacologic treatment for OA. An intervention was then provided to the participants. This intervention included a voiceover PowerPoint poster to share how non-pharmacologic treatments can be used as a treatment for OA. Two-weeks following the intervention a posttest was distributed to measure participant's knowledge level of using non-pharmacologic treatments for OA.

The quasi-experimental design was utilized for a multitude of reasons. Like other research designs, the quasi-experimental design demonstrates a cause-and-effect correlation between independent and dependent variables. A nonparametric test (two related samples test) was used to determine if there is a statistically significant difference for the level of knowledge between the pre and posttest.

The providers chosen to participate in this project were not chosen at random; they were chosen by this researcher and self-selected to participate. Second, the providers were not compared to a control group, nor were they compared to a comparison group (Terry, 2018).

Sample Population

The sample population consisted of orthopedic specialists as well as multiple primary care providers, including physicians and nurse practitioners, in Kansas. It was anticipated that 20 or more providers would participate in this project, all from Kansas, however, 9 responses were received. This population of providers were selected based on convenience. Convenience sampling simplified the recruitment process. The participants participated in this project on a volunteer basis without persuasion or coercion.

Inclusion and Exclusion Criteria

This section discusses the criteria that were required to be met to be selected for participation in this project. If requirements were not met, participants were excluded from the project.

Inclusion Criteria

To be deemed eligible for inclusion for this project, participants needed to have an active license to practice as a primary care physician, orthopedic physician, or a nurse

practitioner. Participants needed an active email address for communication purposes and for means to access the online pre and posttests as well as the educational piece.

Participants also needed to have patients they treat for OA.

Exclusion Criteria

Those who did not meet criteria for inclusion were excluded from this project. Primary care providers who do not treat OA, as well as other providers who are not orthopedic specialists, were excluded. Those who did not have a working email address or did not fill out the tests were excluded. Incomplete tests were also excluded from this project.

Protection of Human Subjects

Prior to conducting this project, an application to the Pittsburg State University Institutional Review Board (IRB) was submitted for approval as well as the pretests, posttests, and education fact sheet. It is important to note that there is no patient involvement within this project. This project qualified for exempt project approval. Upon approval from the IRB, paper copies of the pretest, educational fact sheet, and posttest contained within a manila envelope were hand delivered to participants by the primary researcher. Each manila envelope was labeled with the name, email, and phone number of the primary researcher. There was no coercion or persuasion of providers to participate in this project; participation was conducted on a volunteer basis. Participants were made aware that all answers will be kept confidential, and participants were also informed that all answers will be used for research purposes only. Participants were asked to create an identifier so that each pretest can be paired with the correct posttest. Participants were

also made aware that their answers will not defame their reputation or pose risk for criminal or civil liability.

Instruments

Two instruments were developed for this study. The first is a 16-question pretest that measured the knowledge level of the use of non-pharmacologic treatments for OA prior to the educational fact sheet. This test was validated by a panel of experts and was determined that it was an appropriate instrument to measure knowledge on non-pharmacologic treatment of OA. This panel was asked to: read of the test and make suggestions to each of the test items, make recommendations to adding and deleting items, and finally to provide an overall judgement of whether this test truly measures the knowledge level of participants in using non-pharmacologic treatments for OA. Both the pre and the posttests requested a participant identifier, which was comprised of four questions. The purpose of the participant identifier was to pair each participant pretest with the correct posttest, and it was no way associated with participant name or identity. The four questions that comprise the participant identifier included:

1. What is the first initial of your mother's first name?
2. What is the first initial of your mother's maiden name?
3. What is the first number of your social security number?
4. What is the last number of your social security number?

An additional section on the pretest measured the demographics of the participants. These demographics included: field of practice, years of practice, where the participant practices, if the participant treats OA (specifically knee and/or hip), and first choice of treatment for OA.

Procedure

This project began in January of 2022 and ended in March of 2022. The first step of this project was to obtain approval from the IRB. Following approval of the IRB, paper copies of the pretests, educational fact sheet, and posttests were placed in manila envelopes labeled with the name, email, and phone number of the primary researcher, and hand delivered to participants. Results of this project were analyzed by the primary researcher and the panel of experts. The pre and posttests were kept within the manila envelope in the possession of the primary researcher until data analysis was completed. Following completion of data analysis, the pre and posttests were shredded.

Outcomes and Evaluation Plan

Once all the data was collected, descriptive statistics was used to describe the demographic variables. To compare the pre and posttests, a grade was calculated for each test and then a paired-sample t-test was ran to see if there was a statistical difference between the pre and posttest measures.

- Educating providers on and implementing non-pharmacologic treatment modalities for OA related symptoms will increase awareness of the need for non-pharmacologic pain management options for OA related symptoms.

Evaluation of this project may be affected by several factors. The pretest determined baseline knowledge on non-pharmacologic treatment of OA. The posttest determined if there was an increased knowledge of non-pharmacologic treatment of OA. The purpose of allowing two weeks after implementation of the educational piece was to allow providers time to project and reflect on the current CPG recommendations and compare them to their current practice.

