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Implementation of an Evidence-Based Process for the Management of Concussions in Adolescent Patients for a Primary Care Office

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Implementation of an Evidence-Based Process for the Management of Concussions in Adolescent Patients for a Primary Care Office

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Dedication

To my children Otto and Laina, who simultaneously were a barrier to completing this project, but also two of my greatest motivations. Thank you for reminding me every day of the important things in life. I love you SO much.
Acknowledgements

This project would not have been possible without the help from others, I offer my sincerest gratitude and appreciation to:

My husband Bill, who offered unwavering encouragement, support, and love through this process.

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Abstract
The number of recreation and sports-related concussions (SRC) are estimated at 3.8 million every year in the United States. Recently, widespread media attention has been paid to concussion, and with this there has been a rise in adolescents with SRC seeking health care. Primary care providers are often the first to evaluate and provide treatment for adolescents with concussion. Despite the abundance of literature on concussions, there has been little empirical data to support management practices for this patient population. The purpose of the project was to provide an evidence-based process along with a clinical decision support tool to the providers of a primary care office. The main objective was to improve the confidence in primary care providers’ abilities to evaluate and manage adolescents presenting with a concussion with the most up-to-date clinical guidelines and recommendations. This included increasing confidence in recommending return to play and return to learn guidelines to patients and families. All of these objectives were met after the completion of an educational presentation on the evidence-based process.

Keywords: concussion, management, adolescent, return to play, return to learn
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Executive Summary

Concussion is defined as an injury caused by biomechanical forces, producing a pathophysiological process in the brain. The effects can be somatic, cognitive, mood alterations, and/or sleep disturbances (Choe, 2016). The actual biomechanics and understanding of brain injury are not fully understood, but it is known that the adolescent brain is still developing and undergoing changes, making the effects of injury more complicated than in the adult brain. Complications from a concussion include post-concussion syndrome, second-impact syndrome, and chronic traumatic encephalopathy (Graham, Rivara, Ford, & Spicer, 2014). Primary care providers are in a prime position to evaluate and manage these patients, but frequently may have limited training or systemic processes to manage the patients, and lack decision support tools to assist them in the office (Zonfrillo et al., 2012). The purpose of the project was to create an evidence-based process for evaluating and managing concussion in adolescent patients presenting at a primary care office, as well as provide clinical decision support tools to the providers.

An evidence-based process and clinical decision support tools were created after an organizational assessment and literature review. The process and tools were disseminated to providers via an educational presentation during a regularly scheduled provider meeting. Providers were asked to answer pre- and post- surveys before and after the presentation to evaluate its effects. Only seven providers were able to complete the surveys but the data still yielded positive results. Findings indicate an overall increase in provider confidence to evaluate and manage adolescents presenting with concussion with the most up-to-date clinical guidelines and recommendations. A standardized approach
to caring for this patient population was also identified as valuable to the providers at the office and it was indicated they believed they would change their practice to align with the recommendations of the project.
Introduction and Background

Every year in the United States, there are an estimated 300,000 sports-related concussions (SRC); however, the numbers of recreation and sport-related concussions are actually estimated at 3.8 million (Halstead, Walter, & The Council on Sports Medicine and Fitness, 2010). Concussions account for 10% of all high school athletic injuries and in certain sports the rate of incidence is even higher; football, for example, is at 20% (Provance, Engelman, Terhune, & Coel, 2016). Despite these large numbers of injuries, there has been limited consensus regarding how to diagnose and manage patients with concussion (West & Marion, 2014).

Concussion Pathophysiology/Complications

Understanding the pathophysiology of concussion and potential complications of injury, substantiate the need for efforts to support concussion care. A concussion is defined as an injury caused by biomechanical forces, producing a pathophysiological process in the brain. The injury itself may be in the form of a direct blow to the head, or can be transmitted indirectly by a blow to the body (Choe, 2016). The physiology that follows concussion includes changes in neurometabolism and neurotransmission, and does not typically cause structural damage to brain tissues or vessels. The fundamental idea that there is a “metabolic mismatch,” with increased cerebral metabolic needs, but functionally decreased adenosine triphosphate, is the guiding principle of acute concussion management (Grady, Master, & Gioia, 2012). The actual biomechanics and understanding of brain injury are not fully understood, and current knowledge is derived from research with animals, humans, and anthropomorphic surrogates. In addition, the adolescent brain is still developing and undergoing changes, making the effects of injury...
more complicated than in the adult brain (Graham et al., 2014). The effects of concussion can be somatic, cognitive, mood alterations, and/or sleep disturbances (Choe, 2016). While 90% of patients will have recovered in 7-10 days post injury, some will continue to have persistent symptoms. In teenagers, the recovery time may actually be closer to 2-3 weeks (Purcell, Harvey, & Seabrook, 2016). If the athlete returns to play (RTP) before symptoms resolve, this increases the risk for more severe injury from additional concussion, a prolonged duration of symptoms, and increased severity of symptoms (Hobbs, Young, & Bailes, 2016).

Post-concussion syndrome (PCS) is only vaguely described as a state when concussion symptoms persist. It can last for weeks to months after injury. PCS can interfere significantly with daily life, with academic performance, emotional status, and produces an inability to participate in sport (Graham et al., 2014). Perhaps the most feared complication from concussion is second-impact syndrome (SIS), which occurs if the athlete returns to play too soon after injury before symptoms have resolved, and sustains a second injury. The second injury can cause diffuse cerebral swelling and increased intracranial pressure, which can lead to herniation of the brain potentially resulting in coma or death. The condition is still debated among experts, as representing a sequela of repeat injury or a separate pathophysiological process. The literature most often describes the patient suffering from SIS as under 18 years old. So, despite the conflicting opinions on SIS, the association with repeat concussive injury supports a resolution of symptoms before RTP (Hobbs et al., 2016).

Finally, new evidence is supporting the finding of chronic traumatic encephalopathy (CTE) as a potential sequela of repetitive brain injury. Current
understanding of CTE is still evolving, but it has an associative relationship with multiple concussions in sports. Clinical features are also being debated but in general, potential CTE symptoms have included: progressive deterioration in social and cognitive functioning; mood and behavioral disorders; suicidality; deterioration in interpersonal behaviors; violent behavior; substance abuse; headache; body ache; and increasing religiosity. Overall, it has a slow onset and seems to have three clinical presentations that are predominating, from mostly behavioral or mood disturbances, to mostly cognitive impairment, or a combination of both (Hobbs et al., 2016). The initial effects of concussion and its potential complications make it important for health care providers to be well versed in a timely diagnosis and appropriate management.

**Role of the Primary Care Provider in Concussion Management**

There has been a rise in the number of adolescents with SRC reporting their injuries and seeking health care. Primary care providers (PCP) are in a prime position to manage these patients, often performing the initial evaluation and at times being the only available resource for ongoing concussion management (Arbogast et al., 2013). One substantial study of a large pediatric care network sought to determine where youth were most frequently receiving initial concussion health care. In this study it was revealed that 81.9% of patients aged 18 years and under had their first concussion visit within primary care. Researchers discussed their findings as highlighting the importance of the PCP in concussion care. They also considered PCPs as useful in advocating for clinical decision support tools in their workplaces (Arbogast et al., 2016).

As mentioned, concussion diagnosis and management are difficult because of the lack of consensus on best practice. Most recently, there have been five published clinical
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guidelines/recommendations for managing SRCs. There are also a multitude of assessment tools available to providers to assist in evaluation of these patients. In 2012 alone, there were almost 7000 new published articles about concussions (Popoli, Burns, Meehan, & Reisner, 2014). Even with the vast amount of information on concussions, PCPs still struggle with providing evidence-based care to these patients. In one large study, while medical professionals were mostly able to correctly diagnose a concussion and advise against return to play the same day, they often were unable to correctly apply stepwise return to play recommendations, and all inadequately recommended cognitive rest (Zemek et al., 2014). PCPs are expected to evaluate and treat these patients, but frequently may have limited training or systemic processes to manage the patients, and lack decision support tools to assist them in the office (Zonfrillo et al., 2012). The proposed project would create an evidence-based process for evaluating and managing concussion in adolescent patients presenting at a primary care office, as well as clinical decision support tools.

Problem Statement

There is sufficient evidence in the literature suggesting PCPs, in general, have limited training and system processes to manage patients with concussions, and that clinical settings lack decision support tools to assist them (Zonfrillo et al., 2012). The organization at which the project was implemented, identified the need and desire for a standardized approach to evaluating and treating adolescent patients presenting with concussion.

There was also a multitude of evidence on managing concussions to draw from in creating a standardized evaluation and treatment approach, (Popoli et al., 2014). With the
vast amount of information on this phenomenon, the boundaries of the problem had to be narrowed in order to create a manageable project. In this instance, the project focus became the adolescent population, patients of ages 12 years to 18 years, who present to this primary care office for evaluation and management of possible concussion. The project question was: are primary health care providers more confident in their abilities to evaluate and manage adolescents presenting at the office for concussion if they have an evidence-based process to follow, along with clinical decision support tools?

**Literature Review**

As the foundation of concussion treatment is cognitive and physical rest, the focus of the literature review was on RTP and RTL guidelines (McCrory et al., 2013). Unfortunately, the existing guidelines at the time of the project had mostly been constructed using expert consensus opinion, and most studies on concussion were performed with adult subjects (King, Brughelli, Hume, & Gissane, 2014). There was little evidence addressing efficacy and timing of graduated return to physical activity, or return to cognitive activity. Still, there was evidence that the brain is vulnerable to injury while recovering from a concussion. Therefore, it was assumed that efforts should be made to reduce the risk of further injury (Graham et al., 2014). Acknowledging the lack of strong evidence supporting the guidelines, one goal of the literature review was to recognize and synthesize the most recommended treatment practices for RTP and RTL.

**Return to Play Guidelines**

A total of five organizational statements and three systematic reviews were included in this section of the literature review, all published between 2010 and 2014. The Consensus Statement on Concussion in Sport (CSCS), was produced by an expert
panel after attending the 4th International Conference on Concussion in Sport held in Zurich, in November of 2012 (McCrory et al., 2013). This document was used as a source of comparison for the other four organizational statements because they all referenced it, or the findings from the 3rd International Consensus Conference on Concussion in Sport held in 2008. Overall, the CSCS guidelines were the most cited in concussion literature (DeMatteo et al., 2014).

The 2012 CSCS guidelines defined physical and cognitive rest as the basis of concussion treatment until symptoms resolved, followed by a stepwise return to activity (McCrory et al., 2013). However, the authors acknowledged the published evidence evaluating the outcomes of said treatment was very limited. They called for future research on long-term outcomes of rest, as well as the optimal amounts and types of rest. The graduated RTP protocol that was recommended consisted of six steps, and can be seen in Appendix A. The guidance recommended that the injured person progresses to the next level once asymptomatic at the current level, with each step taking a minimum of 24 hours. Therefore, the protocol minimally required a week to complete before returning back to full play. At any step, if the injured person experienced postconcussion symptoms, he or she should return to the previous step until asymptomatic again. There was unanimous agreement by the conference experts that there should be no RTP the day the suspected concussion occurred, due to some evidence that neuropsychological symptoms may not be immediately evident and have delayed onset (McCrory et al., 2013).

Adolescents are acknowledged as a special population. While overall those aged 13 years and older were considered appropriate for the application of the guidelines set
forth in the consensus statement, it was indicated that they may need modifiers to their treatment plans. It was acknowledged that assessment information may need to come from outside sources in addition to the patient, such as parents, teachers, and the school. The 2012 CSCS expert panel agreed that for this group, no RTP activity should occur before the patient has returned to school. Additionally, there was evidence that head impact during the adolescent time period causes different physiologic responses than in adults, and that it takes adolescents longer to recover after concussion. For these reasons, the panel cautioned that a more conservative RTP is recommended. This could include a longer initial asymptomatic rest period, or longer lengths of time for subsequent steps (McCrory et al., 2013).

