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AN EVALUATION OF ADOLESCENT CONCUSSION MANAGEMENT AND
GUIDELINES BY PRIMARY CARE PROVIDERS IN THE OUTPATIENT SETTING:
DNP SCHOLARLY PROJECT

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

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AN EVALUATION OF ADOLESCENT CONCUSSION MANAGEMENT AND
GUIDELINES BY PRIMARY CARE PROVIDERS IN THE OUTPATIENT SETTING:
DNP SCHOLARLY PROJECT

An Abstract of the Scholarly Project by
Mary Beth Newkirk

Understanding the pathology of a concussion has been a challenging task for many experts in healthcare. An agreed upon definition has yet to be developed and many health care providers are not properly educated to assess and care for those suffering from a concussion. Management of concussion in adolescents, a vulnerable population, requires even more consideration and training. The purpose of this study was to determine the knowledge current providers in the four-state region regarding sport-related concussion management in the adolescent population, to improve patient care and outcomes, and to improve knowledge learned through exposure to a clinical practice guideline-based, educational resource.

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Chapter I

Introduction

Concussion, in general, is a common injury that has emerged as a major health concern in the United States. Over the last several years new state and national legislature have strived to bring awareness of concussion risk with premature return to play and long-term consequences. It has been reported that over one million emergency room visits annually are related to a concussion (King et al., 2014). An estimated 1.6 to 3.8 million sports-related head injuries occur throughout the U.S. on a yearly basis, accounting for 5-9% of all sport-related injuries (King et al., 2014; NATA, 2019; West & Marion, 2014). With the lack of a consistent universal definition for concussion, it can be difficult to recognize and therefor treat appropriately. Due to the limited empiric research, it is essential for the clinician to utilize clinical judgement, expert guidelines, and assessment tools to establish diagnosis and treatment plans for a sport-related concussion in the adolescent population (Scorza et al, 2012).

Concussions are known to affect reaction time, memory, balance, and planning skills with reports of a wide range of symptoms including headache, fatigue, amnesia, dizziness, nausea, vomiting, and sensitivity to light and/or noise. Sport-related concussions typically resolve in 80-90% of all participants by 7-10 days (King et al., 2014). Greater risk for post injury or second impact syndrome can occur during this time

if sustaining repeat head trauma. Research suggests repeat concussions may result in long-term outcomes including depression, mild cognitive impairment, prolonged recovery, electrophysiological changes, and chronic traumatic encephalopathy (King et al., 2014). Concussion symptoms, by their nature, are subjective making diagnosis challenging for the provider and dependent upon the awareness, honesty, and willingness of the athlete to accurately provide information (King et al., 2014).

Clinical Problem

West and Marion (2014) note that concussion is a clinical diagnosis that is ideally made by a licensed health care provider familiar with signs and symptoms of the injury. Although there is no single test to determine whether a concussion has occurred, there are clinical practice guidelines (CPGs) available although, utilization by health care providers is not well documented (King et al., 2014). King et al. (2014) also notes that the quality and consistency of concussion CPGs are reported lower than those of other medical CPGs with considerable variability in the methodology, quality, guidance, and recommendations. The most common reason for variations in the management of a sport-related concussion has been identified as lack of awareness of, and confusion with, the many published guidelines that are available (West & Marion, 2014).

To date there is a paucity of research on emergency department and primary care practitioners' management of concussion. Most of the emergency department and primary care research published was prior to the recent Concussion in Sport Group (CISG) International Conference and guidelines publication. Further research has been suggested and warranted to explore these areas to assist in development of evidence-based information for this group of health practitioners (King et al., 2014). The role of

the nurse practitioner as identified by Waters (2012) can assist in meeting the gap for adolescent concussion management. She suggests nurse practitioners (NPs) can meet this need by focusing on injury prevention, diagnosis, management, and education and guidance for athletes, parents, coaches and school officials (Waters, 2012).

Children and adolescents are at a greater risk of injury and long-term consequences as they are still physically developing. The provider needs to be aware that when working with children and adolescents, recovery may take longer than in adults and require a more prolonged return to play progression (Broglia et al., 2014). According to the National Athletic Trainers' Association Position Statement (2014), age appropriate, validated concussion-assessment tools should be utilized when managing pediatric patients. The clinician should also consider that due to pediatric athletes undergoing continual brain and cognitive development, they may need more frequent updates to baseline assessments (Broglia et al., 2014).

Significance to Nursing

Understanding the significance of a sport-related concussion in the adolescent is critical to this vulnerable population. Healthcare providers, parents, coaches, school nurses, and the athlete must work together to ensure immediate care, removal from play, and evaluation if a concussion is suspected. Education is key in prevention and treatment. Often the school nurse is on the front line, along with coaches, in evaluating a suspected concussion. According to the National Association of School Nurses (2016), a school nurse is an essential member of the school health team and in a unique position to assist in student concussions. The school nurse has the knowledge and skills to provide concussion prevention education to parents/guardians, students, and staff; assist in

identifying suspected concussions; and help guide the student's post-concussion return to school and sports.

In addition to the registered nurse, the advanced practice nurse role is expanding to include school health. In 2019, the Community Health Center of Southeast Kansas received a grant to place a family nurse practitioner in the Pittsburg, Kansas school district as a direct healthcare provider to the students and employees of Pittsburg High School. The Center for Disease Control and Prevention (2019) recognizes health care providers play a critical role in helping to prevent a concussion and to improve a patient's health outcomes through early detection, management, and appropriate referral. This applies specifically to registered nurses and advanced practice nurses.

According to *The Doctor of Nursing Practice Scholarly Project: A Framework for Success* (2017) new methods for care delivery and approaches to disease management are being evaluated to determine if there are better ways to meet current health care needs. The focus is shifting from acute, episodic care to prevention and education (Moran, 2017). Moran (2017) suggests Doctor of Nursing Practice (DNP) scholarly projects are a popular choice to meet these needs. Projects often include an intervention or innovation approach to healthcare delivery that has a goal of positively affecting outcomes. A healthcare delivery DNP scholarly project related to evaluating and implementing evidence-based, sport-related concussion guidelines would be applicable to advanced practice nursing.

Specific Research Aims and Purpose

The specific aim of this scholarly project was to improve the primary care provider's knowledge, management and implementation of guidelines for sport-related

concussion in the adolescent population. This project evaluated current knowledge within the clinical setting and intended to enhance the practitioner's knowledge after reviewing up-to-date clinical practice guidelines. An educational resource was developed to include current state and national recommendations for those practicing in the primary care setting. The development of this educational resource included recognition of a sport-related concussion, immediate removal from play, and a stepwise approach treatment plan that allows the athlete to return to play and school in a safe manner.

The purpose of this study was to evaluate current knowledge levels and quality practice by primary care providers caring for this vulnerable population. Assessment of current management, patient outcomes and gaps in care for the adolescent population who have had a diagnosis of a concussion were identified. The project began with an evaluation of baseline knowledge and practices of advanced practice nurses working in the outpatient setting. Upon completion of the pre-test, a CPG-based educational resource was provided that included up-to-date recommendations for the sport-related concussion population. A follow-up post-test utilizing multiple choice questions regarding the education and implementation of evidence-based clinical practice guidelines was completed by the sample population, in addition to a six-week post evaluation assessment regarding practice change and outcomes.

This scholarly project included a sample population of nurse practitioners working in the outpatient setting located across the four-state region; Kansas, Missouri, Arkansas, and Oklahoma. Inclusion criteria required the nurse practitioner to have a current and active license within their designated state and up-to-date certification. The four-state has a large population of nurse practitioners working in the outpatient setting

which helped to increase validity of the study. Terry (2015) notes this as an embedded mixed-method design where the researcher will include a qualitative section within a quantitative design. This way both types of data are included but the questionnaire would be secondary research data.

Theoretical Framework

The Helping Art of Clinical Nursing Theoretical Framework was developed by Ernestine Wiedenbach in the early 1960's and can be applied to this scholarly project. This theory defines nursing as the practice of identifying a patient's need for help through the observation of presenting behavior/symptoms, exploration of the meaning for those symptoms, determination of the cause of discomfort, the patients' ability to resolve the specific discomfort, or determining if the patient has a need for help from the nurse or other healthcare professional (*Nursing-theory.org*, 2016). Considering the diagnosis of a concussion is based on symptoms and subjective data, this theory is applicable in the clinical setting. The advanced practice nurse or registered nurse is able to assess the athlete's symptoms, explore the meaning through a thorough assessment, and consider a differential diagnosis including sport-related concussion, recommended removal from play and implement concussion guidelines.

Weidenbach (*Nursin-theory.org*, 2016) identified four main elements of clinic nursing including a philosophy, a purpose, a practice and the art. The nurse's philosophy is guided by three main components including reverence for life, respect for the dignity and individuality of the person, and a resolve to act on personal and professional beliefs. The nurse's purpose is that which the nurse wants to accomplish through actions. These actions are directed toward the overall good of the patient. The practice of nursing is the

observable skills and actions that are affected by the nurse's beliefs and feelings regarding the patient's needs. Last is the art of nursing which includes understanding a patient's needs, goals, and actions. This enhances the patient's ability and directs their activities toward the medical plan to improve their condition. The art includes the nurse's ability to focus on prevention of complications or developing healthcare concerns (Nursing-theory.org, 2016).

Practice Questions

1. Is there a difference in knowledge learned by the nurse practitioner between a pre-test/ posttest quantitative study in the management of a sport-related concussion?
2. Do nurse practitioners in the outpatient setting demonstrate a change in practice after the implementation of an educational resource over clinical practice guidelines?

Key Terms

Adolescent Population- Person aged 10 to 19 years (who.int, 2013).

Athletic Trainer (ATs)- highly qualified, multi-skilled health care professionals who provide service or treatment, under the direction of or in collaboration with a physician, in accordance with their education, training and the state's statutes, rules and regulations. Services provided by athletic trainers include primary care, injury and illness prevention, wellness promotion and education, emergent care, examination and clinical diagnosis, therapeutic intervention and rehabilitation of injuries and medical conditions (NATA, 2019).

Clinical Practice Guidelines- systematically developed recommendations to assist the practitioner and patient in decisions about appropriate health care for specific clinical circumstances, e.g. Concussion (NIH, 2010).

Primary Care Provider- a health care practitioner who sees people that have common medical problems and wellness visits. Often involved in long-term care for the patient. This person is most often a doctor, physician assistant or a nurse practitioner (Vorvick, 2019).

Return to Play- multifactorial process of returning an athlete to back to practice or competition post injury when risk of re-injury is minimized. (Menta & Angelo, 2016).