Plan for Sustainability

There was no monetary cost associated with this project. The only cost related to this project was time contributed to this project by both the researchers and providers who voluntarily chose to participate. There will be no future monetary cost as continuing education can be conducted online to follow changes to CPGs. The future of this project will be sustainable as the research to be conducted will be based on current evidence-based research from the American College of Rheumatology/Arthritis Foundation CPG. Using current evidence-based guidelines allows for trust in the research as the guidelines have previously been researched and proven to be effective. It is expected that there will be improvement in patient outcomes if the current CPG is implemented into provider practices.

Chapter IV

Evaluation of Results

Introduction

This chapter discusses the results of the research conducted for this project. The results depict both qualitative and quantitative results which were obtained by using a quasi-experimental design. Data was analyzed by SPSS. Participants included nurse practitioners and physicians that work in either primary care or orthopedics. Participants worked in Crawford County, Kansas. The pretests distributed were used to assess provider's baseline knowledge on treatment of OA. An educational fact sheet was given to providers to study after taking the pretest. A posttest was given and used to measure knowledge retention. A total of 26 pretests, educational fact sheets, and posttests were distributed, and 9 pre and posttests were returned.

The purpose of this project was aimed towards educating providers about the need for non-pharmacologic treatment modalities for OA related symptoms and the benefits of non-pharmacologic treatment. An additional purpose of this project was to increase provider knowledge on non-pharmacologic treatment modalities of osteoarthritis. The hypothesis for this project is as follows: educating providers on non-pharmacologic treatment modalities for OA related symptoms will increase knowledge of the need for

non-pharmacologic treatment and non-pharmacologic treatment options. In addition to the one hypothesis, this project contains four research questions:

1. What are the demographics of the participants?
2. What is the knowledge level of the participants on the pretest?
3. What is the knowledge level of the participants on the posttest?
4. Was there a statistical difference of knowledge level of participants between the pre and posttest?

This project began January 18, 2022, and ended March 01, 2022. Over the span of 6 weeks participants completed a pretest, which included demographic questions, reviewed an educational fact sheet, and completed a post test. The proceeding text discusses the variables of the project, sample population, including demographics, analysis of the project hypothesis and project questions, and additional statistical analyses.

Project Variables

This portion of the chapter will provide answers to the four research questions. Each question will be discussed individually with statistical data. The project hypothesis will also be discussed to determine if the hypothesis was valid versus invalid.

What are the demographics of the participants?

There were 9 participants that returned tests for this project, with 7 being eligible for participation. Due to convenience sampling, participants who were known to be nurse practitioners or providers were chosen by the primary researcher as potential candidates to participate. Gender, age, race, and ethnicity were not assessed. Demographics for the sample population were collected at the time the participants completed the pretest. Of

the 7 eligible participants, 100% answered yes to questions 1, 5, 10, 11, and 12.

Questions 1, 5, 10, 11, and 12 include:

1. Do you practice in the field of orthopedics or primary care?
5. Do you treat major joint osteoarthritis?
10. Do you educate your patients on lifestyle changes to manage their pain?
11. Do you understand that participation is completely voluntary and will come with no civil or criminal liability?
12. Do you agree to voluntarily participate in this study?

According to the demographic questionnaire, more than one-half (57.1%) of participants reported practicing in the field of orthopedics, with 57.1% of the participants having 15 or more years of practice experience.

Table 2

Participant Demographics

Which area participants practiced in.	Frequency	Percent
Orthopedics	4	57.1
Primary care	3	42.9
Total	7	100.0

How many years have you been practicing?	Frequency	Percent
less than one	1	14.3
1-5	2	28.6
15 plus	4	57.1
Total	7	100.0

Participants were given a list of optional treatments for OA and asked to rank them 1 through 3, with 1 being the most important, 2 as the second most important, and 3 as the third most important treatment options. According to participant responses, the most important treatment option is OTC oral analgesics, the second most important treatment option is intra-articular corticosteroid injections, and the third most important treatment

option is physical therapy. Oral opioids were not chosen by any participants as first most, second most, or third most important treatment option. These responses are shown in Table 3 below.

Table 3

Participant Ranking of Top 3 Choices of OA Treatment

Participant Ranking of Top 3 Choices of OA Treatment	Freq. of 1st Rating	Freq. of 2nd Rating	Freq. of 3rd Rating
Physical therapy	0	1	5
Diet/Exercise	3	1	1
OTC oral analgesics	4	2	0
Intra-articular corticosteroid injections	0	3	0
Oral opioids	0	0	0
Surgery	0	0	1

Participant responses to ranking their first, second, and third most important treatment options is consistent with their overall opinion on what they felt is the most effective form of pain management for OA. Participants were given the same options for the most effective form of pain management. Table 3 shows that participants felt both OTC oral analgesics and physical therapy were the most effective forms of pain management.

Table 4

What Participants Felt is the Most Effective Form of Pain Management

What Participants Felt is the Most Effective Form of Pain Management	Frequency	Percent
Physical therapy	3	42.9
Diet/Exercise	1	14.3
OTC oral analgesics	3	42.9
Total	7	100.0

Participants were also asked if they had attempted to treat OA non-pharmacologically, with which 100% of participants responded yes to. With this,

participants were asked to elaborate on what non-pharmacologic treatments they had attempted as a treatment plan in the past. The most common non-pharmacologic treatment option used to attempt to treat OA was weight loss.