The four other organizational statements came from the American Academy of Pediatrics (AAP) (Halstead et al., 2010), the American Medical Society for Sports Medicine (AMSSM) (Harmon et al., 2013), the American Academy of Neurology (AAN) (Giza et al., 2013), and the National Athletic Trainers’ Association (NATA) (Broglio et al., 2014). The five organizational statements had very similar recommendations, as many cited each other, but still there were small differences. The one explicit element they all shared was that no patient should RTP on the same day of the injury. They also all mentioned that adolescents may have a longer recovery time than adults, but they made varying further recommendations on this point. Similarly, all five stated that the patient should be cleared by a licensed health care professional (LHCP) before RTP, though some made a point to clarify that the exam be given by a provider trained in evaluation and management of concussions. Four of the five recommended a six-step RTP protocol along with a timeline. Only the AAN publication did not include a staged
plan, instead indicating that the LHCP may develop an individualized graded plan for RTP. The CSCS document provided the most detailed visual aid for delivering RTP care to patients. The only document specific to pediatric patients was the AAP report. However, this was for all individuals under the age of 18, not solely adolescents.

**Systematic Reviews**

The three systematic reviews included in the literature review all had a section devoted to RTP. King et al. (2014) concluded from the literature that RTP should be individualized based on symptom assessment and cognitive exams, and used to track recovery. Also, they asserted that those under 18 years should have a more conservative RTP protocol.

Congruent with King et al. (2014), the other two reviews had similar findings. Graham et al. (2014) is actually an Institute of Medicine (IOM) report, which is a systematic review of the literature on many aspects of youth concussion evaluation and management. In the RTP section, the IOM found an overall consensus in the literature that the athlete should avoid physical activity in the initial recovery phase, and return to baseline before RTP. The report also found the majority of recommendations include a graded RTP protocol. Some of the only empirical evidence cited supported that the resolution of neurocognitive impairment after concussion may take longer than resolution of physical symptoms. Furthermore, it was stated that moderate exercise may bring about cognitive declines in an asymptomatic patient who has returned to baseline. These findings supported the importance of appropriately managing RTP for patients (Graham et al., 2014).
DeMatteo et al. (2014) identified six articles which included a stepwise approach to RTP, four of which included a 24-hour period without symptoms before progressing to the next step. Notably, one conservative approach recommended having patients return to step one if symptoms returned. Authors recommended that a stepwise approach should be based on symptoms and severity of injury with examples and timeframes for the steps, so they are easier for providers to follow. Again, the evidence generated by the review suggested that RTP guidelines should be more conservative for the pediatric population because of childrens’ prolonged recovery times and the impact of an injury on their developing brains (DeMatteo et al., 2014).

**RTP Discussion**

A six-step RTP protocol was the most widely recommended process for managing physical rest after concussion. All literature was in agreement that there should be no RTP on the same day of injury. In general, it was concluded that completion of the steps would take at least a week before full RTP, but may take longer. For those under the age of 18, a more conservative approach was recommended. However, there is a great need for further research to support the proposed guidelines, and their effectiveness in producing positive outcomes in patients. Additionally, practitioners will need to be aware of new research being generated and changes made to recommendations, as they are expected to continue to progress.

**Return to Learn Guidelines**

A total of 10 documents were included in this section of the literature review: two studies supporting the need for cognitive rest, six documents regarding RTL recommendations, and two systematic reviews of RTL literature. Brown et al. (2014)
concluded from their findings that their study contributes to consensus opinion that limiting extensive cognitive activity reduces duration of concussion symptoms. Additionally, their findings supported the use of academic accommodations for students during their recovery from sports related concussion, potentially speeding up their recuperation. A study by Ransom et al. (2015) led authors to conclude that their findings provided initial evidence that concussions can cause adverse effects on academic learning and performance. They suggested that school-based targeted recommendations may lessen adverse academic effects, reduce parent and student concern about the impact of injury on school, and lower the risk of prolonged recovery for students with post-concussive symptoms.

**RTL Approaches and Accommodations**

Unlike with the RTP guidelines, there was no expert consensus on a protocol for RTL, but there were proposed stepwise approaches and various school accommodations recommended to assist the student in RTL. The two main types of guidance offered for RTL treatment plans were RTL approaches and RTL accommodations, both in efforts to limit the reoccurrence or exacerbation of concussion symptoms. There were five articles included for the descriptions of RTL approaches: Master, Gioia, Leddy, and Geddy (2012); Sady, Vaughan, and Gioia (2011); Halstead et al. (2013); Gioia (2016); and DeMatteo et al. (2015). All of these approaches, whether they included specific stages of RTL and criteria or not, shared two important concepts. First, the RTL plan should be individualized to the student based on his or her symptoms, gradually increasing the amount of cognitive activity performed. This timeframe will be different for each student. Second, the increase of cognitive activity is based on a symptom threshold, meaning the
amount of activity in which the individual participates should not be producing symptoms or worsening them.

McGrath (2010) was one of the first persons to offer specific guidance on how to assist students at school following a sport-related concussion. He offered suggestions for accommodations to utilize during RTL which were widely cited in later literature. In one of the systematic reviews included in this review or RTL literature, authors suggested that academic recommendations could be grouped into four themes: excusing absence from class or activity, allowing increased time to complete tasks, removing of distractions, and monitoring and support (DeMatteo et al., 2014). The recommendations by McGrath (2010) fit into these themes. A few examples given were to have rest periods during the day, extending test time or assignment deadlines, providing preferential classroom seating, and so forth.

Similarly, Sady et al. (2011) recommended a variety of school accommodations. These recommendations were also able to fit into the themes identified above, by DeMatteo et al. (2014). Authors cautioned that while a student may seem to be free of neurocognitive deficits, performance can decrease over time, so the student could still need extra support. Halstead et al. (2013) also offered recommendations fitting into the four themes. These authors further encouraged teachers making the adjustments to choose ones that are agreeable with their teaching style, but also appropriate for the phase of recovery of the student and the student’s tolerance.

Graham et al. (2013) and DeMatteo et al. (2014), both found very little information to guide RTL practices. Graham et al. (2013) importantly noted that students
who have school limitations due to concussion should not be permitted to participate in physical education classes.

**Summary and Rationale**

Overall, there was scant empirical evidence to support RTP and RTL guidelines. Current recommendations were primarily based on expert opinion and consensus panels. However, there was consistency in the literature. There was agreement that RTP should be a gradual progression, with the six-step protocol by McCrory et al. (2013) the most widely supported. All were in agreement that there should be no RTP the same day of injury, and that the adolescent population requires a more conservative approach to concussion management due to the potential effect of injury on the developing brain.

Return to learn guidelines were similar, and a gradual return to school and increase in cognitive activity were the foundations of RTL. The primary guiding principle in the literature was that cognitive activity should be increased based on the concept of symptom threshold. If an activity provokes or worsens symptoms it should be stopped. Many accommodations were offered to assist the student in RTL and can be categorized as being excused or absent from classes or activities, providing increased time to complete tasks, removal of distractions, and monitoring and support. Finally, there is a great need identified for future research to develop empirically-based guidelines and test the efficacy of physical and cognitive rest on patient outcome following a concussion (Graham et al., 2014).

Since the foundation of concussion treatment is physical and cognitive rest, RTP and RTL guidelines are essential components to any management plan. Practitioners should be well-versed in the current literature recommendations, and ready to provide
guidance to their patients and families regarding how to safely return to school and play. Health care providers need to be aware of the growing research on concussion, and stay up-to-date in knowledge of future RTL and RTP guidelines.

**Conceptual Models**

Two theoretical models guided the design and implementation of this project. The theory of andragogy (Knowles, Holton, & Swanson, 2005) was important to designing the education and resources that were provided to the practitioners, along with evaluation tools. The Promoting Action on Research Implementation in Health Service (PARIHS) framework (Kitson, Harvey, & McCormack, 1998) was important for identifying contextual variables that would either be barriers or facilitators of the project.

**Andragogy**

The andragogy model is a theory of adult learning, with the focus on the characteristics of learning. It is a transactional model, because it examines the characteristics of the learning transaction, and is applicable to any adult learning situation. Malcolm Knowles, credited with popularizing andragogy, described six assumptions of adult learners. These assumptions, or principles, can be used to design adult learning experiences so they can be the most successful. The assumptions spurred the andragogical process design, or andragogy in practice model, (seen in Appendix B), which is an eight-step plan for actually creating an adult learning experience (Holton, Swanson, & Naquin, 2001). The practice model consists of three dimensions: goals and purposes of learning, individual and situational differences, and andragogy core adult learning principles. It is structured in this way in order to recognize the multidimensional and interactive factors of adult learning. Significantly, the model is meant to be utilized
for a variety of activities, settings, and experiences. An essential feature of andragogy is its flexibility, so that not all elements have to be adopted, and users of the model may start at any point, applying the model as fits appropriately with the situation at hand (Knowles et al., 2005).

The andragogy process model guided the development of the educational presentation given to providers and the print materials they received during the presentation. The goals and purposes of learning were really the goals and objectives of this project, and are explained later in this paper. Individual and situational differences are variables affecting the learning, and have been grouped by subject-matter differences, situational differences, and individual learner differences (Knowles et al., 2005). The presentation that was given to the group of providers was in a conference room during a provider meeting, which was during the lunch break of the work day. The room had technological capabilities of using visual media, including PowerPoint. The presentation was allotted only 15 minutes during a one hour total meeting. These factors were considered when planning the educational session.

The core adult learning principles also assisted in designing the education session. For example, the presentation introduction focused on explaining and convincing the audience of providers why they needed to learn the concussion management process being presented. The various provider experiences with concussion were acknowledged, understanding that some may have more experience and comfort with this patient population than others, but all come to the table with a unique experience upon which to build. Also, acknowledging that all of the learners in the room may not learn the best from the same style of teaching, a variety of teaching methods were utilized for the
presentation. Overall, the andragogy model was referenced in designing the educational presentation and material resources. For example, one of the key assumptions of the theory is that adults need to know the reason to learn something (Knowles et al., 2005). This assumption is why the presentation started with complications of concussion, as it is the reason the providers would want to learn the information being presented. By recognizing that a learning experience has multiple factors that will affect it, and by considering these variables during the planning phase, the designer can then create the most successful educational platform.

The success of the program was evaluated with pre- and posttest surveys. One of the goals of learning in the andragogy model is individual growth (Knowles et al., 2005). This influenced the surveys to be designed around determining if the providers’ confidence levels in caring for this patient population were increased as a result of the education they received. This aligns with the theory assumption that learners see education as a method to increase competence (Knowles et al., 2005). Confidence and competence are interconnected and directly correlate with each other, as discussed in Benner’s stages of clinical competence, which range from novice to proficient. At each level, increasing levels of confidence are described, along with increasing levels of competence (Benner, 1984).

**PARIHS framework**

The PARIHS framework (Kitson, Harvey, & McCormack, 1998) was used for the analysis of the organization where the project was implemented. The framework hinges on three key concepts: evidence, context, and facilitation. Successful implementation of research into clinical practice depends on the interaction of these three elements.
Depending on the data gleaned regarding evidence, context, and facilitation and the strengths of each, one may be able to better predict the success of a project. The interplay of these concepts can be seen in the model in Appendix C. The most successful projects will have high evidence, a context receptive to change, and appropriate facilitation (Kitson et al., 1998).

**Evidence: Concussion Research**

The evidence supporting the implementation of the project was summarized in the literature review section of this document. In addition, other aspects of the project beyond RTP and RTL guidelines, were also supported by evidence. Evidence should be based on high-level research, clinical experience, and patient experience in order to be the most successful in implementation (Rycroft-Malone, 2004).

**Context: Primary Care Office**

In the PARIHS framework, context can either facilitate or inhibit implementation of projects. It is the overall assessment of the environment where the proposed change will occur. The sub-concepts of culture, leadership, and evaluation, further delineate the contextual factors for evaluation (Kitson, Harvey, & McCormack, 1998). Culture of the organization would include staff attitudes and beliefs about using evidence in practice, and their openness to change. Beyond the individual beliefs, the overall organization’s values, beliefs, and mission also provide an underlying cultural context. Leaders can shape the culture in the ways they inspire their staff to not only make change, but embrace it. Finally, evaluation is necessary for monitoring the effectiveness of the changes, as positive outcome measurements are more apt to encourage change (Rycroft-
Malone, 2004). The majority of this organizational assessment was focused on context principles.