Sport-Related Concussion- a traumatic brain injury inducted by biomechanical forces (Halstead et al., 2018; McCrory et al., 2018; Walter & Moffett, 2018).

Model of the Proposed DNP Project

With the steady changes to healthcare, more consideration is being placed on evidence-based practice to ensure quality care and positive outcomes. Evidence-based practice models are one-way nurses and providers can optimize and apply research into practice. Several models have been developed to assist nurses in conceptualizing a clinical problem or “good idea” and implementing it in the clinical setting (Gawlinski & Rutledge, 2008). According to Gawlinski and Rutledge (2008), the use of practice models will lead to a systematic approach in evidence-based practice, prevent incomplete implementation, promote timely evaluations, and maximize the use of resources and time spent. The Stetler Model (2013) of evidence-based research will be applied to this scholarly project in an effort to move evidence presented into practice.

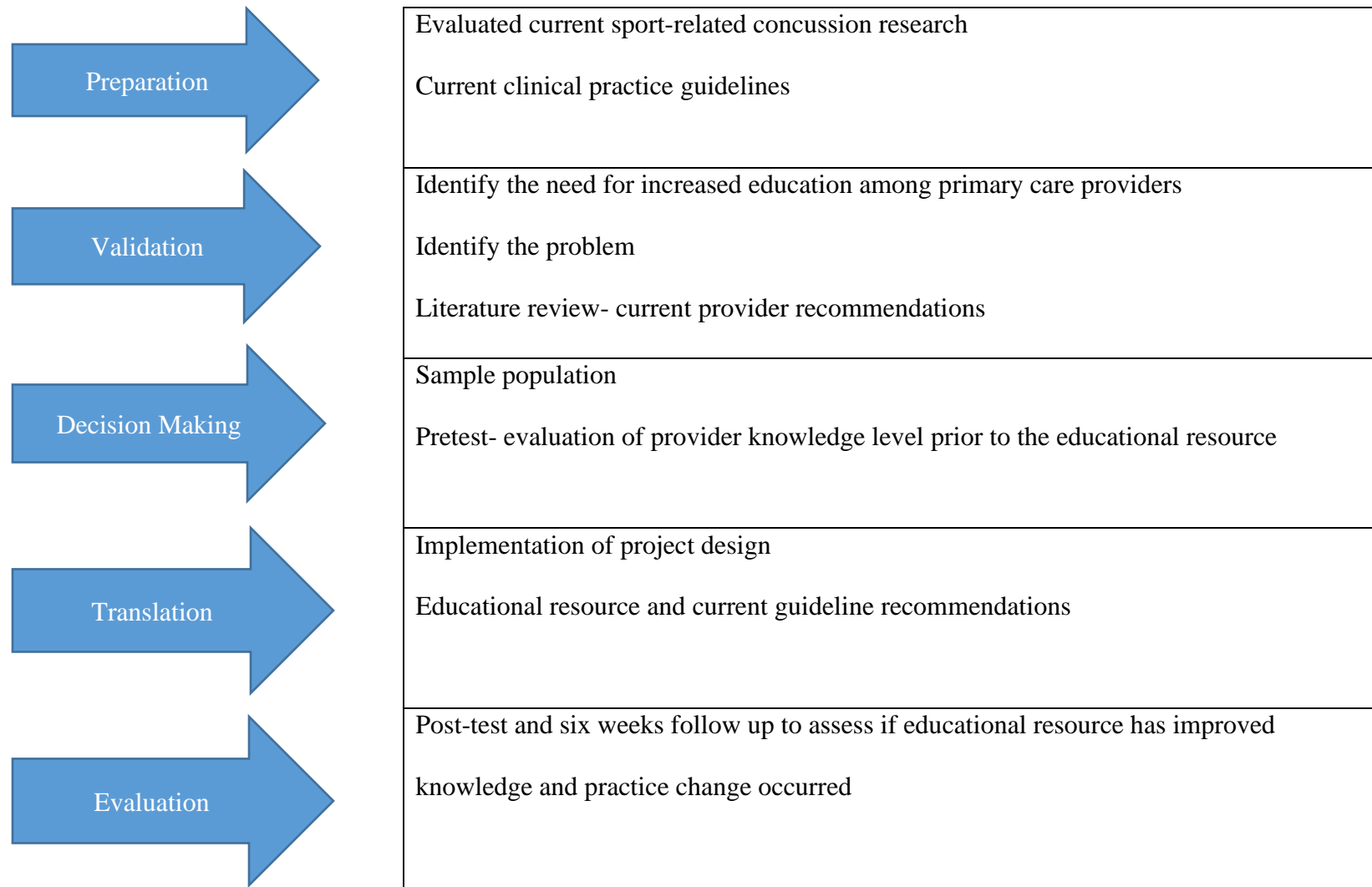
The Stetler Model is one of the oldest nursing models and was developed in 1976, then revised again in 1994 and 2001 (Parkosewich, 2013). It was developed by Baystate Medical Center in Massachusetts and is one of the few models that was created to formalize a process for evidence-based practice changes by individuals as well as teams of clinicians (Gawlinski & Rutledge, 2008; Parkosewich, 2013). This model consists of five critical thinking phases that include preparation, validation, comparative evaluation/decision making, translation/application, and evaluation (Gawlinski & Rutledge, 2008; Parkosewich, 2013). During the preparation phase the purpose for this scholarly project was identified. The project's purpose was to evaluate current practice guidelines and the use of a sideline tool in the outpatient setting, assess the primary care provider's knowledge and implementation of guidelines, and increase the provider's knowledge through an educational resource. According to the Stetler Model, the preparation phase includes consideration in probable internal and external factors that may create barriers and ultimately affect the project's success (Parkosewich, 2013).

The validation phase summarizing evidence from both external and reliable internal sources of information such as research studies, consensus from healthcare experts, quality improvement, and national or local experts (Parkosewich, 2013). This was presented through the identification of the clinical problem, literature review, and the results from the completed pre-test by primary care providers. Next is the decision-making phase which included identifying the need for education and evaluating how well current guidelines are being utilized by primary care providers. The translation phase, also known as the application phase, was used for implementing current changes. For this scholarly project, implementing the project design through providing current clinical

practice guidelines to nurse practitioners in the outpatient setting via the educational resource was applicable. Finally, the evaluation phase assessed if changes have been made to current clinical practice after education has been completed with the providers. This was completed at the six-week follow up evaluation post survey completion.

Figure One:

Stetlers Model of Evidence Based Research: Concussion Guidelines



Summary

Evidence has demonstrated the need for increased research and education regarding concussion management. With the diagnosis of concussion being subjective in nature, it can be difficult to identify and therefore treat correctly in the outpatient setting. The adolescent is part of a vulnerable population identified for increased risk of injury and long-term consequences after sustaining minor head trauma. Sport-related concussion in adolescents requires a comprehensive approach to management by healthcare providers that should include evidence-based practice guidelines. This scholarly project has identified many health concerns regarding this population and proposes the need to increase education to primary care providers.

Chapter II

Integrated Review of Literature

Although research has been completed in regard to concussion management, there is still a lack of knowledge among primary care providers working in the outpatient setting. The following literature review will provide an overview of current research and practice. This review evaluates recommendations in current practice for concussion management in the adolescent population, evaluating overall outcomes and the risk of chronic neurological sequelae. Gaps in research and lack of data will be discussed for future research recommendations.

Definition of Concussion

To date, there is still no universal definition for concussion or more specifically, sport-related concussion (SRC). The Centers for Disease Control and Prevention (2019) define a traumatic brain injury (TBI) “as a disruption in the normal function of the brain that can be caused by a bump, blow, or jolt to the head, or penetrating head injury”. For clarity purposes in research and discussion this scholarly project will utilize the Concussion in Sport Group, a consensus of expert’s, definition for SRC, “a traumatic brain injury induced by biomechanical forces” (Halstead., et al 2018; McCrory et al., 2018). This is stated in its simplest form by the consensus statement (Halstead., et al

2018; McCrory et al., 2018) which also includes five common features for a concussive head injury:

1. SRC may be caused by a direct blow to the head, face, neck, or elsewhere on the body with an impulsive force transmitted to the head.
2. Typically results in the rapid onset (minutes to hours) of short-lived impairment of neurological function that resolves spontaneously.
3. May result in neurological changes, but the acute clinical signs and symptoms largely reflect a functional disturbance rather than a structural injury. This causes no abnormality seen on standard imaging.
4. SRC results in a wide range of symptoms that may or may not include loss of consciousness. Resolution of clinical signs and symptoms can be prolonged but typically follow a sequential course.
5. Clinical signs and symptoms cannot be explained by other possible causes including other injuries, medications, alcohol, or comorbidities.

Pathophysiology

The biokinetics that induce a sport-related concussion consist of forces at acceleration, deceleration, and rotation of the head (Halstead et al., 2018). The pathophysiology of a concussion has been researched in animal studies and some recent human studies describing the neurometabolic cascade of events (Halstead et al., 2018). Researchers believe it leads to a wave of energy that passes through the brain tissue triggering neuronal dysfunction. This involves a complex cascade of ionic, metabolic, and physiologic changes. The cascade, as well as microscopic axonal dysfunction, causes concussion symptoms. In most cases this process will generally improve, and the

majority of patients will fully recover. However, while the brain is still recovering, the reduction in cerebral blood flow may result in cell dysfunction that increases the vulnerability of the cell to second insult (Collins et al., 2006; Halstead et al., 2018).

Signs and Symptoms

Recognizing and evaluating a sport-related concussion in the adolescent population is a challenging responsibility for the primary care provider. High school-aged students are a particularly vulnerable population at risk for concussions due to ongoing physical and cognitive development (Halstead et al., 2018; King et al., 2014; Lopez et al., 2017; McCrory et al., 2018). It is estimated that 50-75% of concussions in athletes go unreported (McDonald et al., 2016). Signs and symptoms are often non-specific and can be delayed after the initial insult to the athlete, making this an individualized injury. According to research the most common reported SRC symptom is headache estimated at 86% to 96% (Gioia, 2006; Halstead et al., 2018; McCrory et al., 2018; West & Marion, 2014; McDonald et al., 2016). Dizziness, difficulty concentrating, fatigue, nausea and vomiting, and confusion are next among the most commonly reported symptoms after headache (Gioia, 2006; Halstead et al., 2018; McCrory et al., 2018; West & Marion, 2014). Other signs and symptoms may include somatic complaints, physical signs, balance impairment, behavioral changes, cognitive impairments, and emotional and sleep complaints (Halstead et al., 2018 & McCrory et al., 2018). Loss of consciousness is not necessary in the diagnosis of concussion and reported less than 5% in SRC (Halstead et al., 2018).