Table 5

Non-Pharmacologic Treatment Options Attempted

Non-Pharmacologic Treatment Options Attempted	Number of Responses
Weight loss	4
Physical therapy	2
Assistive devices	1
Exercise	2
Combined approach	3

In addition to asking participants what non-pharmacologic treatment options they have attempted to treat OA; they were also asked if they educate patients on lifestyle changes to help manage pain. This was another question in which 100% of participants answered yes. Participants were able to use free text to elaborate on non-pharmacologic treatment options they have attempted to use OA. Most participants listed multiple treatment modalities. The most common lifestyle change patients were educated on to help manage their OA pain was exercise.

Table 6

Lifestyle Changes Patients Have Been Educated On

Lifestyle Changes Patients Have Been Educated On	Number of Responses
Weight loss	4
Exercise	6
OTC treatments	1
Diet	3

What is the knowledge level of the participants on the pretest?

Each participant was required to take a pretest to be considered eligible for participation in this project. There were 16 questions on the pretest. After receiving the pretests, grading them, and comparing responses to the educational fact sheet. Though participants answered every question on the pretest and posttest, the decision to eliminate questions 11 and 12 from the data analysis was made. These questions were eliminated from the final score because the answers either were unclear on the educational fact sheet or were not listed on the educational fact sheet. Each question was multiple choice; each correct answer was worth 5 points, and 0 points were awarded for incorrect answers. A total of 70 points was the highest score a participant could achieve. As can be seen in Table 5, the mean pretest score was 52.86 (SD = 12.53), with the most common score amongst participants being 55.

Table 7

Pretest Values of Participants

Pretest Scores	Frequency	Percent
35	1	14.3
40	1	14.3
50	1	14.3
55	2	28.6
65	1	14.3
70	1	14.3
Total	7	100.0

Mean = 52.86 (SD=12.53)

What is the knowledge level of the participants on the posttest?

All participants in the study completed a pre and posttest. Participants were asked to review an educational fact sheet prior to taking the posttest. The posttest served to assess

newfound knowledge. The posttest contained the same 16 questions as the pretest, but upon grading each posttest, questions 11 and 12 were not scored. According to table 6, the mean score among participants was 67.14 (SD = 3.934) out of a total possible score of 70. The most common score amongst participants after reviewing the educational fact sheet and completing the posttest was 70, which was obtained by 57.1% of participants.

Table 8

Posttest Values of Participants

Posttest	Frequency	Percent
60	1	14.3
65	2	28.6
70	4	57.1
Total	7	100.0

Mean = 67.14 (SD = 3.934)

Is there a statistical difference of knowledge level of participants between the pre and posttest?

A nonparametric test (two related samples test) was used to compare the posttests to the pretests, and it was determined that there were no participants who obtained a worse score on the posttest when compared to the pretest. Additionally, 6 of the 7 participants obtained higher scores on the posttests than they did on the pretest, with one participant receiving the same score on both the pretest and posttest. The probability (.027) calculated with the test statistic ($Z = -2.207$) was less than alpha (.05), so the null hypothesis is rejected, acknowledging a statistical difference of knowledge level of participants between the pre and posttests. Overall, participants did better on the posttest than the pretest, indicating that they gained knowledge in non-pharmacologic treatment of OA with the educational fact sheet provided. In Table 8 listed below, N identifies the

total number of participants. There were 0 negative ranks, meaning that 0 of the participants did worse on the posttest than the pretest. There were 6 positive ranks, meaning 6 participants did better on the posttest than the pretest and 1 tie, meaning one participant had the same score on the pretest.

Table 2

Ranks

		Ranks		Sum of
Posttest - Pretest		N	Mean Rank	Ranks
	Negative Ranks	0 ^a	.00	.00
	Positive Ranks	6 ^b	3.50	21.00
	Ties	1 ^c		
	Total	7		

a. Posttest < Pretest

b. Posttest > Pretest

c. Posttest = Pretest

Project Hypothesis

The hypothesis created for this project was the following: educating providers on non-pharmacologic treatment modalities for OA related symptoms will increase knowledge of the need for non-pharmacologic treatment and non-pharmacologic treatment options. Considering the statistical difference identified between the pre and posttests, this indicated a gain in knowledge from the educational fact sheet. The statistical difference identified between the pre- and posttests allows for this hypothesis to be considered valid.

Summary

This purpose of this project was to educate providers on the need for non-pharmacologic treatment for OA related pain, educate providers on the benefits of non-pharmacologic treatment modalities, as well as to increase provider knowledge on non-pharmacologic treatment modalities for OA. Initially, baseline knowledge of participants was assessed with a pretest, education was provided, and knowledge again was assessed with a posttest. Most of the participants (6 out of 7) had an increase in knowledge, one participant's knowledge remained the same, and there were no participants that obtained a lower score on the posttest than on the pretest. By running a nonparametric test (two related samples test) to compare the pretests to the posttests, it was concluded that there is a statistically significant difference and that they hypothesis is considered valid.