**Facilitation: The Doctor of Nursing Practice Student**

Facilitation is making the process of implementing evidence into practice easier. The facilitator is an individual with the appropriate skills and knowledge to help individuals, teams, and organizations apply the evidence into practice (Rycroft-Malone, 2004). In this project, the main facilitator was the author, a Doctor of Nursing Practice (DNP) student. The organizational mentor also assisted the facilitator in her role as facilitator. The project plan will be discussed further in this paper, demonstrating the DNP student as the facilitator.

While the focus of this assessment was the context, it is the interaction between evidence, context, and facilitation that leads to successful implementation. For the highest chance of success, all three areas needed to be at their highest levels. In order to understand the organizational factors that would foster success of the project, and which may prove to be barriers, a strengths, weaknesses, opportunities, and threats (SWOT) analysis was performed, as seen in Appendix D. The SWOT analysis was then reviewed through the lens of the PARIHS framework.

**Organization Assessment**

The project implementation organization site was a family and pediatric primary care office located just outside of a large metropolitan city. The office itself was part of a network of primary care groups operating under a community hospital system, which was also a member of a large national health care system. The organization as a whole developed a vision and guiding behaviors that supported a clinical quality improvement
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project such as this one. The vision included the statement that the team, “… will continuously innovate to deliver high quality care that is comprehensive, coordinated, accessible, and personalized,” (Mercy Health, 2016, para. 3). Additionally, one of the six guiding behaviors was, “We are continuous learners,” (Mercy Health, 2016, para. 6). The overarching health system was so devoted to these themes that it was demonstrating its commitment, by developing pilot sites to test and revise quality improvement practices and initiatives before rolling them out system wide. The primary care office in question was one of these designated sites, making it an ideal location for project implementation.

**Key Stakeholders**

There were four stakeholder groups with interest in the project that were expected to experience effects from implementation: the providers, the primary care office, the health care organization, and the patients. The providers were expected to experience the most direct effects as they were the targets of the project. They would be implementing the process and utilizing decision-support tools in their evaluation and management of patients. Provider feedback was also the basis of outcome metrics for the project. They had the most at stake, needing time to participate in pre- and post-education evaluations and time to learn the proposed process. They were expected to be changing their current practice, which would likely affect length of appointment and documentation time. However, as they had the most at stake, they also had the most to gain, by increasing their competence and comfort levels with managing this patient population.

The primary care office as a business entity was affected by allotting time for the project education to be disseminated. It was also likely that there would be a need to increase the allotted time for a patient visit when a patient with concussion is seen, from
the standard 15 minutes. These time resources could have effects on the overall health care system, albeit, on a significantly smaller scale. In fact, at that site in 2016 there were 32 visits for concussion in patients ages 10-19 years, with 50% of the visits occurring during the fall season (A. Blakeslee, personal communication, February 9, 2017). As this was a relatively small number of patients, potential loss of time for these visits was expected to be negligible. Additionally, if there was any question whether the visit should be billed for a moderate-complexity visit, the increased time of visit would solidify the use of the higher billing code. This would make any potential loss of revenue from seeing one less patient a moot point.

Last, but certainly not least, was the patient group who would ultimately benefit from the implementation of the project. While the patients were not directly involved in the project, as an effect they would receive up-to-date, evidence-based care, which would be standardized across the providers. For example, if they saw one provider for their initial evaluation but could only make a follow-up appointment with someone else, their exams would be the same so that results should accurately reflect similarities and differences in findings, better directing continued treatment plans. Patient and family feedback and input were received through patient surveys. Ideally, the project implementation was expected to impart a positive experience and increase continuity of care for patients and families. Theoretically, this would positively affect their responses to the surveys, but diagnoses are not included on surveys, so data specific to those who had concussions would be unavailable.
Needs Assessment

A pediatrician and pediatric nurse practitioner from the primary care office were interviewed to obtain much of the data. The data are easily visualized in the SWOT analysis table in Appendix D. Notably, it was a pediatrician who approached the DNP student with the project, expressing a desire for guidance in managing patients presenting with possible concussion. Practice among providers varied, as each individual approached the patient differently. He or she may or may not have utilized a concussion tool during the assessment, and the chosen tool, if used, could also vary among providers. The clinicians expressed feeling unprepared to evaluate and create management plans for patients, often trying to review assessment tools and recommendations as the patient was being roomed by the support staff. They also expressed frustration at trying to perform a follow-up exam on patients who were initially seen by another provider in the office. Since there was no standard approach, the initial documentation was limiting to assess for status changes. Additionally, after the appointment, providers often wished there was a clearer handout they could have sent home with patients and families to assist them with knowing how to return to playing sports and school.

The providers acknowledged a lack of systems processes to initiate clinical changes, compared with quality improvement projects involving office workflow changes. Non-clinical projects followed a template, and were frequently involved in a “rapid improvement event (RIE).” They had a plan in place for making the change happen and for evaluating outcomes, and projects were often overseen by the office manager.
Clinical changes however, were much different, with no formal processes to follow. While there was a lead family practice physician and a lead pediatric physician, any provider could introduce a proposed change. Typically, changes were introduced via e-mail, or office memo, or mentioned at a provider meeting. The provider meetings occurred once a month, and were the most used method. The meeting was led by the lead family practice physician, with the office manager overseeing the agenda. Regardless of the method of delivery, there was no follow-up to evaluate outcomes, such as if the providers made the changes to their practices. The lack of a formal process for introducing clinical changes was certainly a barrier to the proposed project, but also an opportunity. The providers expressed optimism at a student-led project like this, which potentially offered a process for change, but also to evaluate outcomes.

The primary care office was also limited by its electronic health system in documenting evaluations of patients with concussions. The system only allowed for the total score of the Sports Concussion Assessment Tool 2 (SCAT 2) to be documented in the record (J. Polizzi, personal communication, October 26, 2016). So that individual signs and symptoms could be part of the record, the provider then had to either scan the paper document into the computer system, which can have a lengthy turnaround, or write his or her own notes into the assessment (S. Wang, personal communication, October 25, 2016). There were a few problems with this. First, at the time of this project the SCAT 3 tool had been released as the newer version of SCAT 2, so the computer system needed to reflect practice updates. Additionally, providers did not have a standard documentation process, further complicating follow-up visits.
Fortunately, the atmosphere of the primary care office was positive, embraced change, and was fiscally secure. Providers who worked there were open to changes, and were drawn to the organization because it was a pilot site, so change was welcomed but also expected. They did not feel over-burdened by projects because they were engaged participants who had a voice in the projects started at the site. They were frequent participants and leaders in the workgroups responsible for the transformations at the office. Additionally, the office opened only two years prior to the project implementation, and they had continued to increase the number of providers since that time, suggesting financial security.

**Project Plan**

The project used a one group pretest-posttest design. Providers at the primary care office were given a paper pretest (seen in Appendix E) to answer at the start of a provider meeting. They were asked to answer the survey before the facilitator gave an educational presentation on the evidence-based process detailed for them regarding evaluation and management of adolescents presenting with concussion. An outline of the PowerPoint presentation along with rationale for the content and order, is seen in Appendix F. During the presentation, the PCPs also received printed materials including a printout of the PowerPoint slide presentation, the 2012 Consensus Statement on Concussion in Sport, a clinical decision support tool (seen in Appendix G), a resource list with web links and local referral options (seen in Appendix H), RTP recommendation key points (seen in Appendix I), RTL recommendation key points (seen in Appendix J) and a documentation pathway tool (seen in Appendix K). After the presentation, providers were asked to complete the posttest survey (seen in Appendix L). The DNP
student collected all of the pretest surveys and five of the post-test surveys at the end of the meeting, and two of the post-tests two days later during a follow-up site visit by the student. Each test, both pre- and- post, consisted of only 12 questions, so as to encourage completion due to their brevity. The project design was meant to lead to answering the project question: are primary health care providers more confident in their abilities to evaluate and manage adolescents presenting at the office for concussion if they have an evidence-based process to follow along with a clinical decision support tool?

**Purpose/Objectives**

The purpose of the project was to provide an evidence-based process along with a clinical decision support tool to the providers in the office. They also received a template for RTL education to include in discharge instructions. The main objective was to improve the confidence in primary care providers’ abilities to evaluate and manage adolescents presenting with a concussion, with the most up-to-date clinical guidelines and recommendations. Specifically, this included increasing confidence recommending RTP and RTL guidelines to patients and families. Additionally, the project had the potential to standardize evaluation and treatment of this population, along with the documentation process.

**Type of Project**

The project was an evidence-based practice initiative, but also a quality improvement project. The DNP student created an evidence-based process and clinical decision support tool for the PCPs to use in the office. The student was asked to develop this project because of an identified need of the PCPs, post-concussion management was an area in which they could use some further training and assistance. Therefore, the
outcome measures of the project evaluated if there was an improvement in the PCPs’ confidence levels with caring for this patient population after the educational intervention on the requested subject matter. Due to time constraints of the project, along with unpredictable numbers and limited potential patient participants, evaluating the effectiveness of the evidence-based process itself, and whether the providers adopted it into practice after implementation was not feasible.

**Setting and Needed Resources**

A significant portion of the project was completed during a provider meeting in a conference room at the primary care office. As a usual practice, the provider meetings occurred only once a month and lasted approximately one hour. During one of these meetings the DNP student gave a 15-minute presentation on the evidence-based process she was recommending. The print materials were also distributed to the providers at this time. Resources required were minimal, and mostly fulfilled by the DNP student. The organization was responsible for providing time during a staff meeting, along with the technology needed to display a PowerPoint. Personnel needed for the project were limited to the DNP student along with guidance from the site mentor. A member from the information technology (IT) support staff of the organization also contributed time. This staff member assisted the student to gain an understanding of the electronic health record documentation system. The IT member also assisted in building the template with the RTL education to utilize in discharge instructions. The main resource was the student’s time required for the research and development of the evidence-based process and clinical decision support tools. Additionally, small material resources created by the
DNP student, were utilized in the creation of printed educational and support materials given to the PCPs.

**Design for the Evidence-based Initiative**

The project itself consisted of an outlined evidence-based process for the providers to follow in their evaluation and management of adolescents presenting with concussion. The outline included a standardized evaluation method, including the Sport Concussion Assessment Tool-3 (SCAT3) (McCrory et al., 2013). Clinical warning signs or “red flags” were highlighted, as to when to be concerned of a more serious injury, and steps to take in this instance. Educational points for the patient and family in the steps to recovery were a large component of the project, including the RTP and RTL guidelines. Decision trees for clinical management and for standardized documentation practices were provided as visual aids to assist in the evaluation and treatment plan creation. The providers received a folder of print materials with all of this information to use as a resource in their future practice.

The print materials to include were decided based on research. The 2012 CSCS review article and resource page were included because one study found that the two most frequently requested resources by general pediatricians were a website listing available resources and a review article (Carl & Kinsella, 2014). The RTP and RTL Key Point sheets were included because they were the basis of concussion management in the adolescent population evidenced by the literature review. Other research also suggested that PCPs do not adequately recommend the guidelines (Zemek et al., 2014). The clinical decision support tool was included because it was identified as a possible support for
PCPs (Zonfrillo et al., 2012). The evidence-based process and management strategies were presented at the provider meeting.

**Participants**

The potential participants in the project included the 14 primary care providers in the office, consisting of eight family medicine physicians, two pediatricians, one pediatric nurse practitioner, one family nurse practitioner, and two physician assistants. On the actual day of implementation there were 11 providers who attended the regularly scheduled provider meeting, but only seven of which heard the entire educational presentation. All seven providers present for the full concussion education completed the pre- and post-implementation surveys.