Concussion symptoms, estimated at 80% to 90% of all sport participants, typically resolve in 7 to 10 days after the initial injury (King et al., 2014). Concussion

symptoms are subjective and depend on the awareness, honesty, and willingness of the adolescent to accurately provide information (King et al., 2014). Complete cognitive recovery is not always indicated in the resolution of signs or symptoms for concussion, and much is unknown regarding the clinical importance of persistent deficits and changes in the absence of symptoms (King et al., 2014). Special attention must be given by the provider to the adolescent population who may have other pre-existing conditions such as migraines, ADHD, learning disorders, sleep disorders, and mental health disorders that could mask symptoms or complicate the clinical picture. Symptoms of a concussion are not specific to the diagnosis and can mimic other injuries or illnesses (Halstead et al., 2018).

A multitude of post-concussion symptom checklists have been developed and recommended as part of clinical practice guidelines to assist in the diagnosis and management of concussion by the clinician. The symptom questionnaire should be age-based for athletes and typically use a 7-point Likert scale grading in symptom severity. The graded scale can assist the athlete to be more honest, and athletes have proven to be less reluctant when asked verbally about the presence or absence of specific symptoms. Parental assessments are also beneficial in the evaluation of concussion as children tend to report more symptoms and worsening severity to parents if completed within one week of insult (Halstead et al., 2018).

Sideline assessments such as the Sports Concussion Assessment Tool (SCAT) are an essential component for any sport-related concussion guideline (LeMonda et al., 2017). Researchers have developed a number of validated sideline tools to be used as a quick assessment for non-medical trained personal when a concussion is suspected.

Various versions have been updated and expanded upon over the years but their use in younger populations and middle school students is not well studied (Halstead et al., 2018; LeMonda et al., 2017). The sideline evaluation tools were developed to assist in objective data collection but are not to be used solely as a diagnostic tool (Halstead et al., 2018; McCrory et al., 2018). Sideline assessment tools have not been studied adequately in younger athletes and recommendations for preinjury assessment to compare are often not obtained or unavailable (Halstead et al., 2018; McCrory et al., 2018). This makes it difficult for the healthcare provider to know the adolescent's baseline prior to the concussion. It is also unclear, with limited research available, to know if sideline assessment tools used multiple days after the injury are of any benefit to the provider and patient (Halstead et al., 2018; McCrory et al., 2018).

Neurocognitive Testing

According to King et al. (2014), neuropsychological and cognitive testing have become a “cornerstone” in concussion management since the 1980's. Initially, this was completed by a neuropsychologist with pencil and paper but has since progressed to a standardized computer test. Multiple versions exist but the Immediate Post-Concussion Assessment and Cognitive Test (ImPACT) has been the most widely used (Halstead et al., 2018; King et al., 2014; McCrory et al., 2018). Computerized evaluation tools provide objective detection of mild cognitive changes that can occur in concussed athletes (LeMonda et al., 2017). The Centers for Disease Control and Prevention (2019) recommend yearly baseline testing in athletes as researchers have questioned the reliability over the years (Bruce et al., 2016; Halstead et al., 2018). Halstead et al. (2018)

note that research conducted by third parties, independent of developers, have demonstrated mixed reliability.

In an attempt to improve reliability, Bruce et al. (2016) completed a research study using two baseline tests compared to one in concussed athletes. This study demonstrated that using the aggregate of two baseline scores improves temporal stability and allows for more accurate predictions of cognitive impairment. Providers are encouraged to review all baseline scores when evaluating a sport-related concussion (Bruce et al., 2016). There has been limited research to indicate any harm on retesting athletes suspected of a concussion. The research that has been completed has not demonstrated to have any long-term negative effects.

Acute Management

Acute management for a suspected concussion should always begin with removal from play and immediate evaluation for severe traumatic brain injury. Once this is complete and sideline evaluation has deemed concussion probable, the athlete should be evaluated by a healthcare provider (Halstead et al., 2018; King et al., 2014; McCrory et al., 2018). The problem arises that not all medical providers are comfortable with concussion diagnosis and management, nor are they consistent in treatment methods due to lack of research and consistency. Most authors (Halstead et al., 2018; King et al., 2014; LeMonda et al., 2017; McCrory et al., 2018) recommend evaluation by a neuropsychologist during the acute phase, but this is unrealistic in rural healthcare locations. The travel to a specialist from rural locations places further stress on the parent and child to drive several miles for a referral. Telemedicine is the future of medicine for

most rural locations and can help decrease the burden of distance although, setting up a quick evaluation within a few days with a specialist is highly unlikely.

Healthcare providers who care for the adolescent population need clear, concise guidelines in how to best care for an SRC and improve outcomes in this vulnerable population. Treatment recommendations begin with “cognitive rest” (Halstead et al., 2018; King et al., 2014; McCrory et al., 2018). In a literature review study published by *The Journal of School Nursing*, cognitive rest is suggested but is not well defined (Schneider, 2015). Many definitions for “cognitive rest” exist and most researchers are inconsistent in what exactly “cognitive rest” should include or exclude. Schneider (2015) notes that researchers report complete “cognitive rest” is very difficult to achieve. Considering the adolescent population grew up on technology as their way of life, including smart phones and video games, “cognitive rest” can be nearly impossible. Halstead et al. (2018) recommends physical and cognitive rest but their discussion indicates new research that extremes in rest may have negative consequences and prolong recovery.

To compound the problem further, research into those who suffer an SRC and did not reduce their cognitive load at all after injury took the longest to improve (Halstead et al., 2018). The Consensus Statement completed at the 5th International Conference in Sport Concussion deemed cognitive rest as the most widely used intervention in concussion management, but it also notes that there is still insufficient evidence to support this (McCrory et al., 2018). Most researchers agree that cognitive rest should be prescribed by the healthcare provider during the initial phase (24-48 hours post injury) until symptom free. The athlete is then encouraged to stair-step their recovery back to

full baseline. This is completed by becoming gradually and progressively more active while staying below their cognitive and physical symptom-exacerbation threshold (Halstead et al., 2018; McCrory et al., 2018). This threshold will vary from athlete to athlete and thus, an individualized plan of care must be developed. According to McCrory et al. (2018), the exact amount and duration of rest is not yet well discussed in literature and further research is recommended.

After removing from play and initiating rest, the provider will need to consider when the athlete can “return to learn.” It has been recommended that a student receive academic adjustments to their course load and homework in an effort to avoid exacerbating symptoms (CDC, 2019; Halstead et al., 2018, McCrory et al., 2018). Prolonged absences from school are discouraged and can add to undue stress to the student. In the study “Academic Accommodations for a Countywide Concussion High School Program” (Lopez et al., 2017), students with increased concussion symptoms, especially females, benefited from a collaborative treatment approach including school accommodations that are individualized to the students’ needs and symptoms. The Center for Disease Control and Prevention (2019) initiated the *Heads-Up Program* in an effort to support healthcare providers, students, parents, and schools in concussion management. The CDC (2019) has a number of resources available to help this multidisciplinary approach for concussion management in return to learn for students.

Return to play is the next step in management of the student with SRC. Each plan should be individualized to the patient and their symptoms (Halstead et al, 2018). Currently, researchers recommend a stepwise approach (CDC, 2019; Halstead et al., 2018; McCrory et al., 2018). Both the CDC (2019) and the Concussion in Sport Group

(McCrory et al., 2018) recommend following a six-step return to play sequence. Each step lasts at least 24 hours before moving to the next step. As the athlete progresses from one step to the next and becomes more physically active, they should be completely symptom free prior to moving on. If symptoms arise during the following step, they are to back down each step until symptoms resolve then start again. Step one consists of symptom-limited activity such as school and daily living activities (CDC, 2019; McCrory et al., 2018). Some research has supported light aerobic activity and brisk walking during step one as well (Halstead et al., 2018). Step two includes no resistant training and only light aerobic exercise. Step three progress to sport-related exercise or moderate activity: this should include running and drills but no head impact activities. Step four continues with non-contact activities but high-intensity workouts. Step five includes full contact practices in a controlled environment, and step six is a return to full sport and games (CDC, 2019; McCrory et al., 2018).

Pharmacotherapy has mixed research results in risk vs benefits for concussion treatment. There is a lack of consistency amongst providers in medication management for a SRC in adolescents (Halstead et al., 2018; McCrory et al., 2018). The most commonly used medication recommended by providers includes over the counter analgesics. Research indicated that Zofran was prescribed frequently by emergency department providers for nausea during the initial visit. Concern arises in that medications may “mask or modify” symptoms in concussion. Another risk is the overuse of these medications and risk of rebound type headaches. According to Halstead et al. (2018), there are currently no medications that are specific in the treatment of concussion

nor is there any evidence-based research to support their widespread use (Halstead et al., 2018; McCrory et al., 2018).

Education is essential to include in the management of any concussion diagnosis, especially in an adolescent sport-related concussion. Education should include the athlete and the parent. The CDC (2019) has developed many easy-to-read educational materials that can be provided to the athlete and parent. Both should be educated in the expected management and outcome related to a concussion, and all should be informed of the potential risk of long-term complications. Prevention is key, but it is unlikely to avoid all concussions in sports. The use of helmets and other protective devices have been shown to reduce the impact of head trauma but headgear in rugby and head-to-ball trauma has had mixed research results (Halstead et al., 2018). Helmets have evolved significantly over the last fifty years. Most are larger and designed to absorb and dissipate the impact but research regarding specific designs with the goal of reducing concussions does not yet exist (Halstead et al., 2018).

Long-Term Risk

On average, concussions in the adolescent population require one to four weeks for a full recovery, sometimes longer depending on severity and history (Halstead et al., 2018; King et al., 2014; McCrory et al., 2018). Most athletes will make a full recovery, but occasionally long-term deficits arise requiring more in-depth management. A referral to a concussion specialist is recommended if symptoms last longer than four weeks (Halstead et al., 2018; McCrory et al., 2018). Literature and research are limited and inconsistent associated with the long-term risk factors and repeated head trauma. Media news and concern over pro-football players has increased awareness and research into the

long-term sequelae associated with concussion. The most common problems associated post-concussion includes migraines, depression, sleep disturbance, cervical strains, and oculomotor disorders (Halstead et al., 2018; McCrory et al., 2018).