Chapter V

Discussion

Purpose

This project had a multifaceted purpose: to educate providers on the need for non-pharmacologic OA treatments, the benefits of non-pharmacologic treatment, and increase provider knowledge of these OA treatment modalities. A pretest was given to participants to assess their baseline knowledge of OA and OA treatments. The pretest also included a demographic questionnaire. Following completion of the pretests, participants were asked to review an educational fact sheet and then complete a posttest. The posttest was used to determine if there was an increase in provider knowledge.

Relationship of Outcomes to Research

A quasi-experimental qualitative and quantitative design was used to answer 4 research questions and one hypothesis. The 14 questions that were scored on both the pretest and posttest had quantitative answers. There were three questions in the demographic questionnaire that had qualitative answers.

For the first research question, *what are the demographics of the participants*, answer options on the demographic questionnaire were multiple choice only and answers were quantitative in nature. Questions 7 (please rank your top three choices of treatment for osteoarthritis, using 1 as the most important, 2 as the second most important, and 3 as

the third most important), 9 (in the past, or currently, have you attempted to treat osteoarthritis non-pharmacologically [without the use of prescription or over-the-counter medications]), and 10 (do you educate your patients on lifestyle changes to manage their pain) were both quantitative and qualitative in nature. Questions 7, 9, and 10 were yes/no questions with ability for participants to elaborate on their answers. The demographics obtained do not correlate with previous findings, as previous findings were not focused on demographic data. This could be partly due to convenience sampling, small sample size, and/or geographic region.

For the second research question, *what is the knowledge level of the participants on the pretest*, each answer option was multiple choice only and answers were quantitative in nature. The highest score possible was 70 as each correct answer was worth 5 points. The mean score on the pretest was 52.86 (SD = 12.53). Nearly three-quarter (5/7) of participants scored at less than 90% on the pretest. There were 6 questions where 3 or more participants answered incorrectly. The areas in which participants scored incorrectly most frequently included greater than 5% body weight loss (if indicated) improves clinical and mechanistic outcomes, self-management programs involve patients making healthy choices and learn to manage physical and emotional effects of OA, exercise is the most effect form of non-pharmacologic treatment, the average number of medications the only adult is prescribed is 6, opioids are typically ineffective in treating pain due to being prescribed at low doses, and improvement in concentration is not an outcome of Tai Chi. The scores on the pretest reiterated the purpose of this project; there was a need for education on non-pharmacologic treatment, benefits of non-pharmacologic treatment, and a need to increase provider knowledge.

For the third research question, *what is the knowledge level of the participants on the posttest*, each answer option was multiple choice only and answers were quantitative in nature. Over half (57.1% of participants received 100% on the posttest. Just like with the pretest, the highest score possible was 70 with each correct answer being worth 5 points. The mean score for the posttest was 67.14 (SD = 3.934). The areas of self-management programs involve patients making healthy choices and learning to manage physical and emotional effects of OA and exercise being the most effective form of non-pharmacologic treatment were the two areas of concern consistent with the pretest. These two questions were two of the frequently missed questions on the pretest, however, the number of participants that answered them correctly on the posttest increased by 66%. The area of osteoarthritis having no cure was a concern on the posttest with one participant answering incorrectly while 100% of participants answered correctly on the pretest. This could be due to confounding text on the educational fact sheet.

For the fourth research question, *is there a statistical difference of knowledge level of participants between the pre and posttest*, a nonparametric test (two related samples test) was used to compare the posttests to the pretests. This test determined that there were no participants who scored worse on the posttest than on the pretest. Of the 7 participants, 6 of them scored higher on the posttest than the pretest while one participant's score remained the same. The probability (.027) calculated with the test statistic ($Z = -2.207$) was less than alpha (.05), so the null hypothesis is rejected, which determined there was a statistically significant difference of knowledge level of participants between the pre and posttest.

Observations

The pretest scores re-emphasized the need for provider education in the realm of non-pharmacologic treatment of OA and benefits of non-pharmacologic treatment of OA. Physical therapy is an option for treatment of OA related symptoms. What is interesting is that 42.9% (3/7) participants reported that physical therapy is the most effective form of pain management, however, no participants listed physical therapy as the most important treatment options, one participant listed physical therapy as the second most important treatment option, and 5 participants listed physical therapy as the third most important treatment option. In contrast to the rankings on physical therapy, 42.9% (3/7) participants also listed OTC oral analgesics as the most effective treatment option for OA related pain, with more than half (4/7) participants ranking OTC oral analgesics as the first most important treatment option and 2 participants listed OTC oral analgesics as the second most important treatment option. Self-management programs are programs listed in the literature that are effective in helping those who suffer from OA manage their symptoms. According to the pre and posttests, this is an area that providers are lacking knowledge in. This is noteworthy as further education may need to be provided to family practice and orthopedics providers that treat patients with OA.