**Measurement: Sources of Data and Tools**

The pre-test and posttest surveys were given at the provider meeting in paper form. Each survey consisted of 12 questions. Ten questions of each survey were on a 7-point Likert scale, with choices ranging from strongly disagree to strongly agree. Two questions of each survey were open-ended. The surveys were completed anonymously, and participants were asked for a loved one’s birthdate on the pre-test, and for the same birthdate on the posttest for pairing of the data for analyses. This information was non-identifiable as the DNP student had no way to associate given birthdates with participants. The pre-test survey was given before the presentation, and the posttest was given immediately after the presentation. The pre-test and post-test surveys are seen in text version in Appendices E and L, respectively.

Variables of interest included: feeling well-trained in concussion evaluation and management of the adolescent, confidence in ability to recommend up-to-date RTP
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guidelines, confidence in ability to recommend up-to-date RTL guidelines, and overall confidence in providing up-to-date care to this patient population. Specifically, the DNP student looked for changes in the pre- and post-education surveys. Confidence levels were determined to have increased if the Likert scale ratings had gone from low numbers to higher numbers.

The questions were designed by the DNP student through the andragogy theory lens. One of the six assumptions or principles of the theory is motivation to learn, which is an intrinsic value (Knowles et al., 2005). Internal motivation drives the adult to learn in order to gain self-esteem and goal attainment (Taylor & Kroth, 2009). Additionally, one of the goals and purposes of learning is individual growth (Knowles et al., 2005). For these reasons, variables of interest included the feeling of being well-trained and having confidence in the provider’s own abilities. By developing questions through the lens of the andragogy theory, the content validity was increased. Surveys and delivery methods were reviewed by a statistical consulting team from Grand Valley State University (GVSU) in order to check for bias, including instrument clarity and instrument format.

The open-ended questions were reviewed for potential themes that may have emerged. However, the main intention was to gain descriptors of the current difficulties with managing concussion in the adolescent patient and descriptors of the potential value the education has given them. Answers to the open-ended questions had the potential, in conjunction with statistical analysis, to offer the organization more specific recommendations at the completion of the project.
Steps for Implementation of Project/Timeline

An organizational assessment and literature review were conducted prior to development of the evidence-based process, the educational presentation, and the print material resources. In comparison, the educational piece and data collection aspects of the project took place over a relatively short period of time. The presentation was delivered during a 15-minute segment of a provider meeting, and print materials were distributed to the providers. The pre-test was given at the start of the meeting, and before the educational presentation. The posttest was given at the completion of the presentation. All but two surveys were collected at the end of the provider meeting. Within a few weeks after data collection the DNP student completed her statistical analyses and developed a written report with findings to share with the office. The student’s scholarly project report and oral defense were delivered. At completion of the project, the project was submitted to ScholarWorks@GVSU. A detailed time line, including the development process for the project, is seen in Appendix M.

Project Evaluation Plan

The DNP student was responsible for all data collection. The surveys were completed during the provider meeting and collected at the end of the meeting and at a follow-up visit two days later by the DNP student. The data were then placed into an Excel spreadsheet and imported to SPSS Statistics. The student sought assistance in running the analyses from the GVSU Statistical Consulting Center. The original plan for statistical analysis was to include a Wilcoxon signed-rank test if the Cronbach’s alpha was ≥ .7, evaluating internal consistency and reliability. The Wilcoxon signed-rank test would be used to assess for differences in pre-and post-scores in specific questions. For
example, might there be a more significant improvement in the PCP’s confidence in recommending RTL guidelines than RTP guidelines? In order to evaluate an overall, or cumulative effect, of the difference between pre-and post-implementation surveys, McNemar’s test was planned. The objectives would be interpreted as successful if there were statistically significant changes with a p-value of < .05 from pre- to posttest surveys. However, improvements in scores from specific individuals would also be considered as positive indicators of change.

**Ethics and Human Subjects Protection**

The proposed project was submitted to the Grand Valley State University Human Research Review Committee (HRRC) for approval before the project was implemented. The HRRC determined that the project was not human subjects research, (the designation form is seen in Appendix N). The only perceived potential risk to participants was if the surveys provoked stress while the participant was answering them. The potential benefit from participating was gaining increased confidence in the ability to provide up-to-date evaluation and management of the concussed adolescent. The proposed project was also submitted to the organization’s research review board and determined as not human research and received quality improvement measurement designation (the designation from is seen in Appendix O). Data were kept secure by saving it on to an encrypted flash drive.

**Budget**

The project did not necessitate a full financial budget. The main resource was the DNP student’s time required to create the project. The organizational cost was already built into the system. The dissemination of the project occurred at a provider meeting.
that was already planned into the clinicians’ schedules. The proposed change in the EHR system of updating the SCAT 2 score total to the SCAT 3 score total did not have a direct cost associated with it. The documentation system vendor does not charge per change request. The documentation vendor company makes money from the organization by taking a percentage of revenue (K. Ingles, personal communication, February 14, 2017). Indirectly, costs were associated with the IT personnel making the change request, and also in the IT personnel assisting the DNP student with the project. This time resource was estimated at one eight-hour day. However, this work was part of the job description and therefore already built into the system. Costs associated with increasing the time of the office visit from 15 minutes to 30 minutes for a concussed adolescent were expected to be negligible due to the potential increase in billing code if the new recommended process was followed. The new process would ensure that the billing code should be up-coded to a 99214, due to the length of visit, detailed history, detailed physical, and moderate complexity. Additionally, for completing the SCAT 3 screening, the provider could bill for a 96160 code (S. Wang, personal communication, March 14, 2017). The only monetary resource required was in supplies for the print materials that were given to the 14 PCPs, and the cost of the encrypted flash drive. This cost was over the estimated budget of thirty dollars, and came to $54.98 and was incurred by the DNP student.

**Stakeholder Support/Sustainability**

Fortunately, one of the facilitating factors of this project was the support of the providers, who were identified as main stakeholders of this project during the organizational assessment. A pediatrician and pediatric nurse practitioner approached the DNP student with the idea of a concussion project that would assist the providers in the
office. Additionally, since the office in question was a pilot site for the health organization, the providers who practice there were open to change, and expected to be involved in quality improvement initiatives.

The full sustainability of this project will be hard to measure. However, the PARIHS framework suggested that there are factors that predict and enable a successful implementation, part of which is sustained change (Stetler, Damschroder, Helfrich, & Hagedorn, 2011). As previously stated, it is the interplay between evidence, context, and facilitation that lead to successful implementation; when all three are at their highest levels there is a high chance for success (Kitson et al., 1998). The literature review provided high amounts of evidence, but had limited empirical data. During the organization assessment, it was determined that the context was high, with a supporting staff and culture supportive of change. The DNP student was highly motivated, with appropriate skills and knowledge to facilitate the project. Therefore, there were high chances of successful implementation and sustainability when viewed through the lens of the PARIHS framework.

Ideally, the project outcomes would lead to an overall improved confidence in ability to care for this patient population, and according to the PARIHS framework, positive outcome measurements are more apt to encourage change (Rycroft-Malone, 2004). Hopefully, it would also show the providers that their coworkers were invested in providing a standardized approach to evaluating and managing these patients. The DNP student shared results with the participants at the completion of this project in efforts to encourage adaptation of the evidence-based process created for the office, use of the clinical decision support tool, and following a standardized method of evaluating and
documenting the patients. A future chart audit of adolescents seen for concussion could
demonstrate if the guidelines presented in the project are being applied to practice.
Unfortunately, this was outside of the scope of this project. Additionally, the providers
could re-take the post-test six months after implementation, and responses could be
compared to original results and statistical analysis. If the office wished to participate
further in this way, the DNP student was willing to assist them with this.

**Implications for Practice**

The project’s contribution to nursing practice was demonstration of the impact of
educating providers about an evidenced-based process. Evidence suggests that PCPs are
often the first providers to evaluate an adolescent with concussion (Arbogast et al., 2016).
Researchers report that while health professionals are mostly able to correctly diagnose a
concussion and advise against return to play the same day, they often are unable to
correctly apply stepwise return to play recommendations, and likewise, inadequately
recommended cognitive rest (Zemek et al., 2014). This project aimed to bridge that gap
for providers, by providing them with an evidenced-based process and clinical decision-
support tools.

If the providers adopted the process, it would also increase the consistency of care
that their patients received. Not every follow-up appointment could be made with the
initial care provider. If the PCPs in the office evaluated and documented their visits in
the same way, this was likely to benefit their colleagues at the patient’s next visit. The
provider would easily be able to locate the findings from the initial assessment, and using
the same assessment approach, easily compare current findings to note any changes in
condition. The patients would benefit by receiving up-to-date standardized care across
providers. Ideally, the project implementation would impart a positive experience and increase continuity of care, potentially positively affecting patient survey scores.

**Plans for Dissemination of Outcomes**

The project outcomes were disseminated at the PCP office. An informal meeting was arranged with a pediatrician and pediatric nurse practitioner to discuss findings and provide recommendations based on findings and occurred during their lunch break. A summary of the findings was also given in a report to the participants and office manager via email. There is potential to share the project with other primary care sites caring for adolescent patients within the health system, to expand concussion support across the organization. Specific to this site, the site mentor was left with extra resource folders for providers, and plans to share the information with any new providers coming to the practice.

Outside of the implementation site there is potential to share this project with similar primary care offices using the same EHR system. Additionally, as part of the Doctor of Nursing Practice coursework the DNP student has the opportunity to present her scholarly project in a digital format poster presentation, during the defense of the scholarly project, and finally with publication to ScholarWorks@GVSU. In order to further disseminate the project findings, the DNP student was accepted for a poster presentation at the GVSU Student Scholars Day and at the Michigan Chapter of National Association of Pediatric Nurse Practitioners Spring Meeting and Conference. The DNP student planned to search for additional conferences in which to participate, as well.
**Project Outcomes**

The data were collected and reviewed with a team from the GVSU Statistical Consulting Center. It was determined that due to the small sample size of seven, the original plan to run McNemar’s test and Wilcoxon signed-rank test was no longer valid options. It was decided that statistical testing would not yield power high enough to produce reliable results. Instead, interpolated medians were calculated for each question and for each provider in order to evaluate for a shift between pre- and post-education survey responses (Tables 1 and 2 respectively). In order to reduce participant response, bias questions two and ten were reverse-coded as they were written with negative verbs and the other statements were written with positive verbs. The possible scores for each item were 1-7, with one signifying a response of “strongly disagree,” and seven indicating “strongly agree.”

For questions 1-7, an increase in the interpolated median suggests an increase in a provider’s confidence in ability to provide up-to-date care to adolescents with concussions. Questions 8-10 were evaluating if initially the provider thought clinical decision support tools, a standardized approach to evaluation and standardized approach to management of these patients, would be beneficial for the office and patients. The post-survey was evaluating if the provider either still felt these were valuable, or were more highly valued after the education. Results that either were initially higher and stayed the same or increased would suggest providers valued these tools and processes. The variables of interest corresponded with the objectives of the project and included a general feeling of being well-trained in concussion evaluation and management of the adolescent, confidence in ability to recommend up-to-date RTP guidelines, confidence in
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ability to recommend up-to-date RTL guidelines, and overall confidence in providing up
to date care to this patient population. Specifically, the DNP student looked for changes
in the pre- and post-education surveys. Confidence levels were determined to have
increased if the Likert scale ratings had gone from low numbers to higher numbers.
Additionally, the project had the potential to standardize evaluation and treatment of this
population, along with the documentation process.

**Objective 1**

The main objective was to improve the confidence in primary care providers’
abilities to evaluate and manage adolescents presenting with a concussion, with the most
up-to-date clinical guidelines and recommendations. Overall, for every statement from 1-7 there was an increase in the interpolated median after the implementation. In addition, responses of six out of the seven providers were increased in their cumulative survey interpolated medians, with the seventh provider having no change. These findings signify a shift from lower ratings to higher ratings of confidence. Notably, all of the medians for post implementation questions 1-7, were 5.63 or higher. Additionally, all of the minimum responses for these items were four or higher (seen in Table 1). These numbers indicate that final responses were all on the agree end of the ranking system. The boxplots seen in figures 1-7 provide visualization in the shift of the scores for each question.