Increased research and awareness have been presented regarding the theory of association between concussion injuries and the risk of neurodegenerative diseases such as Alzheimer's and dementia. The general idea behind this theory is a disruption or damage to the micro-vessels or blood-brain barrier that could play a significant role as an initial triggering factor post-concussion (Alzheimer Research Forum, 2009). Research regarding post impact of moderate to severe traumatic brain injuries demonstrates as one of the leading environmental risk factors for late-onset Alzheimer's disease. Research is still unclear whether a mild traumatic brain injury, or concussion, also increases a person's risk (Hays et al., 2017). In a study completed on war veterans, aged 19-58, significant evidence demonstrated an increased association between history of concussion and genetic risk for Alzheimer's disease (Hays et al., 2017). In 2009, a study sponsored by the National Football League (NFL) announced retired players aged 30-49 were affected by neurodegenerative type diseases twenty times greater than others in the same age range, and players over age fifty were affected at a rate of five times higher than the national average (Phillips, 2015). It is estimated over 100,000 high school athletes suffer from concussions annually (Phillips, 2015). Considering the possible accumulation of concussion injuries from adolescents through retired athletes, significant concern is presented for increased risk of Alzheimer's and dementia-related diseases (Phillips, 2015).

More serious concerns related to concussions in athletes include chronic traumatic encephalopathy (CTE) and second impact syndrome (Halstead et al., 2018; King et al., 2014; McCrory et al., 2018). Healthcare providers need to be mindful of these risks and take the time to evaluate, refer and educate parents and athletes on the associated risk. At this time there is no way to diagnosis CTE, and it is exclusively a post-mortem diagnosis (Halstead et al., 2018). In a recent study, football players donated their brains for evaluation after death with 21% high school-aged players found to have Stage One CTE and almost all professional athletes had evidence of CTE, with most including severe pathology (Halstead et al., 2018). Second impact syndrome is considered a second concussion that happens before the initial head injury is fully healed. Re-injury does not necessarily happen on the same day and has been reported up to two weeks post initial concussion (King et al., 2014). The vast majority of individuals with second impact syndrome have been athletes in high school and younger. The diagnosis is still contested in the medical community, but the theory is a second head injury leads to cerebral vascular congestion that progresses to cerebral edema and ultimately death (Halstead et al., 2018; King et al., 2014; McCrory et al., 2018).

Impact on Society and Healthcare Cost

Traumatic brain injuries (TBI) are the leading cause of death and disability among children and adolescents in the United States (Graves et al., 2019). Adverse outcomes including reduced capacity for communication, self-care, decreased quality of life, behavioral problems, and family burden have been associated with traumatic brain injuries (Graves et al., 2019). TBI is also associated with increased healthcare and economic burdens related to cost utilization and cost for after injury care. A recent study

completed by Graves et al. (2019) demonstrated the total overall healthcare cost is increased in rural compared to urban children despite lower utilization for certain services. In an analysis of commercial claims data comparing inpatient and outpatient healthcare cost for pediatric patients with mild, moderate, and severe TBI, results revealed that although moderate and severe TBI was associated with greater per capita medical cost during the first year, total cost for pediatrics and adolescents who sustained a mild TBI was significantly greater due to higher incidence (Graves et al., 2019).

As a way to combat the financial burden to society and personal cost associated with concussions, efforts to increase awareness, research, and education is warranted (Gaw & Zonfrillo, 2016). Prevention efforts and improvements in injury surveillance are also recommended in an effort to reduce healthcare cost (Gaw & Zonfrillo, 2016). These efforts can be implemented by the primary care provider as well. By implementing up-to-date clinical practice guidelines, the primary care provider ensures the adolescent is receiving quality care. Quality care can reduce overall financial cost to the family, patient, and society by reducing unnecessary visits and ensuring continuity of care by the healthcare team.

Laws and Policy

As an advanced practice nurse, it is important to understand specific state healthcare policies and legislature related to practice in which the provider would be working. Health policy refers to decisions, plans, and actions that are undertaken to manage healthcare delivery and to achieve specific healthcare goals (Nelson & Staggers, 2018). Nelson and Staggers (2018) state the current driving force to healthcare policy development is cost-effectiveness and efficient healthcare delivery.

As of 2014, return to play on the day of injury that SRC is suspected is now illegal in all fifty states and the District of Columbia. According to legislature, if a concussion is suspected that student must be pulled from play and evaluated by a healthcare provider before returning to activities (Halstead et al., 2018; McCrory et al., 2018). There are variations from state to state in concussion legislature, but most consist of three valuable components including. The first component states any sport programs for athletes younger than 18 years of age must provide educational material related to concussion and all parties must sign forms understanding the risk, and this must be updated yearly. The second component states any athlete suspected of a concussion must be pulled from play and cannot return on the same day. Finally, any athlete suspected of a concussion must seek medical clearance from a healthcare provider prior to returning to play (Halstead et al., 2018; McCrory et al., 2018).

Doucette et al. (2016) discuss a major challenge related to outside physician diagnosis and management in sport-related concussion for adolescence. In all cases, participants noted that physicians provide diagnosis, management, medical clearance, and academic accommodations in concussion management. The challenge being that many participants felt physicians had little to no knowledge of the law itself (Doucette et al., 2016). In a study completed by Lowery and Morain (2014), results from interviews noted that 35 states highlighted providers in rural and underserved communities chose to use outside physicians for medical clearance rather than training team doctors or athletic trainers. This can be applied to the Kansas legislature School Sport Head Injury Prevention Act, enacted July 1, 2011, and the lack of provider education in this state (kshsaa.org, n.d.). Kansas, being mostly underserved and made up of a majority of rural

populations (Lowery & Morain, 2014), is a prime example of the concerns discussed in this study. According to Kansas law, as noted by the Kansas Medical Society, only an MD or DO can actually release an athlete to “return to play” (Kansasconcussion.org). Nurse Practitioners providing care to athletes in the state of Kansas may be unaware of this part of the law and practice requirements needing further education in specific Kansas legislature.

Future Recommendations and Summary

Several barriers exist including lack of evidence-based research in short- and long-term care for concussion management (Halstead et al., 2018; Nilsson et al., 2017). Research on concussion in adolescents also demonstrates a societal burden and increased cost on healthcare (Graves et al., 2019). Failure to provide timely assessment and treatment of patients with a SRC creates prolonged challenges for the patient and the healthcare provider (Nilsson et al., 2017). Different standards, guidelines, and the types of providers that may evaluate the SRC further confound the problem. Concussion is multi-faceted by nature and provides many challenges in management in returning to school, work, physical activities, and lifestyle changes. Further research regarding sport-related concussion is necessary in all aspects of diagnosis, management, and improved outcomes as indicated by the literature review. Much of the research completed has shown vast improvements over the years, but there are still many gaps in data for the healthcare provider. This is especially true in the rural population and underserved communities who lack access to care and specialty services. Thus, the burden of an adolescent SRC diagnosis, management, and outcomes rest heavily on the primary care provider in the outpatient setting.

Chapter III

Methodology

Chapter three discusses the method and plan that were utilized for this scholarly project. This project was designed to assess current practice management by primary care providers in the outpatient setting regarding the management of a sport-related concussion in adolescents. The method utilized for this project was chosen based on the implementation process, and ability to produce reliable and valid results. The method and plan utilized in this project has the ability to be reproduced and expanded upon for future research.

Project Design

An analysis of the primary care provider's current knowledge regarding concussion management and implementation of current guidelines created the initial phase of the survey. Once the initial analysis was completed, an educational resource was developed over current sport-related concussion (SRC) guidelines for the primary care provider to review. This resource included appropriate clinical recommendations that can be implemented in the outpatient setting. After the clinical practice guideline (CPG) based educational resource was reviewed, this project re-evaluated the provider's knowledge and assessed clinical practice changes that had occurred. The project goal was to improve the primary care provider's knowledge, implementation of current

clinical practice guidelines, and demonstrate improved quality care for the adolescent patient.

During the initial phase, a multiple-choice survey, also referred to as a pre-test questionnaire, was provided to the sample population. Once this was completed, a CPG-based educational resource was provided for the sample population to review. The educational resource in the form of a voice over power point via YouTube was embedded in the software and presented up-to-date clinical practice guideline recommendations, a review of current state and national legislature, and how to correctly implement a baseline concussion tool. The post-test design included a ten-question quantitative survey set up exactly like the pretest. The opportunity to include a qualitative review was included in the form of two additional open-ended questions that were sent at six weeks post survey to ensure practice had changed and assess patient outcomes.

Sample Population and Recruitment

The sample population consisted of nurse practitioners who provide direction patient care in the outpatient setting located in the four-state region. The target population was based on convenience sampling for nurse practitioners currently employed in the outpatient setting and who had the opportunity to care for the adolescent population. Convenience sampling was utilized because of the current location and access to providers in the four-state region. This method of collection allowed for simplicity of recruitment. Participants were recruited on a volunteer basis via email and online forums for this scholarly project. The decision to use online forums for

recruitment, such as the Facebook 4-state APN group page was because of the low cost and widespread access to nurse practitioners in the four-state region.

Inclusion/Exclusion Criteria

Eligibility requirements for the sample population included a current, active state license and national advanced practice certification that could include the pediatric population. This type of certification included family nurse practitioner and/or pediatrics. Inclusion criteria also required the sample population to be currently employed in the outpatient setting located in the four-state region. Participants were requested to confirm they had the potential to provide direct care for adolescent athletes in the clinical setting. Inclusion criteria was outlined in the invitation-to-participate email and verified in the demographic questionnaire; no supporting documents such as a copy of certification or licensure was required. This meant that the data collected was strictly based on honest answers to the demographic questionnaire but also kept participants anonymous.

Exclusion criteria included nurse practitioners who do not have the potential to care for the concussed athlete in the adolescent population or practiced outside the four-state region. Examples of this would include nurse practitioners who are certified in acute care or adult geriatric only. Both certified family nurse practitioners and/or pediatric nurse practitioners were eligible for the sample population. Years of experience was not anticipated to be a factor but was included in demographic data collection. The data on years of experience as an advanced practice nurse was evaluated to determine if any correlation between experience and comfort level in caring for the concussed adolescent existed. Incomplete survey's that did not include a finished demographic

questionnaire, pre-test and post-test were voided and therefore, not utilized in the final evaluation of data collected.