The pretest, educational fact sheet, and posttest were sufficient and provided results that correlated with the hypothesis. Considering 6 of the 7 participants had higher scores on the posttests while one participant remained the same, the educational fact sheet performed as expected. The results were reassuring, which allows the primary researcher to anticipate that a statistical difference would still be found within a larger sample size.

Evaluation of Theoretical Framework

The theoretical framework for this project was Lewin's Change Theory, also known as the Change Management Theory. This theory was created in the 1940's by Kurt Lewin, who likened this theory to a block of ice and how it changes shape as it unfreezes and refreezes. Overall, the results supported this theory, specifically the qualitative results. The qualitative questions (questions 7, 9, and 12) show how participants have adjusted their practice based on what forms of OA treatment they had attempted with patients in the past.

Though the results from the research adequately answered project questions and the project hypothesis, the primary researcher did not assess potential changes in future practice of the participants. Those results would have determined conclusive support of this theory. The qualitative data that was collected supported the participant's current freeze stage but did not adequately support the unfreeze or change stage of the theory.

Evaluation of Logic Model

The results of this project did support parts of the logic model introduced in Chapter I. The logic model assumed that though non-pharmacologic treatment of OA is the recommended initial treatment, this does not always occur. The qualitative data that was collected from the participants concluded that this assumption was correct. Tables 2 and 3 show that participants tend to focus on a combined approach of non-pharmacologic and pharmacologic treatment options. The logic model also assumed that providers should be educated about starting the process of change, which was consistent with the results of the data collected. The participants did have an increase in knowledge after reviewing an educational fact sheet. The last assumption noted in the logic model was

that providers would be willing to change their practice. The results of the data do not support this assumption as future practice change was not assessed.

The short-term outcomes of the logic model, identifying a patient population and increasing provider knowledge, were obtained. These outcomes were obtained through participant demographics and results of the posttests compared to the pretests. One medium-term outcome, continued education, was obtained. Though the educational fact sheet provided to participants was not a formal format for continued education, it was a way for providers to refresh their knowledge and even obtain new knowledge. Other medium-term outcomes, attitude/belief changes and temporary changes in practice to determine effectiveness, were not able to be assessed based on the data collected and results deduced from that data. Due to time constraints, none of the long-term outcomes were able to be assessed.

Limitations

There were several limitations noted throughout the course of this project. Though the results of data did conclude that there was a statistical difference between the pretest and posttest, the largest limitation of this project was the small sample size. Convenience sampling was an effective method of selecting participants, however, human resources were a factor that caused limitations. Initially it was anticipated that there would be 20 participants for this project, but there were only 9 responses with 7 being eligible for participation. This was due to some participants opting out and some participants who missed the deadline for submitting responses.

The instruments utilized for data collection were appropriate to this type of sampling, however, the instruments were adapted from their initial form. Initially, a

presurvey and postsurvey were to be utilized. After determining that the level of knowledge was to be assessed, the surveys were adapted to a pretest and posttest that were to be scored and compared. This allowed the primary researcher to determine if the educational fact sheet was effective in determining if there was a statistical difference between the pretest and posttest.

Initially a paired sample *t*-test was to be used for data analysis. Due to the small sample size, a nonparametric test (related samples test) was used to analyze data. This is a limitation of this project as it is considered a weaker test than the paired sample *t*-test.

Though there was a mix of primary care and orthopedic providers who participated in this project, all providers were from the state of Kansas. In conjunction with the small sample size, participants were all from the same region. The demographic questionnaire did not assess whether participants were physicians or nurse practitioners. Though convenience sampling allowed the primary researcher to choose participants, not assessing the nurse practitioner to physician ratio is a limitation of this study. Knowing the ratio could help future research determine if there is a difference in practice between nurse practitioners and physicians.

Time was a factor that hindered this project. Time constraints did not give the primary researcher the ability to assess the long-term outcomes listed in the logic model. More time to conduct research for this study may have provided a larger sample size as well.

Implications for Future Projects and Research

The results from this project concluded that after implementing an educational fact sheet, there was a statistical difference between the posttest and pretest. Continuing

education is an important aspect to continue to include in the practice of primary care and orthopedic providers regarding OA treatment. Given the comparison of the pretests and posttests, there are two areas that should be focused on: self-management programs and most effective forms of non-pharmacologic treatment. Continuing education should focus more heavily on non-pharmacologic treatments for OA, given that OA typically affects those 65 years of age and older.

Future projects and research should focus on having a larger sample size, having participants from various regions, and determining the ratio of nurse practitioners to physicians. Analyzing these demographics could have an impact on future results. Future projects should also allot a significant amount of time for research. Time constraints were a major limitation for this project regarding long-term outcomes. With appropriate time for research, researchers would be able to conclude if provider education has a positive impact on the long-term outcomes listed in the logic model.

Implications for Practice and Education

The results of this study showed a statistical difference between the pretest and posttest after implementing the educational fact sheet. Advanced practice nurses as well as physicians should continue to be educated on the need for and benefit of non-pharmacologic treatment options for OA given that OA most frequently affects those aged 65 and older. The physiologic changes that occur with aging should also be considered when prescribing a treatment plan. Given the results of this study, non-pharmacologic therapies should be initiated as first-line treatment in the older population. Pharmacologic therapy should be initiated when non-pharmacologic therapies have failed.