The cumulative survey interpolated medians for providers were similar.
Excluding the one provider whose responses did not change from pre- to post-surveys, all medians were 5.33 or higher, with minimum post-survey answers all being 4 or higher (seen in Table 2), also on the “agree” side of ranking. A visual representation of the
change from pre- to post-education survey responses are seen in the boxplots in figures 8-12. Importantly, some individual providers had greater shifts in ratings of value of aids to practice. Provider interpolated medians were calculated across each individual’s responses in order to evaluate for an overall shift from pre- to post-education surveys. Provider one increased from a median of 3 to 5.5, and provider two increased from 3.5 to 6.5. The responses of these providers exhibited a greater shift from more of their answers initially being “disagree,” to more being “agree.” As these two had the lowest pre-median scores and the greatest shifts, the findings suggest that those providers with less confidence in their abilities to provide concussion care may benefit the most from education programs such as this one. Overall, the positive shift from lower medians to higher medians suggests an increase in confidence levels of the PCPs to evaluate and manage adolescents presenting with concussion, meeting the objective.

**Objective 2**

The second objective was to increase confidence in recommending RTP guidelines to patients and families. The survey statement that specifically evaluated this, was “I feel confident that I appropriately recommend return to play guidelines (physical activity) guidelines.” The interpolated median increased from 5 to 5.63 for this statement, which was a positive shift. Visually, Figure 6 represents the shift in scores. In addition, providers one and two reported the greatest shifts in confidence. Provider one’s response changed from 2 to 5, and provider two’s response changed from 3 to 6. Similar to the first objective, these two providers reported the lowest initial confidence scores on the pre-survey and the greatest shift in confidence reported on the post-survey. These scores suggest that providers with less confidence in providing RTP guidelines,
may benefit the most from education programs such as this one. Overall, as there was a positive shift in medians, it does suggest an increased confidence level in being able to appropriately recommend RTP guidelines, meeting the objective.

**Objective 3**

The third objective was to increase confidence in recommending RTL guidelines to patients and families. The survey statement that specifically evaluated this was, “I feel confident that I appropriately recommend return to learn guidelines (cognitive activity) guidelines.” The interpolated median increased from 4.75 to 5.8 for this statement, which was a positive shift. Visually, Figure 7 represents the shift in overall scores for this statement. There were also three providers initially reporting lower responses for this statement, whose responses recorded a greater shift in confidence on the post survey. Provider one’s responses changed from 2 to 5, provider two’s responses changed from 3 to 6, and provider seven’s responses changed from 3 to 5. Again, these scores suggest that providers who initially have less confidence initially, may benefit the most from education programs such as this one. In reviewing the group’s responses to this statement, it is easy to visualize in the boxplots the great positive shift in provider scores from pre- to post- surveys. Overall, as there was a positive shift in medians, it does suggest an increased confidence level in being able to appropriately recommend RTL guidelines, meeting the objective.

**Standardized Approach**

One goal of the project was to standardize evaluation and treatment of this population, along with the documentation process, but this was acknowledged to be difficult to measure, because of the inability to perform chart audits after implementation.
Due to this limitation, statements 8-10 were directed at trying to evaluate the importance of this objective to the providers, for indication that it may be successful. Because the responses for provider number five on questions 8, 9, and 10 appeared inconsistent, the individual response patterns were examined and the response for question 10 was removed from analyses. This seemed appropriate because this was one of the questions written in the negative form, and since the provider did answer the other negatively worded question in a manner that reflected a positive change, this response was decided to be most likely an error. It was also an outlier when included in the data. With the data from provider number five removed, all three of these questions were rated highly on the pre-survey. Interpolated medians were 6.63, 6.8, and 6.75 respectively. These high scores indicate the providers valued and supported having a standardized process for evaluating and managing this patient population at their office. The post-survey ratings were very similar, except for a minor decrease in the median for statement nine. For that statement one provider gave an answer one numerical value lower than on the pre-survey. The medians for the pre-education survey were almost the highest possible score of 7, making it important they remained unchanged after the educational presentation. Fortunately, the similar scores at the post-education rating supported that the education did not alter the appreciation and support for a standardized approach, and that standardization was valued by the providers at the office.

**Open-Ended Questions**

Three providers gave responses to the open-ended questions on the pre-survey and five gave responses on the post-survey. The pre-education survey questions were aimed at finding what providers found to be the most difficult aspects of providing care
to a concussed adolescent, and which aspects of management for which they felt the least confidence. Interestingly, from the three providers’ responses on the pre-survey, one acknowledged simply knowing the guidelines as the hardest part, one suggested knowing when it was safe to return to play was the hardest, and one suggested the return to learn aspect as the most difficult part of care for this population. These answers align with the three objectives of this project, suggesting the DNP student’s choices for focus were the appropriate topics, and aligned with findings from the literature review.

The questions in the post- survey asked about the most valuable information in the presentation, and how providers thought their practice would change after receiving the concussion education. The responses had a few recurring themes. The SCAT-3 was mentioned twice as the most valuable information; one provider acknowledged he or she had not realized that SCAT-2 had been updated. Guidelines were identified three times, once as being the most valuable information, and twice as factors that would lead to their practice changing, by following the guidelines. These were important responses, as they addressed two specific project objectives, as well as were the focus of the literature review and a large component of the evidence-based process.

Notably, one response to how the respondent’s practice would change was, “overall better quality of care.” A standardized approach to the care of these adolescents was mentioned twice, once as the most valuable information from the education and once as how the provider’s practice would change. These responses support the objective to standardize evaluation and treatment of this population. This objective was identified as one that would be difficult to measure within the constraints of the project. However,
these responses indicate that the providers believe the standardized approach is valuable and they will follow the approach in practice.

**Discussion**

A major limitation of this project was the small sample size. This made it unreasonable to run statistical analyses. This also means findings are restricted in their generalizability to primary care providers inside this office. Another limitation is that the survey questions were created by the student; thus this is an un-validated tool for assessing confidence levels in the providers. Inherently, there is also concern for participant bias in completing pre- and post- surveys. Also, since there was an inability to assess for practice change post-implementation, sustainability could not be measured.

Strengths of the project include that the open-ended responses support that the objectives and variables of interest were appropriate and in congruence with literature findings. Another strength was that all but one provider who remained unchanged in post- survey responses, reported a positive shift in ratings of confidence and knowledge from pre- to post- surveys. Likewise, questions 1-7 all had positive shifts in responses as well. This indicated that the educational presentation had a positive impact on the providers’ confidence levels in providing up-to-date care for adolescents with concussion. All three measurable objectives were met, and qualitative data provided evidence that the fourth goal of standardizing evaluation and treatment of this population through the project may be successfully achieved as well.

**Conclusions**

The findings indicate that an educational presentation on an evidence-based process for evaluating and managing concussion in the adolescent, including a clinical
decision support tool, may increase the confidence levels of clinicians in providing care to this patient population at this office. This includes improving confidence in appropriately recommending RTP and RTL guidelines to patients and families. The survey responses to items 8-10 were rated very highly, reflecting the providers’ beliefs that a standardized approach to care would be valuable to the providers, patients, and the office. The standardized approach was also mentioned twice in the post-education survey open-ended responses as valuable information and how providers believed their practice would change. These findings are important as indicators for future sustainability of the project in this office.

Beyond the findings suggesting the project’s impact on the objectives, it was also identified that providers who initially scored lower, indicating lower levels of confidence in providing concussion care to adolescents, had the greatest shifts in responses. This suggests that providers with less confidence may benefit the most from a project such as this one. However, even those providers with higher initial scores reported a positive shift, easily seen in Figure 10 of provider three’s pre- and post- responses. Despite initial confidence levels, all providers may benefit from the education.

**Implications for Practice**

These findings support the use of educational presentations with resource materials as a useful method to communicate evidence-based processes to clinical practitioners in the health care setting. This project does appear to have helped bridge the gap for providers to be able to also correctly apply the RTP and RTL guidelines for the patients and families, as ratings for these specific items increased following the presentation. Additionally, new guidelines were cited three times in the post- survey
open-ended responses as the most valuable information gained from the session and it was noted that practice will change by following them. The findings also support this type of project as a method to impart a standardized approach to evaluation and management of concussion in adolescents at a primary care office.

Future research to further evaluate efficacy of educational sessions for improving knowledge and practice confidence of providers will require larger sample sizes in order to run statistical analyses, increasing the strengths of the findings. In order to evaluate sustainability of projects such as this one, a future chart audit would be recommended. Finally, future efforts to improve care of this patient population at this site, may look to focus on the RTP aspect of care. While an item on this topic in the survey was rated more positively post-session, the post-education survey interpolated median was 5.63, the lowest for all items.

**Key Facilitators**

There were two key facilitators of this project. First, was the site mentor. She was able to provide contacts for assessment purposes and assistance with the IT system. She also facilitated the ability to present the education session at a provider meeting, often speaking with the office manager on the student’s behalf. The second facilitator was a member from the IT department. This person not only explained the EHR system to the student but also alerted her to potential barriers and provided suggestions along the way. She placed the request to change the SCAT 2 total score to SCAT 3, and built the MacroText template for the RTL education. She also provided the student with screenshots to help make decisions about the documentation pathway, and readily answered all questions.
Barriers

There were a few barriers during the project implementation. First, was the lack of involvement from the office manager in the project. While the student attempted contact on a number of occasions, the manager frequently was not responsive to these attempts. Most communications with the manager had to be made via the site mentor. This made it more difficult to be involved at the organization and participate in office activities outside of the project.

The next barriers were not discovered until the day of implementation. The laptop computer used to connect to the projector was having technical issues. The student was unable to project the PowerPoint and had to speak without the visual aid. While the providers did have printouts of the PowerPoint slides, they were eating lunch and unable to easily follow along with the oral presentation. Also, since the student gave the education presentation at the start of a provider meeting which took place over the lunch hour, four providers were late to the meeting and missed part of the presentation. This caused an already expected small sample size, to become even smaller as the tardy providers were unable to participate in answering the surveys. This ultimately led to the change in how the data was analyzed.

It is also important to recognize the barriers affecting the sustainability of this project and the factors outside of the office affecting care of these patients. Three of the providers in the office were unable to attend the provider meeting and missed the education presentation entirely. The student did leave resource folders at the office for these providers. However, there is no way to know if they reviewed the resources, and it is known that they missed key discussion on certain points of emphasis during the
presentation, such as making sure to perform a SCAT 3 assessment at every appointment and having it barcoded and faxed to the EHR. Additionally, four providers arrived late to the presentation and missed some of the discussion. Without all providers hearing the same information, even with having the print resources, this may make it less likely for them to adopt the evidence-based process and documentation practices.

Outside of the office, barriers to care include parental and patient adherence to the treatment plan. Research suggests that for over half of concussed patients, the most distressing part of the injury is the loss of activity from either symptoms or the prescribed treatment. The emotional and social effects of treatment can potentially decrease adherence to treatment (Stein et al., 2016).

**Unintended Consequences**

A positive unintended consequence was the fostering of a professional relationship with this site. This was not a main goal of the project, however, one of the barriers identified early on was an office manager who “supported the project as long as she did not have to be involved.” While the student was at the site doing follow-up after the education presentation, which the manager attended, the student was approached by the manager. The manager thanked the student for the project and acknowledged her time and efforts spent on it. She recognized that she had received positive feedback from providers on the presentation, and that it was valuable to the office. During this time the site mentor was able to offer that a third-year DNP student was planning to do a scholarly project at the site the next year. This project was able to, hopefully, pave the way for future student work at this site, promoting a relationship between the site and the university, for further scholarly efforts such as this one.
Clinically, the unintended consequences for the most part remain to be seen with this project. One provider had been using SCAT2 and did not realize it had been updated to SCAT3 and switched immediately to the newer version. An intention of the project was for the providers to use SCAT3, but it had been assumed they were knowledgeable of the document and just not using it. Since the frequency of adolescents with concussion is lower than other diagnoses, it may take some time before positive or negative consequences appear in the patient population.