Protection of Human Subjects

Before this scholarly project was implemented, an application to Pittsburg State University Institutional Review Boards (IRB) was submitted for approval. This included an evaluation of participant treatment to ensure guidelines are followed in the protection of human subjects. No potential for harm was identified prior to submission. Benefits included the potential for increased knowledge and confidence in the nurse practitioner regarding management of sport-related concussion in adolescents. The participants agreed to volunteer for the study design. Informed consent was assumed prior to initiating the pre-test through completing the initial demographic questionnaire; see appendix A. The information requested from participants did not include any identifiers; demographics did include an estimate of years practicing as an NP. Individual information such as nurse practitioner certification and clinic setting were considered as part of the inclusion criteria. There were no vulnerable populations identified within the sample participants. Ethical conduct and confidentiality were maintained by the author throughout the implementation of this project. The software, Qualtrics, was utilized for both the pre-test and post-test. This software prevented any participant identified to be utilized and the results remained anonymous. By keeping the participation anonymous, the volunteers were more likely to be honest in their response ensuring little to no concern of judgement or backlash.

Instruments

The specific instruments chosen for the quantitative portion of this research project are listed below and include a demographic questionnaire, pre-test and post-test survey, and the follow-up qualitative questions evaluating if practice has changed.

1. **Informed Consent-** Informed consent is the process in which the researcher educates the volunteer in risk vs benefit to participation in this study. The participant decided this on a voluntary basis with no persuasion from the researcher or stakeholders. An initial question prior to the demographic portion of the research specifically ask about providing consent and understanding about the project and criteria to participate.
2. **Pre-test-** The pre-test consists of a ten-question multiple choice survey. The pre-test was created to be clear and concise in nature, reducing participant fatigue and increasing response rate.
3. **Educational Resource-** The educational resource provided covered the most recent and reliable recommendations from the Centers of Disease Control and Prevention: Heads-up Program (2020) and The Fifth International Conference, Concussion in Sport Group (2018). It was created utilizing a voice over power point embedded in the software to play after the pre-test has been completed.
4. **Post-test survey-** The post-test included the same ten multiple choice questions as the pre-test survey.
5. **Qualitative questionnaire-** An additional two question, open-ended survey regarding changes specific to practice utilized as a 6-week follow-up evaluating practice change.

For the evaluation of data collected, a paired sample t-test was implemented to compare the results of the pre-test and post-test surveys. A total score of 50 points possible was applied to the questionnaire. This meant each question was worth five points. The demographic data was presented comparing frequency and percentage. The qualitative data was gathered and evaluated for themes discussed in response to the open-ended questions.

Procedure

The initial step for the procedure aspect of this scholarly project was to seek IRB approval through Pittsburg States University. IRB approval assess the risks vs benefits to the sample population. It also ensured ethical conduct and the protection of human subjects was implemented prior to the start of this study. Once approval was obtained from Pittsburg State University, the sample population was contacted via email and public forums. The study began early in July 2020. A description of the study was provided and included the risk vs benefits and informed consent. If the participant was agreeable to the study, they were asked to proceed with the survey and an anonymous link was provided.

An ideal timeline was discussed and submitted for approval. After IRB approval and mutual consent, participants were contacted in early July to volunteer for the study. The project continued with the pre-test, CPG-based educational resource presentation, post-test, and data analysis including the six-week follow-up questionnaire (appendix D) and the evaluation of results through October 1, 2020.

Resources for this scholarly project included personal guidance from committee chair and the committee members in development, implementation, and data analysis.

Assistance with creating the pre-test and post-test surveys including measurable responses and ensuring validity was discussed with the committee prior to implementation. Technology used was provided from the Pittsburg State University Department of Business. The survey, including demographics, pre-test and post-test was created utilizing the Qualtrics software. Fiscal cost was low for this research project. With implementation through electronic sources such as software and email, the cost to mail responses, stamps, and paper were voided. Participants were voluntary, therefore, avoiding any financial responsibility on the researcher's behalf.

With the low cost, access to voluntary participants, and little to no risk to human subjects the feasibility of this study was successful. Sustainability for this study was high. Per Chapter II, literature review, the need for primary care providers to stay educated in evidence-based practices was made apparent. Evidence suggests that the primary care provider lacks preparation to follow up-to-date guidelines related to the sport-induced concussion in adolescents. The sustainability of this project will ensure providers in the outpatient setting are prepared to care for this vulnerable population without compromising any risk to the provider or adolescent patient.

After the sample population was contacted either via peer email or through the invitational post via online forums, a brief explanation of the study and link to the anonymous survey was provided and participants were able to begin. The survey began with the demographic portion of the study (appendix A). Once demographic questions were answered the participant was able to proceed to the pre-test. The software required the pre-test to be completed in its entirety before proceeding to the CPG-based educational resource. The CPG-based educational resource was created using a voice-

over power point and uploaded to YouTube. The YouTube link was embedded in the Qualtrics data and set to play once the pre-test was submitted.

Following the review of the CPG-based educational resource, the post-test including the same ten multiple choice questions was next. Once the participant completed the post-test the initial survey was done and submitted to the researcher. The six-week follow-up that included the two open-ended questions reviewing practice change, was emailed to the peers that had been contacted initially. The post-test and six-week follow-up was used to assess outcomes to the educational resource and direct patient care. By completing this study through the pre-test/post-test format using Qualtrics software, the project format decreased the risk to any outside variables or the researchers' opinions.

Outcomes and Evaluation Plan

The studies objectives, to assess current provider knowledge, if knowledge was learned after review of a CPG-based educational resource and the evaluation of implementation by the provider of concussion guidelines in the adolescent population, were assessed. The anticipated outcomes for this scholarly project included improved provider knowledge and quality patient care provided as outlined by the Stetler model in Chapter I. Evaluation of the objectives and outcomes was completed through the project design and data analysis. The study tools described under the project design section provided measurable results regarding outcomes. Implementing the pre-test vs post-test design increased quality results and interpretation

Evaluation of the study was based upon a variety of factors. All factors had the potential to affect the study outcomes and reflect if objectives were met. First, the pre-

test multiple choice survey established baseline knowledge of sport-related concussion guidelines in the primary care provider. Next, the post-test multiple choice survey compared to the pre-test evaluated if the practitioner gained knowledge after review of a CPG-based educational resource. Finally, the six-week follow-up determined if the knowledge gained had improved the use of CPG's and improved the quality of the practitioner's care for the adolescent population.

Plan for Sustainability

This study meets anticipated predicted outcomes and objectives; by utilizing the framework, this study has the potential to be influential and sustainable. The study was projected to be reproducible by implementing a similar stepwise approach for future research. The research used in development of the educational resource was founded on pre-existing evidence-based guidelines produced with The Centers for Disease Control: Heads-up Program (2020) and The Fifth International Conference, Concussion in Sport Group (2018). This means it has been proven effective to guide treatment in the adolescent population who have sustained a sport-related concussion. Financial cost was expected to be low and was the sole responsibility of the researcher. Political stakeholders in the State of Kansas have the potential to be affected by this research. Ideally, future research would build upon the demonstrated quality care and improved patient outcomes by nurse practitioners in this project. The research results have the potential to influence legislature change, including nurse practitioners as healthcare providers in the Kansas Act. There were no anticipated negative impacts for this study.

Summary

Clinically there is a need for improved management by the primary care provider for adolescents who sustain a sport-related concussion. Clinical practice guidelines have been developed for this vulnerable population but their use in the outpatient setting shows limited data. With the increased awareness of sport-related concussions by the public and media, it is imperative that nurse practitioners stay up-to-date in their clinical care and continue to demonstrate positive outcomes. This chapter outlined the scholarly project's design method and plan for implementation that was utilized. Planned objectives and anticipated positive outcomes were addressed.

Chapter IV

Evaluation of Results

The data collected in this study was evaluated to determine the nurse practitioner's knowledge regarding practice guidelines, associated with a sport-related concussion (SRC) in the adolescent population. One goal identified for this study was to enhance the provider's knowledge level through an educational resource about up-to-date, clinical practice guidelines (CPG). This study aimed to evaluate the nurse practitioner's prior knowledge level of management for the adolescent who has suffered a SRC. The knowledge level was assessed, both before and after the review of a CPG-based educational resource. This step allowed for the assessment of a nurse practitioner's prior knowledge and to evaluate if there was knowledge learned after reviewing the CPG based, educational resource.

The intent of this study was to provide additional learning through an up-to-date educational resource and furthermore, improve quality care provided by nurse practitioners in the outpatient setting whose patients may include adolescent athletes suffering a sport-related concussion. The educational resource provided covered the most recent and reliable recommendations from the Centers of Disease Control and Prevention: Heads-up Program (2020) and The Fifth International Conference, Concussion in Sport Group (2018). Both resources were determined to be the most

relevant, accessible, and up-to-date CPG available to providers. The educational resource regarding a sport-related concussion in the adolescent population covered universal definitions, signs and symptoms including emergent red flags, how to diagnosis, and an appropriate treatment plan with the six-step return to play recommendations. The educational resource concluded with long-term risk factors and information regarding national and state legislature. Nurse practitioners can continue to utilize this resource for educational purposes and to review CPG related to SRC in adolescents.

Demographic Data

Data collection began on July 4, 2020 and concluded on August 17, 2020. Participants were recruited on a volunteer basis through professional groups, peer networking, and online forums. The Qualtrics software link included the pre-test, educational resource, and post-test for the nurse practitioner to complete. An anonymous link was sent via email and was posted to specific online forums such as the 4-State APN Facebook Group. This allowed for increased recruitment of volunteers. Participants were able to access the software and submit their surveys at any time during the collection period. A total of forty-seven surveys were completed prior to the submission end date. To meet the inclusion criteria the nurse practitioner had to be working in the four-state region, have an active APN license and national certification, and provide direct patient care to the adolescent population.

Full participation within the study included completion of the pre-test, review of the educational resource provided, and completion of the final post-test. The initial study was conducted completely online using the Qualtrics software provided by the Pittsburg State University College of Business. Demographic data and consent were collected

through a seven-question multiple choice survey (see appendix A). The first question requested the practitioner to either agree or disagree to their consent in participation and understanding this project was voluntary. The next six questions focused on demographics, access to current CPG, and years in current practice.

Final results revealed 21 participants who met inclusion criteria and completed the surveys through the final post-test. The 21 nurse practitioners who met inclusion criteria ascertained they had a valid APN license in the four-state region and provide direct patient care to the adolescent population. Of the final participants, 85% (n = 18) are licensed in the state of Kansas, with 9% (n = 3) licensed outside Kansas but in the four-state region. Participants were asked if they worked in the outpatient setting and to identify if they provided direct care to the adolescent population with potential to suffer from a sport-related concussion. Research results indicated 80% (n = 17) of participants had access to current, up-to-date guidelines and a sideline evaluation form from their current employer; while 76% (n = 16) of participating nurse practitioners stated they are not confident assessing the adolescent with an SRC. As part of the demographic data, current years of practice was assessed.