Providers should be educated on less common forms of non-pharmacologic treatments such as self-management programs and Tai Chi because previous and current literature shows the effectiveness of these treatment options and the positive impact it has on patient symptoms.

Conclusion

OA is a joint disorder where the intra-articular cartilage wears down over time. This most frequently occurs in those 65 years of age and older. There are significant physiologic changes that occur with aging that make pharmacologic therapies the less safe option for treating OA. Because of this, non-pharmacologic therapies should be initiated as first-line therapies.

The purpose of this project was to educate providers on the need for and benefit of non-pharmacologic treatment options for OA as well as to increase provider knowledge on the need for and benefit of non-pharmacologic treatment options for OA. Education was provided to participants through the form of a paper copy of an educational fact sheet. A nonparametric test (related samples test) showed that there was a statistical difference between the posttests and pretests. Though there was a small sample size, the statistical difference identified allows for anticipation that future research with larger samples would have similar results.

Future research should focus on larger sample sizes, determining the nurse practitioner to physician ratio, and including participants from different regions. Additionally, future research should continue to focus on educating providers but also how the education provided affects the long-term outcomes for both providers and patients.

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Appendices

Appendix A

Osteoarthritis: Provider Education of Current Clinical Practice Guidelines

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INTRODUCTION

Osteoarthritis (OA) is the most common form of chronic joint disease and is a major contributor to disability. OA commonly affects adults aged 65 and older, with almost half of adults 65 years of age and older having symptomatic OA to some degree. There is no cure for OA without a very invasive surgical procedure known as a total joint arthroplasty (AKA total joint replacement). The average number of medications an older adult takes is 6. Age-related physiologic changes, such as decreased metabolism and increased total body fat can make pharmacologic therapy unsafe.

Non-pharmacologic treatment in the forms of physical activity, exercise, and weight management are important in the treatment of this disorder. Maintaining physical activity has been shown effective in decreasing pain and improving overall function. Many OA patients are physically inactive, which can worsen their disorder. OA patients should partake in an exercise regimen that focuses on strength training and endurance. However, for this regimen to be effective, the patients should be monitored for adherence. It has been shown that a combination of treatments is more effective than monotherapy alone. For this reason, it is important for patients to be educated on the benefits of physical activity and exercise. Providing education will give patients with an understanding of their condition as well as knowledge of their treatment plan. This knowledge will aid patients in adhering to their treatment plan.

CLINICAL PRACTICE GUIDELINES

- Current 2020 American College of Rheumatology/Arthritis Foundation clinical practice guidelines (CPG) for OA management were reviewed.
- The focus for this study will be non-pharmacologic treatment options for hip, knee, and hand OA.
- Only "strongly recommended" and "strongly recommended against" guidelines will be mentioned.

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HIP CPG

- Strongly recommended treatment options ³:
 - Exercise
 - Self-efficacy programs
 - Self-management programs
 - Weight loss
 - Tai Chi
 - Cane
- Strongly recommended against treatment options ³:
 - TENS units
- There is no specific exercise to recommend for pain control; it is individualized to the patient ³.
- There is a dose-response relationship regarding weight loss and symptom and/or functional improvement ³.
- Canes are recommended for 1+ diseased joints that impact walking, joint stability, and/or cause pain ³.
- TENS units are not recommended due to low quality studies and lack of benefit noted within previous studies ³.

KNEE CPG

- Strongly recommended treatment options ³:
 - Exercise
 - Self-efficacy programs
 - Self-management programs
 - Weight loss
 - Tai Chi
 - Cane
 - Knee brace (tibiofemoral OA)
- Strongly recommended against treatment options ³:
 - TENS units
- There is no specific exercise to recommend for pain control; it is individualized to the patient ³.
- There is a dose-response relationship regarding weight loss and symptom and/or functional improvement ³.
- Canes are recommended for 1+ diseased joints that impact walking, joint stability, and/or cause pain ³.
- Bracing is strongly recommended when ambulation or joint stability is impacted, and/or if there is pain and the patient can tolerate bracing ³.

PROVIDER/PATIENT EDUCATION

- Physiologic changes that occur with aging warrant need for non-pharmacologic treatment ³.
 - Decreased kidney/hepatic function
 - Nephrotoxicity can occur
- NSAIDs can exacerbate often present comorbidities ^{1, 7}
 - Cardiac (hypertension, heart failure)
 - Kidney dysfunction
 - GI conditions (bleeding, peptic ulcer)
- Opioids in the elderly population can cause sedation and can lead to falls ⁴.
 - Typically prescribed at lower doses which are often ineffective for pain.
- Non-pharmacologic treatment options provide long-term pain.
- Exercise is the most effective non-pharmacologic treatment for managing osteoarthritis pain
 - Range of motion and flexibility
 - Strengthening exercises
 - Aerobic/endurance exercises
 - Walking
 - Aquatic exercises
- Self-efficacy is confidence in one's ability to manage pain.
 - Increase self-efficacy through education
 - Programs are beneficial for patients to participate consistently.
- Self-management involves making healthy choices and learning to manage physical and emotional effects of osteoarthritis.
 - Get adequate amounts of sleep
 - Physical activity
 - Eat a healthy, balanced diet
 - Programs are beneficial for patients to participate consistently.
- Tai Chi is a form of Chinese Martial Arts useful in treating osteoarthritis pain⁶.
 - Improves lower body muscle strength
 - Improves joint stability
 - Improves coordination
 - Improves self-efficacy