**Recommendations**

For future projects at this site, one recommendation is to allow the education presentation to be at the end of the provider meeting. This would have ensured that any provider entering late would be able to participate. In the case of this project it would have meant four more participants and an increased sample size to 11. The larger sample size would have made the analysis more feasible, but more importantly, allowed all providers to hear the same information and discussion, potentially increasing the utilization of the project. All providers were sent e-mails with follow-up information and the site mentor received all documents included in the resource folder in online versions for future replication and distribution as new providers come into the office.

Another recommendation, if possible, is to consider allotting 20 minutes during the meeting for the student’s presentation. While 15 minutes was workable, it was rushed and some information was left out due to the time constraint, and providers were simply directed to their handouts. Specifically, there was not enough time to walk through the recommended adolescent concussion clinical pathway, only small pieces were highlighted. One of the questions at the end of the presentation was about local referrals
and resources. There was a handout specifically addressing these questions, but providers had to be directed to this information and it was only briefly addressed by the student.

Specific to the sustainability of this project, it is recommended to increase appointment times for this patient population to thirty minutes. This time would allow the providers the ability to actually complete the recommended process, which includes completing the SCAT3 assessment at each appointment, and provide patient education. It is recommended to follow the clinical pathway and documentation pathway tools in order to increase consistency among practitioners, and improve continuity of care for patients. In order to evaluate the sustainability of this project and whether providers are adhering to the recommended evidence-based process and documentation suggestions, a chart audit is encouraged. This will allow the providers to see which aspects of the process are being followed and which areas need improvement. This allows for a tailored re-education of specific topics.

Future work with concussion in adolescents may be focused on RTL and partnerships with schools. The literature review found that there were no widely-followed protocols for RTL practices, however attempts were being made. Often cited was the need for partnerships between the medical team and schools in being able to produce a plan for the patient returning to school (Graham et al., 2014). Additionally, further attention on learning the RTP recommended guidelines and how to apply them should be considered. While answers to the RTP specific item of the survey shifted towards greater confidence at the post-education survey, the interpolated median remained the lowest of the questions.
Another potential area of future focus is making sure the patient actually follows through with the proposed treatment plan. There is concern that once the patient leaves the office, he or she may not rest appropriately. This may be because schools do not have the appropriate guidance in how to assist the patient at school, and fall short in their support (Olympia, Ritter, Brady, & Bramley, 2016). Another factor may be the emotional and social effects of treatment, so the provider may need to help the patient find alternative sources of fulfillment in these areas until treatment is complete (Stein et al., 2016).

Finally, the knowledge and research on concussion is growing considerably, as it is a current hot topic in healthcare. The 5th International Consensus Conference on Concussion in Sport was held October of 2016 and a new Consensus Statement was expected out in the spring of 2017, soon after the project was completed. As the 2012 Statement was the most widely cited literature on concussion, this new statement was highly anticipated in the healthcare community. This document is one that would be a great place to start with continuing education on the topic. Providers need to keep up-to-date on new research becoming available on management of concussions, updating the evidence-based process presented to them, as needed.

**Relationship to Other Evidence/Healthcare Trends**

The project outcomes were congruent with other research. Zonfrillo et al. (2012) concluded at the end of their study that “specific provider education, decision support tools, and patient information could help enhance and standardize concussion management” (p.1120). This project was the delivery of provider education, along with a clinical decision support tool. The findings through the surveys support that the
providers at the primary care office believed it would help standardize their care of concussions in adolescents.

Likewise, Zemek et al. (2014) identified gaps in concussion care in being able to appropriately apply RTP and RTL guidelines. This project aimed to bridge this gap for the providers at this office and findings suggest that the project did lessen this gap. Additionally, Graham et al. (2014) identified a general lack of literature on concussion management in the adolescent patient. While this project did not contribute any research data for management of this patient population, it does add to literature for implementing work with this population. The project supported the need for further assistance to PCPs in managing these patients, and offered an evidence-based approach for doing so. As newer research is published, it could be disseminated in a manner similar to the methods used in this project.

Goal Achievement

The goals of this project were achieved. From an evaluation standpoint, the biggest drawback was not having a large enough sample size to run statistical analysis. However, in retrospect the student recognizes that even if all 14 potential participants would have been able to complete the surveys, the sample size would have still been limiting the findings. If this project is implemented at further sites, there is potential to increase the sample size and run the statistical analyses, potentially strengthening findings. Within the scope of this project, the objectives were still deemed to be met through descriptive analysis of the data. The feedback from the open-ended questions supported that appropriate variables were evaluated. One participant wrote in response to “what was the most valuable information gleaned from this presentation?” “Excellent
presentation- I have a better understanding of guidelines and how to assess RTP and RTL.” This response articulates what the student had set out to achieve.

Through the development of this project, the student also reached many goals in relation to becoming a DNP prepared nurse practitioner. The project pushed her beyond comfort levels, pressing her to advance skills in organizational assessment, evaluation of evidence, development of a project with outcome evaluation, and being a leader in the healthcare system. These achievements reflect the attainment of the DNP Essentials.

**Reflection on Enactment of DNP Essentials**

There are eight *Essentials of Doctoral Education for Advanced Nursing Practice*, (AACN, 2006) which are considered the required competencies of doctoral nursing education. Each Essential should be addressed by DNP students throughout their education, however the depth of focus on each Essential may vary, based on the role for which the student is preparing (AACN, 2006, p. 8). Most of these eight Essentials were addressed and advanced, though to varying degrees, throughout the development, implementation, and analysis of this project, and will be briefly discussed in the following sections.

**Scientific Underpinnings for Practice**

This project was developed with both the andragogy theory and the PARIHS framework as the guiding theories. The theory of andragogy was used to guide the development of the educational presentation and the resource folder that was given to the providers. It was also used to build the surveys used to evaluate the educational portion of the project. The PARIHS framework was used as a method for assessing the
organization at the start of the project, for developing the educational presentation, and for the evaluation of sustainability potential.

**Organizational and Systems Leadership**

The first step in this project was performing an organizational assessment. This allowed the student to determine the needs of the organization, the supportive elements of completing a project at that site and the barriers that may need to be addressed in order to have a successful project. The SWOT analysis in Appendix D, offers a brief visual summary of this assessment. It was determined through the assessment completed using the PARIHS framework, that the site was supportive of change and would be ideal for implementation of the evidence-based process.

**Clinical Scholarship and Analytical Methods for Evidence-Based Practice**

This Essential was one on which there was an in-depth focus, due to the nature of the project. This project was a quality improvement project, aimed at promoting safe, effective, and efficient care for patients through the development of an evidence-based process for evaluating and managing concussion in the adolescent patient. An extensive literature review was performed specifically on RTP and RTL guidelines. Overall, while developing the evidence-based process recommended to the office and resource folder given to providers, the student read and studied over 80 journal articles and books, selected from hundreds of documents, to guide and support her work.

**Information Systems/Technology and Patient Care Technology**

Initially the informational technology system Essential was not expected to be a component to this project. Through the organizational assessment, this was actually an area determined to be a barrier. Some of the providers were not documenting in the
electronic health records (EHR) system in a way that promoted effective or efficient follow-up care. This project ultimately included a recommendation for documentation practices in the existing EHR system, a request to the IT department to update the SCAT 2 total score to read SCAT 3 in the EHR system, and the creation of a template to use in discharge instructions on RTL education.

**Healthcare Policy for Advocacy in Health Care**

The healthcare policy Essential was one with less emphasis in this project. However, policy was still a component. In the research process during the organization assessment stage, both state level and national level policies and advocacy efforts regarding concussion management were reviewed. Understanding that the state of Michigan requires, as of June 30, 2013, written clearance from a health professional before a child is allowed to return to play after a concussion, is important for the support of a project such as this one (Michigan Department of Health & Human Services, 2017). Similarly, recognizing that there are national efforts to improve concussion care, such as asking for money in the President’s Budget to establish a National Concussion Surveillance System, emphasizes the attention to this topic and the advocacy for improving patient outcomes (Centers for Disease Control and Prevention, 2016).

**Interprofessional Collaboration**

The majority of this project was designed by the student alone. However, the information was developed to be used by family medicine physicians, pediatricians, a pediatric nurse practitioner, a family nurse practitioner, and physician assistants, alike. Additionally, there was assistance from staff from the IT department who spent time explaining the EHR system, identifying current documentation practices, placing a
request to the EHR vendor to change the SCAT 2 total score to SCAT 3, and creating the
template for RTL discharge education. Also, there was work with a statistician and
graduate statistics students at the GVSU Statistical Consulting Center, in reviewing
surveys and determining appropriate methods to analyze data.

Clinical Prevention and Population Health

The adolescent population is vulnerable to the effects and consequences of
concussion due to their still developing and changing brains (Graham et al., 2014). It is
also known that concussions account for 10% of all high school athletic injuries and in
certain sports the incidence is even higher (Provance et al., 2016). Sports-related
concussion is an injury that affects children and adolescents at a much higher rate than in
the adult or even in the collegiate athlete (Pfister, Pfister, Hagel, Ghali, & Ronksley,
2016). Yet, despite these numbers, the amount of research on concussion in this
population is limited, along with guidelines specific to this group (Graham et al., 2014).

Advanced Nursing Practice

The competencies addressed by the last Essential were heavily applied, and
certainly made the difference between practicing as a registered nurse, as compared to the
new advanced nursing practice role. This project allowed the student to do an extensive
assessment of an organization and a health issue, and create an evidence-based program
to attempt to try and improve the care of the adolescent patient presenting with
concussion. It also became an experience in learning thorough evaluation skills and
intervening with patients with the most up-to-date guidelines for the student as well. It is
important during practice to realize the research and efforts put into what is
recommended to patients and families, and understand how and why they change. The
project also pushed the student past her comfortable boundaries of direct patient care, to also facilitating change at an organization, being in a leadership position and managing all of the responsibilities that come with this role.

**Role Discussion**

Ultimately, the development of this project has contributed significantly to preparing the student for her future role as a DNP prepared pediatric nurse practitioner. The learning and growth that occurred during this process was unexpected. At the start of the project the student looked at the work as an overwhelming step to overcome in order to receive a degree. Having never attempted or completed anything similar to this work, it was daunting and the pathway to the end obscured by the unknown.

The project ended up presenting itself early on during a clinical rotation at the site. The clinical fell during the fall months, and there was an increase in patients presenting with concussion. At this point a pediatrician mentioned to the student that it would be something they would love some help with at the office, to have a plan on how to approach these patients and their care. For the next months the student grew relationships with pediatric providers and observed the daily functioning and processes of the office. During this time, the project started to take shape as it became clearer how the student may be able to help the office, and what kind of information she needed to be searching for.

Once the dedicated work on the project began, the student became absorbed and passionate about the topic, realizing the vast amount of literature in existence, but relatively limited guidance to health care providers on how to manage concussion. It was a struggle to reign in the search, because it was all interesting, but the pertinent
information needed to be identified in order to assist the PCPs. Following the steps in conducting a scholarly project was key to being able to narrow the scope of the review, and to stay focused. Determining the objectives and metrics for the objectives was also crucial to building the project. As the project continued it was easy to see how all of the previous education in the DNP program was all starting to come together, so the student realized she actually did have the toolkit to support her in this process.

The student utilized her advisor and committee members for guidance during the project development. With their support, the student gained confidence in her abilities to take on the leadership roles in the multiple areas identified in the previous mentioned competencies. At the completion of the final project, the student has gained appreciation for the process as an important component to earning the degree. It has prepared her to go beyond providing excellent clinical care to patients, but also recognize the processes supporting said care. She can now identify problems in practice and develop procedures and methods to improve them, ultimately improving care for her patients. The skills and knowledge developed through the DNP program and particularly participation in the scholarly project, make the difference between a registered nurse and the advanced nursing practice role.