Demographic information presented in the table below (Table 1).

Table 1: *Demographic Information*

Are you currently practicing as a Nurse Practitioner in the State of Kansas		
	Frequency	Percent
Yes	18	85.7
No	3	14.3
Total	21	100.0
Do you have access to current up to date guidelines and sideline evaluation forms from your employer regarding concussion management in adolescents?		
Yes	17	81.0
No	4	19.0
Total	21	100.0
Do you feel confident assessing the sport related concussed athlete?		
Yes	16	76.2
No	5	23.8
Total	21	100.0
Years of Practice		
Less than a year	2	9.5
1-5 years	7	33.3
5-10 years	5	23.8
10+ years	7	33.3
Total	21	100.0

Pre-Test, Educational Resource, and Post-Test

The Centers of Disease Control and Prevention Heads-up Program (2020) and the Fifth International Conference, Concussion in Sport (2018) clinical practice guidelines were chosen to be used within this study as their recommendations were the most consistent and reliable. The information from both CPGs provided up-to-date recommendations for both patient and provider regarding the care of the sport-related concussion in adolescents. The CPG recommendations were utilized to create the survey questions for both the pre-test and post-test.

The pre-test and post-test were comprised of 10 multiple questions. These 10 questions reflected recommendations for assessment, diagnosis, and treatment in current clinical practice guidelines. Each question was organized in a multiple-choice format with four choices and one correct answer. The 10 questions for both pre-test and post-test matched exactly to provide comparison of results in learning after participants reviewed the educational resource. The last two questions provided in *appendix D* were qualitative in nature. The decision to utilize the qualitative questions was to evaluate if the educational resource improved practice standards and care by the nurse practitioner. This allowed for participants to discuss in their own words how practice has changed and if they feel better prepared to care for the SRC in the adolescent population. Of the 21 participants 47% (n = 10) completed the qualitative portion.

Access to the Qualtrics survey link provided required pre-test, educational resource, and post-test so that participants would complete all required aspects at one time. The goal was to reduce any risk of uncompleted assessments. The survey began with the consent question and demographics then proceeded to the pre-test. Once this was completed, the educational resource was provided via a voice-over Power Point, uploaded to YouTube, and embedded in the survey that played for the practitioner. The educational resource was kept clear and concise, providing detailed education over the CPG in under ten minutes. The estimated time frame to complete the survey was 15-17 minutes. The limited time frame was an attempt to prevent participation fatigue and loss of interest in completing the project.

The survey finished with the final 10 question post-test. Once the post-test was submitted, participants had completed all required elements of the survey. All

submissions were kept anonymous through the Qualtrics software, so no personal identifying information was obtained. This kept results confidential and validity assured. The survey was set to not allow any participant from moving forward through the project without first completing the prior portion. The software also prevented participants from moving back through the survey and thus, avoided changing answers on the pre-test. After submission by the participant, the Qualtrics software provided a confirmation notification that a survey was completed. There was no compensation, gift, financial gain, or other incentives provided to the participants for completion of the study.

Project Questions and Study Results

The pre-test consisted of ten multiple choice questions. Each question was worth five points with a total of fifty points possible. The overall range on the pretest score was five to ten correct answers. The mean score for participants ($n = 21$) on the pretest was 33.8 with a standard deviation of 6.5. The post-test consisted of the exact pre-test questions and was provided after the educational resource was reviewed. This comparison was assessed to answer the question, “Is there a difference in knowledge learned by the nurse practitioner between a pre-test/posttest quantitative study in the management of a sport-related concussion?”. The mean scored by participants ($n = 21$) for the posttest survey was 37.1 with a standard deviation of 6.99.

A comparison of pretest/posttest results is presented in the table below (Table 2).

Table 2: *Comparison of Pre-Test/Post-Test Scores*

	Mean	Standard Deviation
Pre-test	33.8095	6.50092
Post-test	37.1429	6.99490

The researcher's null hypothesis, "there was no difference in knowledge learned between the pre-test and post-test by the nurse practitioner after review of a CPG-based, education resource regarding care of an SRC in the adolescent population" was rejected due to the following statistical results. The probability (.009) calculated with the test statistic ($t=-2.870$) is less than alpha (.05). This indicated there was a significant difference between knowledge learned with participants scoring on average 3.33 points higher on the post-test over their pre-test results. Survey results indicate that after review of a CPG-based educational resource, overall scores improved, and knowledge was gained regarding the management of an SRC in adolescents.

Paired Sample Statistics is presented below in the table below (Table 3).

Table 3: *Pair sample t-test results*

		Mean	N	Std. Deviation	Std. Error Mean	
Pair 1	Pre-test	33.8095	21	6.50092	1.41862	
	Post-test	37.1429	21	6.99490	1.52641	
		Std. Error				Sig. (2-tailed)
		Mean	Std. Deviation	Mean	t	df
Pre-test – Post-test		-3.33333	5.32291	1.16155	-2.870	20

There were four main components used to create the project including the pre-test, CPG-based educational resource, and post-test. Components included diagnosis, assessment, treatment plans including the six-step return to play recommendations, and current state and national legislature. The educational resource was developed to include all four components of the CPG and ensure increased knowledge for overall management was obtained by the participating practitioners.

Qualitative Results

This study provided an opportunity to obtain not only quantitative results but qualitative data as well. Peers who were initially recruited to participate in the study were sent a follow-up email six weeks later with two qualitative questions (see appendix D). These open-ended questions were completed to assess how practice has changed after reviewing the educational resource provided and to assess if the practitioner feels prepared to care for the SRC athlete in the outpatient setting. Participants were asked to write one paragraph or less addressing these topics. Of the 21 completed quantitative surveys, 23% (n = 5) responded to the qualitative questions.

Practice Change

The first question asked under the qualitative portion of this research was, “According to the educational material presented for sport-related concussion in adolescent, explain in one paragraph how practice has changed.” This question provides the research with a follow up of how providers have been able to implement knowledge learned and discuss practice change in the outpatient setting. The survey clearly states to provide an answer in one paragraph. Themes identified align closely to both the educational resource and CPG referenced in this study.

Qualitative themes identified for question one is outlined below (Table 4).

Table 4: *Qualitative data associated with practice change.*

Participant Practice Change Recommendations
<ul style="list-style-type: none">• Increased confidence in diagnosis and management.• Improved ability to recognize a SRC quickly.

- Educational material provided an actual peer utilized algorithm to follow for testing and eventually clearance.
- Six-step approach to return to play has been implemented prior to full clearance.
- Better understanding of practice guidelines have been implemented.
- Printed copies of side-line evaluation forms are now available in the office.

Outpatient Concussion Preparedness

The second qualitative question asked specifically, “As a nurse practitioner, do you feel prepared to care for the SRC athlete in the outpatient setting?” This resulted in mixed themes identified by participants. Most participants still state they do not feel prepared to manage an adolescent who has sustained a sport-related concussion. Participants stated they felt this specific syndrome is complex and not covered in depth for a classically trained nurse practitioner. Few participants stated they did feel prepared to handle a concussed adolescent but stated the challenge was inability to provide clearance as a nurse practitioner in Kansas. This was stated specifically as a problem in rural clinics. Some mentioned improved confidence and preparedness in management after reviewing the CPG-based educational resource provided in this study.

See below for themes related to concussion preparedness (Table 5).

Table 5: *Qualitative Data associated with Concussion Preparedness*

Concussion Preparedness in the Outpatient Setting
<ul style="list-style-type: none">• Overall do not feel prepared to care for the SRC in the outpatient setting.• Education as a nurse practitioner needs more specialized training on SRC identification and management.• Complex syndrome with multiple variation in symptoms including physical, emotional, and cognitive manifestations that can lead to a challenging diagnosis.• Overall prepared to handle the SRC athlete in practice but challenges with state legislature.• Concerns regarding legislature clearance by an MD or DO for return to play. This makes being a nurse practitioner in the rural setting a challenge.

Summary

The purpose of the study was to evaluate the current knowledge base and management abilities of the SRC adolescent by nurse practitioners working in the outpatient setting, measure knowledge learned after review of a CPG-based educational resource, and evaluate how practice has changed since the completion of the initial survey and review of a CPG-based educational resource. Assessment of the provider's initial knowledge level associated with a SRC in adolescence was evaluated. After completion of the survey and exposure to an educational resource over current CPG, the providers knowledge was reassessed. Review of study results indicated by the statistical

analysis signifies that knowledge was learned by the nurse practitioner after review of a CPG-based educational resource related to adolescent's who sustain an SRC.

The second portion of this research included a qualitative evaluation into how practice has changed and if the sample population feels prepared to care for the SRC athlete in the outpatient setting. The data was collected via email and separated into two different categories based on response. Data was reviewed and themes drawn from participant's answers. Answers reflected how their practice has changed over the last six-week and indicated overall practice changes follow closely with current guideline recommendation. The qualitative data presented by the sample population reflects mixed reviews in preparedness to care for the SRC adolescent. Participating providers recommend SRC specialized training and education to better care for this vulnerable population.

Chapter V

Discussion

The research in this study was used to examine provider's knowledge levels regarding management of a sport-related concussion (SRC) in the adolescent population. The study first assessed the sample population's current knowledge in regard to clinical practice guidelines (CPG) available through a pre-test survey. The pre-test questions included common signs and symptoms, diagnosis, assessment, and treatment options that are recommended in CPG. Knowledge related to national legislature and Kansas specific law was also included. After completion of the pre-test, participants reviewed an up-to-date CPG-based educational resource related to SRC in adolescence. The survey concluded with a final post-test that contained the same 10 multiple choice questions as the pre-test. This was designed to evaluate if participants had gained knowledge after exposure to a CPG-based educational resource that reviewed the management of an SRC in adolescence. A follow-up, two-question qualitative evaluation was then sent to participants six weeks after the initial pre-test/post-test survey to evaluate how knowledge has been applied to their practice and if providers feel confident in caring for this population.

Relationship to Research Outcomes

The purpose of this study was to evaluate current knowledge levels and quality care by nurse practitioners caring for the SRC adolescent in the outpatient setting. The aim of this study was to improve current management practices related to an SRC by nurse practitioners through the review of CPG-based educational resource. Research as completed through a pre-test/post-test survey comparing current knowledge to knowledge learned after reviewing an up-to-date CPG-based educational resource over SRC in adolescence. This study focused on the following research questions:

1. Is there a difference in knowledge learned by the nurse practitioner between a pre-test/ post-test quantitative study in the management of a sport-related concussion?
2. Do nurse practitioners in the outpatient setting demonstrate a change in practice after the implementation of an educational resource over clinical practice guidelines?