PROVIDER/PATIENT EDUCATION

- Weight loss is strongly recommended if indicated ³.
 - Loss of >5% body weight is associated with changes in clinical and mechanistic outcomes (Kolasinski et al., 2020, pg. 225).
- Treatment success may be enhanced by ³:
 - Improving mood
 - Reducing stress
 - Addressing insomnia
 - Managing weight
 - Enhancing fitness

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Appendix B

For this study there will be a pre and posttest. These will be completely anonymous. There will be a pre-survey, an educational poster, and a post-survey following the educational piece. You will need to create an identifier so your pre- and post-survey answers can be analyzed for statistical purposes. Your identity will remain anonymous. Participation is voluntary and participants may withdraw from the study at any time without consequence.

Educational Pre-Test

The following questions are used only to assess your knowledge in the treatment of osteoarthritis. All of these questions will be related to **mild-moderate** major joint (hip/knee) osteoarthritis.

1. What age group does osteoarthritis most commonly affect?
 - a) 35-44
 - b) 45-54
 - c) 55-64
 - d) 65+
2. What is the cure for osteoarthritis?
 - a) Surgery
 - b) Exercise
 - c) Lower body muscle strengthening
 - d) There is no cure
3. What is a recommended non-pharmacologic treatment option for osteoarthritis?
 - a) Modified shoes
 - b) Exercise
 - c) Massage therapy
 - d) Transcutaneous electrical nerve stimulation (TENS) unit
4. What joint(s) is cane use recommended for those patients identified with osteoarthritis?
 - a) Hip
 - b) Knee
 - c) Both
 - d) Cane use is not recommended
5. What joints are TENS units recommended for?
 - a) Hip
 - b) Knee
 - c) Both
 - d) TENS units are not recommended
6. At what percent of body weight loss (if indicated) does improvement in clinical and mechanistic outcomes occur?
 - a) Less than or equal to 3%
 - b) 4%
 - c) 5%
 - d) >5%

7. What form of exercise is **NOT** an exercise recommended to help manage osteoarthritis related pain?
 - a) Range of motion and flexibility exercises
 - b) Strengthening exercises
 - c) Endurance exercises
 - d) High impact aerobics exercises
8. What programs involve patients making healthy choices and learning to manage physical and emotional effects of osteoarthritis?
 - a) Self-efficacy
 - b) Self-management
 - c) Self-control
 - d) Self-denial
9. What is the most effective form of non-pharmacologic treatment?
 - a) Weight loss
 - b) Self-efficacy programs
 - c) Exercise
 - d) Cane use
10. What is the average number of medications that an older adult patient is prescribed?
 - a) 3
 - b) 4
 - c) 5
 - d) 6
11. Which physiologic change that occurs with aging that can make pharmacologic therapy unsafe?
 - a) Decreased metabolism
 - b) Increased glomerular filtration rate (GFR)
 - c) Increased serum albumin
 - d) Decreased total body fat
12. What organ does the first-pass effect occur?
 - a) Kidneys
 - b) Liver
 - c) Stomach
 - d) Intestine
13. Which co-morbid condition can NSAIDs exacerbate?
 - a) Heart failure
 - b) Lupus
 - c) Gastroparesis
 - d) Hyperlipidemia
14. What class of medication is typically ineffective in treating pain due to low doses being prescribed?
 - a) NSAIDs
 - b) Opioids
 - c) Steroids
 - d) Biologics

15. Which of the following is **NOT** an outcome of Tai Chi for treatment of osteoarthritis pain?
- a) Improves lower body strength
 - b) Improves joint stability
 - c) Improves concentration
 - d) Improves self-efficacy
16. Which of the following does **NOT** enhance osteoarthritis treatment success?
- a) Managing weight
 - b) Support groups
 - c) Stress reduction
 - d) Addressing insomnia

The following demographic questions will be used to describe the participants in this study. Your identity will remain anonymous. At the end you will be asked to create a participant identifier. The purpose of the participant identifier is to measure answers between pre- and post-test and it is no way associated with participant name or identity.

Participant identifier

What is the first initial of your mother's first name?:

What is the first initial of your mother's maiden name?:

What is the first number of your social security number?:

What is the last number of your social security number?:

Demographic questions:

1. Do you practice in the field of orthopedics or primary care?
 - a. Yes
 - b. No
2. If the answer to #1 is yes, which area do you practice?
 - a. Orthopedics
 - b. Primary care
3. How many years have you been practicing?
 - a. Less than one
 - b. 1-5
 - c. 6-10
 - d. 11-15
 - e. 15+
4. What state are you currently practicing in?
 - a. Kansas
 - b. Missouri
 - c. Oklahoma
5. Do you treat major joint osteoarthritis?