**Conclusion**

The implementation of education on a designed evidence-based process focused on the management of concussions in adolescent patients for a primary care office was successful. The main objective was to improve the confidence in primary care providers’ abilities to evaluate and manage adolescents presenting with a concussion, with the most up-to-date clinical guidelines and recommendations. Findings indicate this objective was
met, along with specifically improving provider confidence in the ability to appropriately recommend RTP and RTL guidelines. A standardized approach to evaluation and management was found to be valued by the providers and many expected their practice to change to following the recommended approach. The gap from providers being able to appropriately diagnose concussion, but also appropriately apply evidence-based practice recommendations, was lessened by this project. The providers have increased confidence in their ability to care for this patient population, and were left with resources to support them in achieving this. It is the hope that this will translate into high-quality, standardized, and continuity of care for patients, the goal of evidence-based practice.
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**Tables 1-2**

### Table 1

**Cumulative Pre- and Post-Education Responses per Question**

<table>
<thead>
<tr>
<th>Question</th>
<th>Pre-education</th>
<th>Post-education</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>1. Feel well-trained in evaluation of concussion</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>2. Feel poorly-trained in management of concussion *</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>3. Often reference clinical guidelines/medical literature</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>4. Currently use a standardized concussion assessment tool</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>5. Feel confident I am providing up-to-date clinical management</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>6. Appropriately recommend RTP guidelines</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>7. Appropriately recommend RTL guidelines</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>8. Would like clinical decision support tools</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>9. Believe standardized approach to evaluation will benefit the office</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>10. Believe standardized approach to management will hinder the office *</td>
<td>5</td>
<td>7</td>
</tr>
</tbody>
</table>

Note. Inter Mdn = Interpolated Median. Questions are shortened versions of the full statements included in survey. * These responses were reverse coded for analysis

### Table 2

**Cumulative Responses for each Provider**

<table>
<thead>
<tr>
<th>Provider</th>
<th>Pre-education</th>
<th>Post-education</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>7</td>
</tr>
</tbody>
</table>

Note. Inter Mdn = Interpolated Median.
Figures 1-3

Figure 1

Figure 2

Figure 3
Figures 4-7

Figure 4

Figure 5

Figure 6

Figure 7
IMPLEMENTATION OF AN EBP PROCESS

Figures 8-12

Figure 8

Figure 9

Figure 10

Figure 11

Figure 12
Appendix A

Graduated return to play protocol

<table>
<thead>
<tr>
<th>Rehabilitation stage</th>
<th>Functional exercise at each stage of rehabilitation</th>
<th>Objective of each stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No activity</td>
<td>Symptom limited physical and cognitive rest</td>
<td>Recovery</td>
</tr>
<tr>
<td>2. Light aerobic</td>
<td>Walking, swimming or stationary cycling keeping intensity &lt; 70% maximum permitted heart rate No resistance training</td>
<td>Increase HR</td>
</tr>
<tr>
<td>exercise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Sport-specific</td>
<td>Skating drills in ice hockey, running drills in soccer. No head impact activities</td>
<td>Add movement</td>
</tr>
<tr>
<td>exercise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Non-contact</td>
<td>Progression to more complex training drills, eg, passing drills in football and ice hockey May start progressive resistance training</td>
<td>Exercise, coordination and cognitive load</td>
</tr>
<tr>
<td>training drills</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Full-contact</td>
<td>Following medical clearance participate in normal training activities</td>
<td>Restore confidence and assess functional skills by coaching staff</td>
</tr>
<tr>
<td>practice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Return to play</td>
<td>Normal game play</td>
<td></td>
</tr>
</tbody>
</table>

Appendix B

Andragogy in Practice Model

Appendix C

A three dimensional matrix in which evidence, context, and facilitation can either be expected to influence the outcome in a positive or negative way.

## Appendix D

### Organization SWOT Analysis

<table>
<thead>
<tr>
<th>Internal</th>
<th>Economic Trends:</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCO STRENGTHS (+)</td>
<td>• Included in the 2017 President’s Budget is a request for $5,000,000 to establish and oversee a National Concussion Surveillance System</td>
</tr>
<tr>
<td>• PCO is a pilot site for change initiatives amongst the larger organization</td>
<td></td>
</tr>
<tr>
<td>• Staff embraces change</td>
<td></td>
</tr>
<tr>
<td>• Office Manager makes efforts to change</td>
<td></td>
</tr>
<tr>
<td>• Pediatric providers approached DNP student with concussion project need</td>
<td></td>
</tr>
<tr>
<td>• Vested and highly-motivated student facilitator</td>
<td></td>
</tr>
<tr>
<td>• Implemented a new computer system in January 2016 which has ability to document SCAT 2 assessment total</td>
<td></td>
</tr>
<tr>
<td>• Organization includes vision “team will continuously innovate to deliver high quality care that is comprehensive, coordinated, accessible, and personalized.”</td>
<td></td>
</tr>
<tr>
<td>• Guiding behaviors include “We are continuous learners.”</td>
<td></td>
</tr>
<tr>
<td>• Currently no standard practice all providers follow when managing concussion patients</td>
<td></td>
</tr>
<tr>
<td>• Fiscally secure office</td>
<td></td>
</tr>
<tr>
<td>Economic Trends:</td>
<td></td>
</tr>
<tr>
<td>Political Trends</td>
<td>• Included in the 2017 President’s Budget is a request for $5,000,000 to establish and oversee a National Concussion Surveillance System</td>
</tr>
<tr>
<td>• On June 30, 2013 Michigan approved legislation to regulate sports concussion and return to athletic activity</td>
<td></td>
</tr>
<tr>
<td>Socio Cultural Trends</td>
<td>• Concussions have been receiving national media attention, making headlines, even been the focus of a Hollywood movie</td>
</tr>
<tr>
<td>• Hopefully next year there will be a national surveillance system to start tracking concussions and outcomes, both short-term and long-term</td>
<td></td>
</tr>
<tr>
<td>Technical Trends</td>
<td></td>
</tr>
<tr>
<td>• No current formal concussion surveillance system for tracking outcomes</td>
<td></td>
</tr>
<tr>
<td>PCO WEAKNESSES (+)</td>
<td></td>
</tr>
<tr>
<td>• Office Manager approved project at office as long as she “does not have to be involved.”</td>
<td></td>
</tr>
<tr>
<td>• Sick visits are typically only slotted for 15 minute intervals</td>
<td></td>
</tr>
<tr>
<td>• No official process for implementing clinical changes</td>
<td></td>
</tr>
<tr>
<td>• Lack of change process leads to no established measurements of evaluation</td>
<td></td>
</tr>
<tr>
<td>• Due to copyright and licensing issues, unable to get full SCAT 3 assessment into EHR more than just a total score, limited usefulness without specific questions/answers being visible to providers</td>
<td></td>
</tr>
<tr>
<td>Economic Trends</td>
<td>• Unsure if the National Concussion Surveillance System budget will be approved</td>
</tr>
<tr>
<td>Political Trends</td>
<td>• Currently an election year, potential changes in leadership tends to stall political decisions</td>
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<td>Socio Cultural Trends</td>
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<tr>
<td>• While the culture is slowly changing, still many athletes are expected to stay “tough” and are under pressure to keep playing despite injury, especially for big games</td>
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<tr>
<td>Technical Trends</td>
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<tr>
<td>• No current formal concussion surveillance system for tracking outcomes</td>
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</table>
Appendix E

A1 Survey
Please provide a birthdate of a loved one. This information will be used for matching purposes only and all answers will remain anonymous. Birthdate (xx-xx-xxxx) ____________

Please rate your level of agreement with the following statements regarding treating adolescents with concussion:

<table>
<thead>
<tr>
<th>Statement</th>
<th>1</th>
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<tbody>
<tr>
<td>1. I feel well-trained in the evaluation of concussion in an adolescent patient.</td>
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<td>3. I often reference clinical guidelines/recommendations or medical literature when treating an adolescent with concussion</td>
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<td>4. I currently use a standardized concussion assessment tool when I evaluate adolescents presenting with concussion</td>
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<td>5. I feel confident that I am providing the most up-to-date clinical management for this patient population.</td>
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<td>6. I feel confident that I appropriately recommend Return to Play (physical activity) guidelines.</td>
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<td>7. I feel confident that I appropriately recommend Return to Learn (cognitive activity) guidelines.</td>
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<td>8. I would like clinical decision support tools to assist me in management of this patient population.</td>
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<td>9. I believe a standardized approach to evaluation of these patients, along with standardized documentation practices, will benefit the office and patients.</td>
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<tr>
<td>10. I believe a standardized approach to management of these patients, along with standardized documentation practices, will hinder the office and patients.</td>
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</table>

Open-Ended
11. What aspect of providing care to a concussed adolescent do you find the most difficult?

12. Which aspect of management do you feel the least confident about?
### Appendix F

PowerPoint Outline and Rationale

<table>
<thead>
<tr>
<th><strong>PowerPoint Topic</strong></th>
<th><strong>Rationale</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Objectives of the presentation</td>
<td>Step in creating the learning experience is preparing the learners for the program. Sharing the objectives not only prepares the providers, but also announces the goals and purposes of the learning another aspect of the andragogy model (Holton et al., 2001).</td>
</tr>
<tr>
<td>Complications: Symptoms, post-concussion syndrome, second-impact syndrome, chronic traumatic encephalopathy</td>
<td>“Adults need to know why they learn something before they learn it” (Holton et al., 2001 p.120) a core principle of the andragogy model. In this case the “why” the providers need to learn an evidence-based process for managing concussions is to prevent the complications</td>
</tr>
<tr>
<td>Brief General Summary of Literature Review</td>
<td>According to the PARIHS framework, a key component to successful evidence based practice implementation, leading to sustainability, is having high evidence to support the proposed evidence based change (Kitson et al., 1998).</td>
</tr>
<tr>
<td>RTL Key Points</td>
<td>RTL is a main component of adolescent concussion management and also further summarizes key findings from the literature review, it is the evidence component of the PARIHS framework</td>
</tr>
<tr>
<td>RTP Key Points</td>
<td>RTP is a main component of adolescent concussion management and also further summarizes key findings from the literature review, it is the evidence component of the PARIHS framework</td>
</tr>
<tr>
<td>Evidence-based process/Clinical Pathway</td>
<td>A visual, easy to reference tool that includes the findings of research. Consistent application of evidence-based management using guidelines may help reduce impact of concussion and persistent postconcussive issues in adolescents (Zemek et al., 2014). In one study, clinical decision support tools/pathways were identified as being helpful by 96% of providers (Zonfrillo et al., 2012). Additionally, during the organization assessment, the DNP student</td>
</tr>
</tbody>
</table>
was approached by providers for the project, expressing they often felt unprepared for evaluating and treating concussion patients, and would like some assistance in that. Having the learners identify their own needs and objectives in education leads to a more successful educational program according to the andragogy model (Knowles et al., 2005).

**Standardized Documentation**

- During the organizational assessment, the lack of standardized documenting processes amongst providers was identified as a barrier in performing follow-up exams on patients seen initially by another provider, limiting ability to assess for status change. Acknowledging this context of the current practices and working to improve it is working through the lens of the PARIHS framework in order to promote sustainability. This also recognizes creating a successful learning situation in the andragogy model, by taking into account the learners’ own objectives and identifying their own learning needs, in order to have a more successful education program (Knowles et al., 2005).

**Final Recommendations**

- Final recommendations summarizes the PowerPoint but will also be encouraging the providers to stay current on concussion research and continue to look at new changes and recommendations that will be coming out, it will highlight that concussion management is expected to change, and soon This speaks to the self-concept of the learner, as the adult learner is autonomous and self-directing in the andragogy model (Knowles et al., 2005) so at this point the DNP student is facilitating this learning principle.
Appendix G
Adolescent Concussion Clinical Pathway

Adolescent presents to office for concussion evaluation

Provider performs initial evaluation, including SCAT 3

Evaluation Results (Red Flags):
- Worsening headache
- Persistent vomiting
- Focal neurological deficits
- Lethargy
- Seizures (beyond time of injury)
- Worsening confusion
- Slurred Speech

Send patient to the Emergency Department for further evaluation

Is patient currently experiencing concussion symptoms?

Yes
- Worsening irritability
- Unusual behavioral changes
- Skull fracture suspected/proven
- Weakness/numbness in arms or legs
- Change in state of consciousness

Send patient to the Emergency Department for further evaluation

No

May start return to activity.
- If patient has returned to school with no problems or symptoms, then may being return to play (RTP).
- Evaluate how many days since initial injury and if the patient has already resumed some activity, determine where in RTP protocol patient is. Remind patient and family that it should take minimally 6 days before full RTP!

Schedule follow up appointment based on day of completion of RTP in order to be cleared for full return to play (note: if school has on-site certified athletic trainer following patient, may skip office follow-up and be cleared by athletic trainer if patient and family comfortable with plan)

At follow-up: symptoms present but improved and <3 weeks post-injury: Follow-up with provider in 1 week

At follow-up: symptoms worsened or unimproved, Refer to specialist/concussion clinic

Factors that may prolong recovery/Risk for postconcussion syndrome:
- Hx of previous concussion
- Hx of headache
- Hx of developmental delay
- Comorbid conditions such as: Depression, other mental health disorders, ADHD, learning disabilities

When to Refer:
- Hx of multiple concussions, with subsequent injuries happening with less force, symptoms becoming more severe, and longer in duration
- Worsening or unimproved symptoms at follow-up
- Residual neurocognitive problems after all other symptoms resolved
References
Appendix H

Resources

Concussion Toolkit for Medical Professionals- Provides interactive SCAT 3 on-line, scoring the assessment, and has an option to print the completed form

http://physicians.cattonline.com/scat/

HEADS UP to Health Care Providers- Access to a free CDC online training module for concussions (free continuing education credits), and other clinical tools

https://www.cdc.gov/headsup/providers/index.html

Michigan Sports Concussion Law- Information on Michigan's concussion laws, access to a printable medical clearance return-to-play form, and other resources

http://www.michigan.gov/mdhhs/0,5885,7-339-71548_54783_63943--,00.html

Center for Concussion: The REAP Project- An example of a Community-Based Concussion Management Program with some great information for providers, families, and schools


Local Referrals

Mary Free Bed Post-Concussion Outpatient Clinic
616-840-8005
800-668-6001

Spectrum Health Sports Medicine
616-267-8860

Spectrum Health Sports Medicine Concussion Clinic (Fall Sports Season Only)
616-267-7600

Mercy Health Hauenstein Neuroscience Center – Dr. David Ehrhardt
616-685-5050

Helen DeVos Pediatric Neurology
616-267-2500
### Appendix I

**Return To Play (RTP) Key Points**

- The patient should **never** RTP the same day of injury!
- The patient with a concussion does not need imaging studies… unless there is concern for more serious injury such as a skull fracture or bleed.
- Reassure patients and families that 90% of patients will be fully recovered within 7-10 days after injury.
- RTP protocol should not be started until patient has returned to school without any problems or symptoms. Return-to-learn comes first.
- If at any point during activity the patient experiences symptom return, he or she needs to stop and return to previous step of protocol.
- Patient should spend at least 24 hours symptom free at each level before moving to the next level.
- The protocol should take **at least 6 days** to complete before the patient is at full RTP.

The return to play protocol from the 2012 Consensus Statement on Concussion in Sport

<table>
<thead>
<tr>
<th>Rehabilitation stage</th>
<th>Functional exercise at each stage of rehabilitation</th>
<th>Objective of each stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No activity</td>
<td>Symptom limited physical and cognitive rest</td>
<td>Recovery</td>
</tr>
<tr>
<td></td>
<td>Walking, swimming or stationary cycling keeping intensity $&lt; 70%$ maximum permitted heart rate No resistance training</td>
<td>Increase HR</td>
</tr>
<tr>
<td>2. Light aerobic exercise</td>
<td>Skating drills in ice hockey, running drills in soccer. No head impact activities</td>
<td>Add movement</td>
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<tr>
<td>3. Sport-specific exercise</td>
<td>Progression to more complex training drills, eg, passing drills in football and ice hockey May start progressive resistance training</td>
<td>Exercise, coordination and cognitive load</td>
</tr>
<tr>
<td>4. Non-contact training drills</td>
<td>Following medical clearance participate in normal training activities</td>
<td>Restore confidence and assess functional skills by coaching staff</td>
</tr>
<tr>
<td>5. Full-contact practice</td>
<td>Normal game play</td>
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<tr>
<td>6. Return to play</td>
<td>Normal game play</td>
<td></td>
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</tbody>
</table>
References
Appendix J

Return to Learn (RTL) Key Points

- Patient should be successfully back to school without any problems before starting RTP.
- Depending on the day injury occurred, consider missing at least 1-2 days initially.
- When patient’s symptoms are tolerable, short lived, and/or responsive to rest and intervention, then the patient may return to school.
- Consider a cognitive trial at home before returning to school, if patient can tolerate 30-45 min of cognitive activity at home then he or she can RTL with accommodations as needed.
- Symptom threshold is key idea of RTL – the patient should not participate in activities if they produce symptoms or worsen them.
- If a student is needing academic accommodations, he or she should not be permitted to participated in physical education classes.
- Types of school accommodations: absence from class or activity, increased time to increase tasks, removal of distractions, and monitoring and support.

Accommodation Examples
- Rest periods during the day
- Shortened day
- Extended test time or assignment deadlines
- Preferential classroom seating
- Permission to wear sunglasses
- Avoidance of noisy environments, i.e. cafeteria, assemblies
- Use of a reader for assignments/testing
- Use of a note taker/scribe
- Temporary assistance from tutor
- Monitor backpack weight, stair usage, playing of wind instruments
References


Appendix K

Adolescent Concussion Documentation Pathway

Family Practice Provider

Document HPI under HPI-Concussion-CHILD

Document Appropriate findings under Neurology Exam **

Detailed Neuro Exam should include: mental status, cognitive functioning, gait, and balance (Note: If you performed SCAT 3, you will have findings for all of these important components to concussion evaluation)

Document SCAT 3 total under Screening Section > SCAT 2 Total score (note there is a current request for SCAT 2 total score to be updated to SCAT 3 total score)

Pediatric Provider

Document HPI under Concussion/Head Injury-CHILD

Document Appropriate findings under Neurology Exam **

In Discharge Instructions: Include care instructions from Healthwise: Concussion in Children: Care Instructions and Returning to Activity After Childhood Concussion: Care Instructions, also pull in the Text Macros on ReturnToLearningAfterAConcussion:CareInstructions

Make sure to have team member barcode the completed SCAT 3 form and fax it to Athena so it can be tied to the patient encounter

* The HPI templates for family practice and pediatrics are the same, only named differently
** The Neuro exam templates for family practice and pediatrics do differ
### Appendix L

**B1 Survey**

Please provide the same birthdate of the loved one you gave on the A1 Survey. This information will be used for matching purposes only and all answers will remain anonymous.

Birthdate (xx-xx-xxxx) ______

Please rate your level of agreement with the following statements regarding treating adolescents with concussion after having received education from the DNP student:

<table>
<thead>
<tr>
<th></th>
<th>1. I feel well-trained in the evaluation of concussion in an adolescent patient.</th>
<th>2. I feel poorly-trained in the management of concussion in an adolescent patient.</th>
<th>3. I will likely reference the clinical guidelines/recommendations or medical literature provided to me when treating an adolescent with concussion.</th>
<th>4. I will use a standardized concussion assessment tool when I evaluate adolescents presenting with concussion.</th>
<th>5. I feel confident that I can provide the most up-to-date clinical management for this patient population.</th>
<th>6. I feel confident that I can appropriately recommend Return to Play (physical activity) guidelines.</th>
<th>7. I feel confident that I can appropriately recommend Return to Learn (cognitive activity) guidelines.</th>
<th>8. I believe I will use the clinical decision support tools provided to me to assist in management of this patient population.</th>
<th>9. I believe the standardized approach to evaluation of these patients, along with standardized documentation practices, will benefit the office and patients.</th>
<th>10. I believe the standardized approach to management of these patients, along with standardized documentation practices, will hinder the office and patients.</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Somewhat disagree</td>
<td>Neither agree or disagree</td>
<td>Somewhat agree</td>
<td>Agree</td>
<td>Strongly Agree</td>
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**Open-Ended**

11. What was the most valuable information gleaned from this presentation?

12. How do you think your practice will change after receiving the concussion education?
## Appendix M

### Project Timeline

<table>
<thead>
<tr>
<th>Task</th>
<th>Nov ‘16</th>
<th>Dec ‘16</th>
<th>Jan ‘17</th>
<th>Feb ‘17</th>
<th>Mar ‘17</th>
<th>Apr ‘17</th>
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<tr>
<td>Organizational assessment</td>
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<td>Literature Review</td>
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<td>Create surveys</td>
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<td>Evidence-based process and clinical decision support tools developed and put into print resource</td>
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<td>Apply for IRB approval</td>
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<td>Implement project: Presentation at provider meeting/delivery of print resources, pre and posttest taken</td>
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<td>Student prepares final projects and oral defense</td>
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<td>Final scholarly project defense</td>
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<td>Publish final project to ScholarWorks@GVSU</td>
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DATE: March 3, 2017
TO: Ashley Karczewski
FROM: Grand Valley State University Human Research Review Committee
STUDY TITLE: [1036101-1] Implementation of an Evidence-Based Process for the Management of Concussions in Adolescent Patients for a Primary Care Office
REFERENCE #: 17-173-H
SUBMISSION TYPE: Non-Human Subject Research Determination Form
ACTION: Not Research
EFFECTIVE DATE: March 3, 2017
REVIEW TYPE: Administrative Review

Thank you for your submission of materials for your planned research study. It has been determined that this project:

DOES NOT meet the definition of covered human subjects research* according to current federal regulations. The study, as proposed, is not "designed to develop or contribute to generalizable knowledge," and therefore DOES NOT require further review and approval by the HRRC.

If you have any questions, please contact the Office of Research Integrity and Compliance at (616) 331-3197 or rci@gvsu.edu. Please include your study title and reference number in all correspondence with our office.

*Research is a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge (45 CFR 46.102 (d)).

Human subject means a living individual about whom an investigator (whether professional or student) conducting research obtains: data through intervention or interaction with the individual, or identifiable private information (45 CFR 46.102 (f)).

Scholarly activities that are not covered under the Code of Federal Regulations should not be described or referred to as "human subjects research" in materials to participants, sponsors, or in dissemination of findings.

Office of Research Compliance and Integrity | 11 Campus Drive | 049 James H Zumberge Hall | Allendale, MI 49401 | Ph 616.331.3197 | rci@gvsu.edu | www.gvsu.edu/rci
Appendix O

NOTICE OF CLINICAL QUALITY IMPROVEMENT MEASUREMENT DESIGNATION

To: Ashley Karczewski, BSN, RN  
Grand Rapids, MI 49507

Re: IRB# 17-0223-8  
Implementation of an Evidence-Based Process for the Management of Concussion in Adolescent Patients for a Primary Care Office

Date: 03/13/2017

This is to inform you that the Mercy Health Regional Institutional Review Board (IRB) has reviewed your proposed research project entitled "Implementation of an Evidence-Based Process for the Management of Concussion in Adolescent Patients for a Primary Care Office." The IRB has determined that your proposed project is not considered human subjects research. The purpose and objective of the proposed project meets the definition of a clinical quality improvement measurement. All publications referring to the proposed project should include the following statement:

"This project was undertaken as a Clinical Quality Improvement Initiative at Mercy Health and, as such, was not formally supervised by the Mercy Health Regional Institutional Review Board per their policies."

The IRB requests careful consideration of all future activities using the data that has been proposed to be collected and used "provide an evidence-based process and clinical decision support tool to primary care providers in order to improve the confidence in their ability to evaluate and manage adolescents presenting with a concussion with the most up-to-date clinical guidelines and recommendations."

The IRB requests resubmission of the proposed project if there is a change in the current clinical quality improvement measurement design that includes testing hypothesis, asking a research question, following a research design or involves overriding standard clinical decision making and care.

Please feel free to contact me if you have any questions regarding this matter.

Brenda Hoffman, CIM  
IRB Chairperson

Copy: File