After completion of the pre-test, participants reviewed a CPG-based, educational resource via embedded YouTube, Power Point. The educational resource reviewed was based on current practice guidelines as discussed by the Centers for Disease Prevention and Control: Heads-up program (2019) and the Fifth International Concussion Group (2018). The post-test evaluated if knowledge was learned after reviewing the CPG-based educational resource presented in the survey. The increase from a 33.3 on the pre-test to a 37.1 on the post-test indicated an overall improvement and knowledge learned after reviewing the CPG-based educational resource. Results indicated that the null hypothesis, “There was no difference in knowledge learned between the pre-test and post-test by the nurse practitioner after review of a CPG-based, education resource

regarding care of an SRC in the adolescent population” was rejected. This data answered research question one and presented the evidence that knowledge was learned by providers comparing the pre-test and post-test evaluation. Pre-test findings suggested that providers may not be managing the adolescent who has sustained a SRC appropriately based on CPG recommendations.

Research related to the management of concussions in general is limited (King et al., 2014). The literature review completed prior to the project implementation indicated that more research is necessary and ongoing. King et al. (2014) also note that the quality and consistency of concussion CPGs are reported lower than those of other medical CPGs with considerable variability in the methodology, quality, guidance, and recommendations. The most common reason for variations in the management of a sport-related concussion is identified as a lack of awareness of and confusion with the many published guidelines that are available (West & Marion, 2014).

Practice change was evaluated through the six-week follow-up qualitative questionnaire in an effort to answer research question two. Multiple themes were made apparent by participants. Many stated that their confidence overall had improved after the review of an up-to-date CPG-based educational resource, but it was evident in the follow up evaluation that nurse practitioners in the outpatient setting feel specialized training is still necessary to appropriately manage a SRC adolescent. This demonstrated that review of a CPG based educational resource specific to adolescent concussion management is vital for providers working in the outpatient setting. The overall goal to improve patient care and outcomes was met through a better understanding, and

knowledge learned, of a CPG-based educational resource regarding SRC management in the adolescent population.

The qualitative research indicated mixed results in confidence level by nurse practitioners managing the adolescent who has sustained a SRC in the outpatient setting. Multiple themes gathered from provider responses supported this evaluation. As part of the demographic questionnaire, providers were asked if they currently felt confident providing care for the concussed athlete. Of the final twenty-one participants, ten were emailed for the follow-up qualitative study. Because the initial survey was anonymous, there was no contact information for the sample population. Peers who were initially emailed the survey, were sent the follow-up qualitative questionnaire asking if they participated in the initial pre-test/post-test survey to please respond to the follow-up qualitative questionnaire. Of the 10 providers emailed, only 5 responded to the qualitative questionnaire.

Participant's stated they did not feel confident assessing the SRC adolescent. Some providers continued to state that they did not feel confident in the management of a concussed athlete even after review of a CPG-based educational resource. Speculation as to why these results continued after review of a CPG-based educational resource is probably related to management of any traumatized head injury in a child. Another speculation includes years of experience and exposure to managing the SRC athlete almost half ($n = 9$) the participants had less than five years' experience as an advanced practice nurse. In a study completed by Kim et al. (2020), understanding one's scope of practice and ensuring providers are exposed to a variety of the services within their scope of practice is crucial to support improvement in confidence and competence.

Observations

Many observations were made based on the review of both the quantitative and qualitative data gathered. This scholarly project provided an in-depth review of concussion management as a whole. The research was narrowed as the study progressed to focus on up-to-date information regarding the adolescent population. This project focused on the management aspects provided specifically by nurse practitioners, which allowed for a very specialized sample population to be evaluated. To date there is a paucity of research on emergency department and primary care practitioners' management of concussion (King et al., 2014). This was further supported in the literature review specifically regarding the management of a sport-related concussion by nurse practitioners. The results from this scholarly research project support that the advanced practice nurse is knowledgeable and can improve their management of the SRC adolescent through clinical practice guidelines.

The instruments utilized when conducting this study performed as expected to both gather and compare the data provided. The instruments were specific, reliable, and provided valid results. The pre-test/post-test comparison provided an accurate evaluation of the paired sample t-test results. Overall, the outcome results presented as expected; there was improved knowledge learned after the review of a CPG-based educational resource. This was found to be reassuring that review of a CPG-based educational resource improved knowledge and resulted in practice change.

The advanced practice nurse should be prepared to provide their patient with recommendations and education associated with a sport-related concussion. Clinical practice guidelines supported by evidence-based research ensures that the

recommendations have been proven both effective and valid. The implementation of a CPG-educational resource provided in this study demonstrated improved knowledge and practice change by the provider. This highlights the importance of continued learning by providers to stay up-to-date on new and emergency CPG available in practice.

Evaluation of Theoretical Framework

The theoretical framework, the helping art of clinical nursing, developed by Ernestine Wiedenbach was applied to this scholarly project. This theory defines nursing as the practice of identifying a patient's need for help through the observation of presenting behavior/symptoms, exploration of the meaning for those symptoms, determination of the cause of discomfort, the patient's ability to resolve the specific discomfort, or determining if the patient has a need for help from the nurse or other healthcare professional (Nursing-theory.org, 2016). The theoretical framework utilized is applicable in the diagnosis and management of concussion but not specific to the first research question utilized in the evaluation of knowledge learned by providers. This framework could be applied by the practitioner in their concussion management. It has value and is better applied in the qualitative data gathered to answer question two, "do nurse practitioners in the outpatient setting demonstrate a change in practice after the implementation of an educational resource over clinical practice guidelines?"

In the theoretical framework, Weidenbach (2016) identified four main elements of clinic nursing including a philosophy, a purpose, a practice and the art (nursing-theory.org, 2016). These four elements are identified throughout the themes provided by practitioners in the qualitative data. Throughout qualitative data gathered, providers state their desire for more education and what they perceive is in the best interest of

patient care. This demonstrates the nurse practitioners' desire for learning in an attempt to actively change their practice and better meet the needs of the patient. Their actions, directed toward improving quality care and producing positive patient outcomes, demonstrates the framework in action. By having improved knowledge regarding SRC practice guidelines, the provider directs patients' activities with the goal to improve their condition. They are better able to grasp the severity of the diagnosis and focus on preventing complications or developing healthcare concerns (nursing-theory.org, 2016).

Evaluation of Logic Model

The Stetler Model was developed by Baystate Medical Center in Massachusetts and is one of the few models that was created to formalize a process for evidence-based practice changes by individuals as well as teams of clinicians (Gawlinski & Rutledge, 2008; Parkosewich, 2013). It was applied to this research project through implementation of the five critical thinking phases. The six critical thinking phases included preparation, validation, comparative evaluation/decision making, translation, application, and evaluation (Gawlinski & Rutledge, 2008; Parkosewich, 2013). After reflecting on the process of this scholarly project, research and data analysis proved to support the Stetler Model of evidence-based research.

Stetler's Model of evidence-based research: Concussion guidelines (Figure 1) laid the foundation for this clinical research project. Reflecting upon the research process, the model presented in Chapter 1 was applicable. The project followed the five-step critical thinking phases as identified in the Stetler Model. During the preparation phase, the researcher evaluated current SRC research including current clinical practice guidelines available to nurse practitioners. The validation phase included the literature review which

supported the need for increased education among primary care providers in the outpatient setting regarding management of adolescents who have sustained a sport-related concussion.

There was some variation identified in the original model prediction related to the decision-making phase and the translation phase. Once the project began, the decision-making phase and the translation phase proceeded quickly. While the decision-making phase evaluated current knowledge of current guidelines through the pre-test, the translation phase implemented the CPG-based educational resource and post-test. In reflection, these two phases happened back-to-back through the Qualtrics survey. The final evaluation phase, to assess if changes had been made in clinical practice, was completed at the six-week follow-up as predicted. Overall, the results demonstrated the Stetler Model concepts as predicted in this research project.

Limitations

Limitations for this study include a small sample size and low post-test completion. An initial 47 responses to the Qualtrics survey were submitted but only 21 included the final completed post-test. The post-test was completed after review of the CPG-based educational resource to identify if knowledge was learned by the advanced practice nurse. Both the pre-test and post-test scores provided the research for the paired t-test comparison analysis. The study results concluded with an increase of 3.33 points on the post-test compared to pre-test results. This indicated an increase in knowledge learned after review of a CPG-based educational resource related to SRC adolescent management. While the study results indicated a benefit in knowledge learned, the

sample population was small. It would have proven beneficial to have all 47 participants completed the post-test and increase the overall sample size.

Some consideration to either software malfunction or user error is considered as to why the post-test was not completed prior to submission. The Qualtrics software should have prevented the participant from submitting a partially completed survey. Other considerations include participation fatigue, lack of time and/or incentives, or errors in the survey development through Qualtrics. Significant efforts were made to prevent any technology issues related to the development of the survey process. This also included clear instructions to the sample population and a concise questionnaire. In consideration of future research, the low post-test survey response could have been prevented if an in-person survey had been implemented. Options could include offering a continuing education course for the advanced practice provider through an in-person delivery format incorporating the pre-test, CPG review, and post-test. This would ensure all parts of the initial survey were completed in its entirety.

Limitations may include the implementation of both survey and educational resources that had not had prior validation. The survey, including pre-test and post-test, and the CPG-based educational resources were created to represent information accessible from both the Centers for Disease Prevention and Control: Heads-Up Program (2019) and the Fifth International Concussion Group (2018). Efforts were made in the creation of both survey and educational resource to adequately reflect the CPG's available to providers. While both the Centers for Disease Prevention and Control: Heads-Up Program (2019) and the Fifth International Concussion Group (2018) CPG's

have high validity, the newly developed resource used for this research lacked any comparison prior to implementation with the sample population.

Future Research Recommendations

Future research recommendations include continued evaluation of clinical practice guidelines regarding sport-related concussion management in the adolescent population. Providers in the outpatient setting require evidence-based guidelines and protocols to assist in appropriate management of their patients. The results produced in this study, along with prior research, support the lack of provider confidence associated in the management in SRC adolescents. Future research should also include treatment options for the concussed adolescent. The only treatment available is conservative in nature no specific treatment options including medication management or interventional therapies exists (Halstead et al., 2018; McCrory et al., 2018). Future research is needed to determine how best to equip the healthcare provider, including advanced practice nurses, with the education and resources necessary to care for a sport-related concussion in the adolescent population. Limitations identified in this study could also be addressed through future research.

Implications for Practice, Education, and Policy

Implications for practice include a need for specific training and review of CPG's related to the management of a SRC adolescent. The adolescent population is considered a vulnerable population both cognitively and physically. Research has demonstrated the need for increased provider education and implementation of CPGs. For the concussed adolescent, integration of a team approach, cognitive rest, and the six-step return to play is imperative to the recovery process. This study demonstrates that current knowledge

and confidence regarding a SRC may be lacking by nurse practitioners. By improving knowledge, the nurse practitioner can increase their confidence, alter current practice to reflect evidence-based care, and improve patient outcomes in the adolescent population. Providers need to be aware of their own gaps in knowledge and be willing to seek education through available resources including clinical practice guidelines. Other resources to improve knowledge include continuing education opportunities specific to concussion management. Continuing education is part of the required re-certification process and thus, the provider should be diligent to seek out education that can improve their knowledge and management skills.

The nurse practitioner scope of practice varies from state to state. The nurse practitioner should be familiar with their own litigation and policies regarding the care of an adolescent who has suffered a SRC. Policy change specific to Kansas, should include the recognition of the Nurse Practitioner as a medical provider. Per the Kansas Act, only an MD or DO can clear a concussed athlete back to return to play (KSHSAA, n.d.). In the rural setting this is made difficult as not all practicing nurse practitioners have an MD or DO on site while managing their own patients. In Kansas, the nurse practitioner's scope of practice can include the assistance in the management of the concussed adolescent, but they cannot return them to play or clear for activities.

Conclusion

The data collected in this study was used to evaluate the current advanced practice nurse (APN) knowledge regarding practice guidelines, associated with a sport-related concussion (SRC) in the adolescent population. The purpose identified for this study was to enhance the provider's knowledge level through a review of up-to-date, clinical

practice guidelines (CPG) specific to a sport-related concussion in the adolescent population. The knowledge level was assessed, both before and after the review of a CPG-based educational resource. This step allowed for the assessment of a nurse practitioner's prior knowledge and to evaluate if there was knowledge learned after reviewing the CPG based, educational resource. The intent of this study was to provide additional learning about available CPGs and furthermore, improve quality care provided by nurse practitioners in the outpatient setting whose patients may include adolescent athletes suffering a sport-related concussion. The educational resource provided covered the most recent and reliable recommendations from the Centers of Disease Control and Prevention: Heads-up Program (2020) and The Fifth International Conference, Concussion in Sport Group (2018).

Review of study results supported by the statistical analysis indicates that knowledge was learned by the nurse practitioner after review of a CPG-based educational resource related to adolescent's who sustain an SRC. The qualitative data presented by the sample population at six-week follow-up, reflected mixed reviews in preparedness to care for the SRC adolescent. Participating providers recommend SRC specialized training and education to better manage this vulnerable population. Recommendations for future practice should include increased specialized education and review of CPGs available to the provider. Providers should be aware of their own gaps in knowledge and seek additional training. Caring for the concussed adolescent athlete can be a challenge for nurse practitioners and primary care providers if they do not have the resources, knowledge, and support available. Nurse practitioners should be diligent in advocating for this population. By increasing knowledge learned the provider can improve their

quality care, adjust practice management, and improve patient outcomes specific to the sport-related concussed athlete.

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APPENDIX

Appendix A:

**An Evaluation of Adolescent Concussion Management and Guidelines by Primary
Care Providers in the Outpatient Setting: DNP Scholarly Project**

Consent

1. I understand this is a voluntary research project and give consent to participate.
 - a. Agree
 - b. Disagree

Demographics

1. Are you currently practicing as a nurse practitioner in the state of Kansas?
 - a. Yes
 - b. No, please clarify the state you are currently practicing in.
2. Do you practice in the outpatient setting?
 - a. Yes
 - b. No
3. Do you see adolescent patients in your practice?
 - a. Yes
 - b. No
4. Do you have access to current, up-to-date guidelines and sideline evaluation forms from your employer regarding concussion management in adolescents?
 - a. Yes
 - b. No
5. Do you feel confident assessing the sport-related concussed athlete?
 - a. Yes
 - b. No
6. Please rate your current years in practice.
 - a. Less than one year
 - b. 1 to 5 years
 - c. 5 to 10 years
 - d. 10+ years

Appendix B:

An Evaluation of Adolescent Concussion Management and Guidelines by Primary

Care Providers in the Outpatient Setting: DNP Scholarly Project

Pre-Test Part A

1. In the state of Kansas, an athlete can be cleared for return to play by:
 - a. Athletic trainer
 - b. A licensed MD or DO only*
 - c. An MD, DO, APRN, or PA
 - d. An athlete does not have to be cleared prior to return to play
2. The diagnosis of concussion includes:
 - a. Forehead contusion
 - b. No recent history of minor trauma to the head, face, or neck
 - c. Loss of consciousness
 - d. Subjective symptoms*
3. In what percent of patients does the sport-related concussion symptoms typically resolve after the initial injury?
 - a. 50%
 - b. 70%
 - c. 25%
 - d. 80%*
4. A 13-year-old male is tackled from behind during a middle school football game. His initial complaint includes dizziness, headache, and blurred vision. He did not lose consciousness. A sideline assessment is completed by the athletic trainer and concussion is suspected. Initial steps according to guideline management should include:
 - a. Have the patient sit for 15 minutes, then reassess
 - b. Immediate removal from play until cleared by healthcare provider*
 - c. Return to play to finish the game
 - d. Call 911 for ambulance and stat CT scan
5. Cognitive rest is the most widely used intervention for sport-related concussion.
 - a. True*
 - b. False
6. An athlete can return to full play after 24 hours post injury if symptoms have resolved.
 - a. True
 - b. False*

7. Follow up with a 16 year old female, who sustained a concussion two days prior indicates she is currently symptom free after cognitive rest at home. The next step according to guidelines should include:
 - a. Initiate the 6-step return to play sequence.
 - b. Release to full sports and activities.
 - c. Release to modified return to learn with reduced homework adjustments.*
 - d. Release to practice only, no competing.
8. A 17 year old male presents to the clinic for follow up after initiating the 6 step return to play sequence post football related concussion. He began step three, return to sport related exercise, yesterday after school and noticed a headache, nausea, and some difficulty concentrating last night. As the provider you recommend:
 - a. Go back to step two, light aerobic exercise, until symptoms resolve again for 24 hours.*
 - b. Complete cognitive rest until symptoms resolve again, then restart the 6 step process.
 - c. Proceed with imaging due to worsening symptoms.
 - d. Educate this is expected as he is increasing activity.
9. Current guidelines recommend referral to a concussion specialist if symptoms persist past:
 - a. 10 days
 - b. 8 weeks
 - c. 6 months
 - d. 4 weeks*
10. Legislature now exist in all fifty states regarding sport related concussion and includes three main components. Which is **NOT** a component.
 - a. Sport programs for athletes younger than 18 years of age must provide educational material related to concussion.
 - b. Sport programs for athletes younger than 18 years of age must provide an athletic trainer for sideline concussion evaluations.*
 - c. Any athlete suspected of a concussion must be pulled from play and cannot return on the same day.
 - d. Any athlete suspected of a concussion must seek medical clearance from a healthcare provider prior to returning to play.

Appendix C:

**An Evaluation of Adolescent Concussion Management and Guidelines by Primary
Care Providers in the Outpatient Setting: DNP Scholarly Project**

Post-Test Part A

1. In the state of Kansas, an athlete can be cleared for return to play by:
 - a. Athletic trainer
 - b. A licensed MD or DO only*
 - c. An MD, DO, APRN, or PA
 - d. An athlete does not have to be cleared prior to return to play
2. The diagnosis of concussion includes:
 - a. Forehead contusion
 - b. No recent history of minor trauma to the head, face, or neck
 - c. Loss of consciousness
 - d. Subjective symptoms*
3. In what percent of patients does the sport-related concussion symptoms typically resolve after the initial injury?
 - a. 50%
 - b. 70%
 - c. 25%
 - d. 80%*
4. A 13-year-old male is tackled from behind during a middle school football game. His initial complaint includes dizziness, headache, and blurred vision. He did not lose consciousness. A sideline assessment is completed by the athletic trainer and concussion is suspected. Initial steps according to guideline management should include:
 - a. Have the patient sit for 15 minutes, then reassess
 - b. Immediate removal from play until cleared by healthcare provider*
 - c. Return to play to finish the game
 - d. Call 911 for ambulance and stat CT scan
5. Cognitive rest is the most widely used intervention for sport-related concussion.
 - a. True*
 - b. False
6. An athlete can return to full play after 24 hours post injury if symptoms have resolved.
 - a. True
 - b. False

7. Follow up with a 16 year old female, who sustained a concussion two days prior indicates she is currently symptom free after cognitive rest at home. The next step according to guidelines should include:
 - a. Initiate the 6-step return to play sequence.
 - b. Release to full sports and activities.
 - c. Release to modified return to learn with reduced homework adjustments.*
 - d. Release to practice only, no competing.
8. A 17 year old male presents to the clinic for follow up after initiating the 6 step return to play sequence post football related concussion. He began step three, return to sport related exercise, yesterday after school and noticed a headache, nausea, and some difficulty concentrating last night. As the provider you recommend:
 - a. Go back to step two, light aerobic exercise, until symptoms resolve again for 24 hours.*
 - b. Complete cognitive rest until symptoms resolve again, then restart the 6 step process.
 - c. Proceed with imaging due to worsening symptoms.
 - d. Educate this is expected as he is increasing activity.
9. Current guidelines recommend referral to a concussion specialist if symptoms persist past:
 - a. 10 days
 - b. 8 weeks
 - c. 6 months
 - d. 4 weeks*
10. Legislature now exist in all fifty states regarding sport related concussion and includes three main components. Which is **NOT** a component.
 - a. Sport programs for athletes younger than 18 years of age must provide educational material related to concussion.
 - b. Sport programs for athletes younger than 18 years of age must provide an athletic trainer for sideline concussion evaluations.*
 - c. Any athlete suspected of a concussion must be pulled from play and cannot return on the same day.
 - d. Any athlete suspected of a concussion must seek medical clearance from a healthcare provider prior to returning to play.

Appendix D:

An Evaluation of Adolescent Concussion Management and Guidelines by Primary

Care Providers in the Outpatient Setting: DNP Scholarly Project

Post-Test Part B

1. According to educational material presented for sport-related concussion in adolescent, explain in one paragraph how practice has changed.
2. As a nurse practitioner, do you feel prepared to care for the SRC athlete in the outpatient setting?