- a. Yes
 - b. No
6. What major joint osteoarthritis do you treat?
- a. Knee
 - b. Hip
 - c. Both
 - d. Other _____
7. Please rank your top three choices of treatment for osteoarthritis, using 1 as the most important, 2 as the second most important, and 3 as the third most important.
- Physical therapy
 - Diet/exercise
 - Over-the-counter oral analgesics (NSAIDs, acetaminophen, etc.)
 - Intra-articular corticosteroid injections
 - Oral opioids
 - Surgery
 - Other: _____
8. What do you feel is the most effective form of pain management for osteoarthritis?
- a. Physical therapy
 - b. Diet/exercise
 - c. Over-the-counter oral analgesics (NSAIDs, acetaminophen, etc.)
 - d. Intra-articular corticosteroid injections
 - e. Oral opioids
 - f. Surgery
 - g. Other: _____
9. In the past, or currently, have you attempted to treat osteoarthritis non-pharmacologically (without the use of prescription or over-the-counter-medications)?
- a. Yes
 - If yes, please elaborate:
 - _____
 - _____
 - _____
 - b. No
 - If no, please elaborate why:
 - _____
 - _____
 - _____
10. Do you educate your patients on lifestyle changes to manage their pain?
- a. Yes
 - If yes, please elaborate on lifestyle changes you typically educate patients on:
 - _____
 - _____
 - _____
 - b. No

If no, please elaborate why:

11. Do you understand that participation is completely voluntary and will come with no civil or criminal liability?
 - a. Yes
 - b. No
12. Do you agree to voluntarily participate in this study?
 - a. Yes
 - b. No

Appendix C

Educational Post-Test

The following questions are used only to assess your knowledge in the treatment of osteoarthritis. All of these questions will be related to **mild-moderate** major joint (hip/knee) osteoarthritis. Participation is voluntary and participants may withdraw from the study at any time without consequence.

17. What age group does osteoarthritis most commonly affect?
 - a) 35-44
 - b) 45-54
 - c) 55-64
 - d) 65+
18. What is the cure for osteoarthritis?
 - a) Surgery
 - b) Exercise
 - c) Lower body muscle strengthening
 - d) There is no cure
19. What is a recommended non-pharmacologic treatment option for osteoarthritis?
 - a) Modified shoes
 - b) Exercise
 - c) Massage therapy
 - d) Transcutaneous electrical nerve stimulation (TENS) unit
20. What joint(s) is cane use recommended for those patients identified with osteoarthritis?
 - e) Hip
 - f) Knee
 - g) Both
 - h) Cane use is not recommended
21. What joints are TENS units recommended for?
 - e) Hip
 - f) Knee
 - g) Both
 - h) TENS units are not recommended
22. At what percent of body weight loss (if indicated) does improvement in clinical and mechanistic outcomes occur?
 - e) Less than or equal to 3%
 - f) 4%
 - g) 5%
 - h) >5%
23. What form of exercise is **NOT** an exercise recommended to help manage osteoarthritis related pain?
 - a) Range of motion and flexibility exercises
 - b) Strengthening exercises
 - c) Endurance exercises
 - d) High impact aerobics exercises

24. What programs involve patients making healthy choices and learning to manage physical and emotional effects of osteoarthritis?
- a) Self-efficacy
 - b) Self-management
 - c) Self-control
 - d) Self-denial
25. What is the most effective form of non-pharmacologic treatment?
- a) Weight loss
 - b) Self-efficacy programs
 - c) Exercise
 - d) Cane use
26. What is the average number of medications that an older adult patient is prescribed?
- a) 3
 - b) 4
 - c) 5
 - d) 6
27. Which physiologic change that occurs with aging that can make pharmacologic therapy unsafe? (Select all that apply)
- e) Decreased metabolism
 - f) Increased glomerular filtration rate (GFR)
 - g) Increased serum albumin
 - h) Increased total body fat
28. What organ does the first-pass effect occur?
- a) Kidneys
 - b) Liver
 - c) Stomach
 - d) Intestine
29. Which co-morbid condition can NSAIDs exacerbate?
- a) Heart failure
 - b) Lupus
 - c) Gastroparesis
 - d) Hyperlipidemia
30. What class of medication is typically ineffective in treating pain due to low doses being prescribed?
- a) NSAIDs
 - b) Opioids
 - c) Steroids
 - d) Biologics
31. Which of the following is **NOT** an outcome of Tai Chi for treatment of osteoarthritis pain?
- a) Improves lower body strength
 - b) Improves joint stability
 - c) Improves concentration
 - d) Improves self-efficacy

32. Which of the following does **NOT** enhance osteoarthritis treatment success?
- a) Managing weight
 - b) Support groups
 - c) Stress reduction
 - d) Addressing insomnia

Participant identifier

What is the first initial of your mother's first name?:

What is the first initial of your mother's maiden name?:

What is the first number of your social security number?:

What is the last number of your social security number?: