5-2006

Inoperative Hypothermia

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CONCUSSIONS: DEVELOPMENT OF A UNIVERSAL RETURN-TO-PLAY GUIDELINE FOR ATHLETES OF CONTACT SPORTS

by

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Bachelor of Science in Nursing, University of North Dakota, 2003

An Independent Study

Submitted to the Graduate Faculty

of the

University of North Dakota

in partial fulfillment of the requirements

for the degree of

Master of Science

Grand Forks, North Dakota

April

2012

PERMISSION

Title: Concussions: Development of a Universal Return-to-Play Guideline for Athletes of Contact Sports

Department: Nursing

Degree: Master of Science

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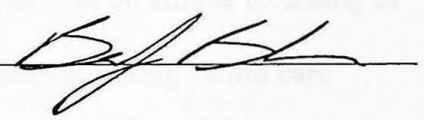
Signature 

Date April 12, 2012

Abstract

Sports-related concussions remain the most common head injury among athletes of contact sports. Recent estimates indicated the incidence of concussions range from 1.6-3.8 million cases per year in the United States (US). The importance of appropriate medical management of these patients is vital to their health and they should be allowed to return to their sport only after medical clearance. Concussion guidelines are currently available for primary practitioners to use in order to assist them in their clinical judgment of the concussed patient; the utilization and effectiveness of these guidelines remain in question. A literature review was performed to analyze the current use of guidelines available in the U.S. and to ascertain whether or not a universal, evidence-based, return-to-play guideline would be beneficial in assisting health care practitioners to make an informed decision about the safety of an athlete returning to play. The literature showed the current use of return-to-play guidelines among health care providers is scant. With numerous states recently mandating the management of the concussed athlete to be the responsibility of health care providers, health care institutions are going to see an increase in the number of these patients. Nurse practitioners need to be prepared to manage these patients safely and effectively.

Introduction

The most common type of head injury seen with athletes of contact sports is a concussion. The actual number of concussions suffered on a yearly basis by athletes is largely unknown, due to the number of concussions that are not identified or not reported. However, according to Harmon (1999), up to 20% of athletes who participate in contact sports will suffer a concussion at some time during their athletic career. Although most concussion injuries are mild and resolve without complications, it is important to evaluate and treat the patient returning from a concussion to avoid potentially life-threatening outcomes.

The management of an athlete who has suffered a concussion, including determining when the athlete is able to return to competition, remains largely controversial. Several return-to-play guidelines have been created to assist the clinician in determining the most objective reason to allow an athlete to return to their previous sport. Although there are over twenty return-to-play guidelines currently in use in the US, very few of these guidelines are evidence-based, and furthermore, none have been universally accepted (Randolph et al., 2009). Although each return-to-play guideline varies in its overall content, they are all in agreement that an athlete needs to be symptom-free before returning to play to decrease the incidence of a repeat concussion during the symptomatic post-concussive period.

In 2009, a study by Beaumont, et al., found that former athletes who sustained their last concussion in the past 30 years continued to have brain function decline. The brain function decline included memory loss, inability to perform simple motor skills, and overall cognitive impairment. This brain function decline was worsened by the number of concussions experienced by each athlete. Numerous other studies have supported the findings of the study

done by Beaumont. Due to the large number of return-to-play guidelines, it is virtually impossible to retrospectively critique what guideline was used for these athletes, and propose improvements to these guidelines in order to more effectively manage an athlete recovering from a concussion. With the development of a universal return-to-play guideline, this guideline could be critically analyzed on a routine basis to create an evidence base, which could be retrospectively studied to ensure athletes are being medically managed appropriately and are returning to their specific sport safely.

Purpose

More research needs to be done in developing a universal return-to-play guideline. The literature has shown some currently available guidelines have been effective in allowing athletes to return to play in a safe manner, but not all guidelines are equally effective. Furthermore, the majority of primary health care providers do not utilize a return-to-play guideline, when attempting to objectively decide on when an athlete may return to their sports after suffering a concussion.

The development of a universal return-to-play guideline along with appropriate education on how to properly use the proposed guideline needs urgent attention. Legislatures in numerous US states have recently required mandatory concussion management by a health care provider. By encouraging new research and bringing the issue of the lack of a universal return-to-play guideline to health care researchers, my hope is that this issue will receive the attention it deserves. By submitting an op-ed to a health care journal, I will have brought the attention of this issue to the appropriate people.

The literature review has revealed a significant amount of evidence that shows current guidelines are underused and result in inconsistent results when attempting to return an athlete to their sport safely. The literature has shown not only the need for the development of identification of a universal return-to-play guideline, but that this guideline should also be evidence-based, which means an increase in the current research being done in the area of return-to-play guidelines.

Significance

Concussions account for the most common head injury suffered by athletes of contact sports. Annually, the estimated United States (US) prevalence of concussions is estimated to be 1.1 million per year. Athletes who have suffered a concussion need to be medically managed appropriately and only allowed to return to play after a medical professional has deemed them to be able to return to their sport safely. Potential hazards of returning to play prematurely after a concussion consist of permanent neurologic impairment, development of second-concussion syndrome, and even death (Harmon, 1999).

Within the past few years, the states of Texas (2007), Washington (2009), Oregon (2009), and most recently, North Dakota (2011) have implemented specific laws aimed at decreasing the negative outcomes related to athletes returning to play too soon. Each state's law is specific as to what is expected in the management of concussed athletes; the general consensus is that an athlete must be medically cleared by a health care professional in order to be allowed to return to their sport. In North Dakota, the law requires all schools that sponsor or sanction athletic activities must adopt a concussion management program. This concussion management program requires "any student who is removed (from their sport) must be examined as soon as possible by

a licensed, registered, or certified health care provider and that the student does not return to competition or training until written permission is obtained by an authorized health care provider" (North Dakota, Office of the Governor, 2011).

As nurse practitioners are increasingly taking on the role of primary health care providers across the US, they will be relied upon more to manage athletes who have suffered a concussion, most notably in states where the management of a concussion by a health care provider is mandated. Literature has shown there is great discrepancy in how to objectively decide an athlete is able to return-to-play safely. Furthermore, research and funding in the area of return-to-play guidelines has been found to be lacking (Wiebe, et. al, 2011).

Theoretical Framework

The theoretical framework for a study of concussions is physiological. A concussion is defined as a traumatic brain injury resulting in an alteration in mental status from a forceful blow to the head or neck (Seidel, et al. 2011). Concussions can also be defined by the appearance of specific symptoms, such as: headache, cognitive impairment, (feeling as if in a "fog"), loss of consciousness, amnesia, irritability, slowed reaction times, and drowsiness (McCrory, et al. 2008). The trauma caused by an initial concussion very rarely causes permanent brain injury or fatal injury, rather, it is the combination of multiple concussions in a short time period, or the athlete returning to play too soon after a concussion, that results in more serious, and sometimes catastrophic brain injury.

Postconcussive syndrome is a syndrome that develops when an athlete returns to play prior to their initial concussion symptoms completely resolving. Postconcussive syndrome is characterized by prolonged symptoms (fatigue, headaches, balance disturbance, or difficulty

concentrating) of the initial concussion. The most serious effect of postconcussive syndrome is the serious sequelae known as second-impact syndrome (Seidel, et al. 2011). Second-impact syndrome results in a loss of autoregulation of the brain's blood supply. The athlete suffering from this syndrome may develop a rapid deterioration in their mental status followed by a sudden collapse; mortality for this group of athletes is quite high. Thus, an athlete who has suffered multiple concussions, versus a single concussion, is at a much higher risk of developing brain function deterioration.

The positive side of postconcussive syndrome and second-impact syndrome is that with proper medical management of the concussed athlete, both of these syndromes are completely preventable. Proper medical management should include the use of return-to-play guidelines to assist the practitioner in making the most objective clinical judgment as to how the athlete is recovering from their concussion. However, the effectiveness of current return-to-play guidelines have not fully been researched, few to none are currently evidence-based, and with the lack of a universal return-to-play guideline, the outcomes of athletes who are allowed to return to play are inconsistent.

Process

A review of the literature was conducted to critically analyze the current management of athletes who have suffered a concussion. The review included articles related to positive management outcomes, negative management outcomes, current return-to-play guidelines, compliance with the utilization of return-to-play guidelines, and analysis of brain function post-concussion. The search engines used were PubMed and Google Scholar from the Harley E.

French Library of Health Sciences. Search terms and phrases used were: *concussions, management of concussions, return-to-play guidelines, and brain function post-concussion.*

The search was limited to retrospective and longitudinal studies due to the usefulness of these studies in determining the effectiveness of the specific return-to-play guideline used, and whether or not an athlete suffered a second concussion, despite given the medical clearance to resume participation in contact sports. Several return-to-play guidelines were also analyzed to determine their subjective versus objective criteria in determining when an athlete may return to contact sports safely. Only guidelines currently being used by medical professionals were reviewed. Other return-to-play guidelines that have been proposed have not been utilized by health care professionals. These guidelines are theoretical. Other articles reviewed focused specifically on the idea that there may be a need to develop a "gold-standard" when it comes to return-to-play guidelines based on the fact that very few, if any, current guidelines are evidence-based and athletes recovering from a concussion, depending on which guideline was used, are managed differently, which results in a mix of positive and negative outcomes.

To effect change in clinical practice regarding the use and development of a universal return-to-play guideline for the management of concussions, an op-ed will be submitted to a health care journal. An op-ed will be a convenient and inexpensive way to reach a large audience of health care professionals regarding the use of a universal return-to-play guideline. A journal such as *The American Journal for Nurse Practitioners, Journal of the American Academy of Nurse Practitioners, The American Journal of Public* Health, or *Neurology* (the official journal of the American Academy of Neurology), are journals that would be appropriate for this type of op-ed. Showing the need for a universal return-to-play guideline will hopefully stimulate further

research in this area of health care, which ultimately could result in more positive outcomes for athletes who have suffered from a concussion in their lifetime.

Review of the Literature

It is documented in several articles that were reviewed that the use of return-to-play guidelines for management of athletes who have suffered a concussion are useful to health care professionals as a guide to assist them in the most objective reasoning possible as to when an athlete is able to return to their sport in a safe manner. Currently, several return-to-play guidelines or concussion severity scales are in use in the US to aid the health care professional in making a sound clinical decision as to when an athlete can safely return to contact participation.

Quantitative Studies

A retrospective study recruited 138 participants for a randomized-control study of the management athletes received after suffering a concussion (Schatz, Pardini, Lovell, Collins, and Podell, 2005). The sensitivity of concussion guidelines for their use as a guide to health care providers as an accurate way to objectively make a decision on an athlete's ability to return to play safely was analyzed. The study found the specific concussion guideline used had 81.9% sensitivity, and 89.4% specificity. Furthermore, the concussion guideline:

> Offers a thorough assessment of changes in cognitive functioning and symptom status following concussion, which is consistent with Concussion Sport Group recommendations that neuropsychological assessment become an integral aspect of concussion diagnosis and management. Ultimately, this will make participation in organized athletic programs safer for student athletes (p. 99).

A three-year surveillance study conducted from 2005-2008 discovered at least 40.5% of concussed athletes return to play prematurely, resulting in further, and preventable, brain injury due to second concussion syndrome (Yard & Comstock, 2009). The data was collected from 100 high schools in the US whose athletic enrollment was greater than 1000 student athletes. Overall, 1308 concussions were captured and studied. The most common reason for athletes in this study returning to play prematurely was found to be the underutilization of appropriate return-to-play guidelines. Given the detrimental and potentially catastrophic consequences of returning an athlete back to their sport prematurely; the findings in this study further stress the importance of the need for education on appropriate use of return-to-play guidelines.

In an attempt to identify an appropriate universal return-to-play guideline, a 24 item questionnaire was distributed to 65 athletic departments in the NCAA to isolate a dominant guideline commonly utilized by the majority of health care practitioners. The questionnaire used both multiple choice questions as well as a five-point Likert scale to assess which, if any, of the currently return-to-play guidelines were being utilized to manage athletes post-concussion. Of the 65 respondents, 47% utilized any return-to-play guideline, while 53% used no guideline at all. Of the 47% that used return-to-play guidelines, no dominant guideline was able to be identified. The Cantu Guideline was utilized by 29% of the respondents, followed by 13% using the Colorado Medical Society Guideline, and finally, 11% used the American Academy of Neurology Guideline. It should also be noted that 24% of the test subjects utilized a private guideline, which had been approved by the institution where they worked (Miller, et. al 2011).

Limitations of this study include the fact this study was retrospective and relied highly on the health practitioner to accurately recount the events that took place with the management of several athletes who have suffered a concussion. Also, a sample size of 65 is quite narrow and

results could easily be skewed by only a few erroneous answers. Also, the influence of each specific NCAA institution could have resulted in biased results in wanting to make the institution look as though they reported and treated concussions more accurately than is actually true. The conclusion of the study revealed to date, there is no return-to-play guideline that is able to be considered a universal guideline and more research is needed in this area to identify, or develop a universal return-to-play guideline.

Another research study group used an empirically derived scale for monitoring the resolution of symptoms following a concussion in order to safely make a recommendation for an athlete to return to their sport. The study compiled data from three separate projects used to manage post-concussion treatment to create a universal scale that could be used to effectively manage concussed athletes. The Concussion Prevention Initiative (CPI), the NCAA Concussion Study, and Project Sideline were the three guidelines used to compile that data and create a universal guideline. A sample size of 641 athletes was used to compute the data. The guideline consisted of each athlete using a Likert scale to rate the severity of the following twelve symptoms: headache, nausea, balance problems/dizziness, fatigue, drowsiness, feeling like "in a fog", difficulty concentrating, difficulty remembering, sensitivity to light, sensitivity to noise, blurred vision, and feeling slowed down. The total rated symptoms were added up and the product was used to assess the athlete's readiness to return to play. The Concussion Symptom Inventory (CSI) gave a score that related to how many days the athlete was post-concussion. Post day 1 scores fell in the 72 to 60 point range (72 points was the max, 6-point Likert scale with 12 questions, 6x12=72). Day 3 was 46 to 40, and day 5 was 51 to 30. This guideline was designed to be used in addition to the health practitioner's medical opinion, so no minimum score was given as to when an athlete can safely return to their sport (Randolph, et al. 2009).

While the results of this study ultimately revealed this guideline could not be used solely to assess the safety of an athlete to return to their sport, it did provide empirically based, rapid and systematic methodology for tracking subjective symptoms following sport-related concussions. Thus, the CSI is not a suitable universal return-to-play guideline, but it may serve as a universal subjective concussion symptom tracking guideline, which may lead to a more universal return-to-play guideline.

To illustrate cases where return-to-play guidelines were not being utilized due to the lack of evidence-based research was a study which reviewed physicians' management styles of sports-related concussions. The study was a retrospective qualitative design that consisted of a survey questionnaire asking each physician which, if any, of the current return-to-play guidelines available in the U.S. was being used. In total, the study had 73 participants reporting their data. One per cent reported using the Colorado Medical Society guideline, 8% reported using the Cantu guideline, 10% reported using the American Academy of Neurology guideline, 11% reported using a hospital protocol, and 66% reported using no guideline at all. Of the 66% that reported not using a guideline to manage return-to-play decisions for athletes, the most common reason for not using a guideline was due to the fact that no one guideline had been deemed the "gold-standard" and the guidelines currently available lacked evidence-based research (Giebel, Kothari, Koestner, Mohney, and Baker, 2010). The authors stated in conclusion of this paper, "In the future, physicians may wish to incorporate a more standardized evaluation of patients with sports-related concussion and follow a graduated return-to-play protocol until more evidence-based guidelines become available" (p. 5). As noted earlier, current funding for research on a universal, evidence-based guideline has been found to be lacking.

One of the reasons concussion research has been found to be underfunded is due to the fact that concussions are not yet fully understood and appropriate return-to-play guidelines remain largely controversial. A study found that a majority of primary care providers studied preferred not to use guidelines to manage concussions, but rather preferred to rely more on specific patient symptoms than rigid test scores that do not allow patient specific information to be a factor. (Covassin, Elbin, and Stiller-Ostrowski, 2009). The study consisted of a quantitative retrospective online survey that addressed a provider's preference in the management of a concussed athlete. The study found numerous instances where the neurocognitive test score proved the athlete to be back at baseline after suffering a concussion, but the athlete was still experiencing concussion symptoms. The researchers further found that according to the guideline used, the athlete was approved to return-to-play, but the practitioner would not allow the athlete to return-to-play based on their specific and sometimes uncommon concussion symptoms. Ninety-five percent of the respondents stated they would rely more on their own history and physical exam to allow an athlete to return-to-play than relying on a guideline to steer them in the correct direction. A total of 399 providers responded and completed this survey.

This study was not without limitations, however. Despite the fact 399 practitioners responded, this was only 33% of all contacted. Such a low response rate may have revealed a survey that was difficult to understand, or considered to be not useful. Furthermore, the survey was sent to numerous collegiate universities whose sports varied from all sports, to schools that did not have football, hockey, baseball, or basketball, which are some of the most high-impact sports in the U.S. Furthermore, current return-to-play guidelines available in the U.S. are designed to assist the practitioner in making a safe return-to-play decision. No one guideline has

ever been intended to take the place of the opinion of a primary care provider, rather the ideal guideline is used to assist the practitioner to make the most objective decision in regards to when an athlete is able to safely return to their sport.

A study at the University of Montreal analyzed 45 athletes to learn more about the effects of a second concussion when compared to the effects of only a single concussion (Beaumont, et al. 2007). Two groups of athletes were analyzed, 15 athletes in the control group had a history of only one sports concussion, the other group had 30 athletes who had sustained at least two sport-related concussions. Neuropsychological as well as brain imaging studies were done to analyze the effects of multiple concussions on long-term brain function and development. The results from the study revealed that sport-related concussions resulted in chronic subclinical motor system dysfunctions and intracortical inhibitory system abnormalities. The study went one step further and linked the severity of these conditions to three main sources: (a) an athlete with a history of concussions; (b) sustaining subsequent concussions exacerbated the abnormalities; (c) the brain function decline was positively correlated with the severity of the concussion suffered. A limitation found in this study was the lack of imaging results in the subjects. The brain function decline seen in the imaging studies could be related to congenital or acquired structural damage and not solely to the sports concussion. An important point to take away from this study was the fact that multiple concussions have been shown to be the most important factor in future brain function decline, not simply the initial concussion.

Qualitative Studies

Despite the ample evidence for advocating the use of return-to-play guidelines for the management of concussed athletes, further research states current guidelines are underused and the large number of available guidelines led to inconsistent results among treated athletes. A retrospective qualitative study found of 513 primary care providers and athletic trainers interviewed, 66% had not routinely utilized return-to-play guidelines for the management of their patients (Covassin, Elbin, Stiller-Ostrowski, and Kontos, 2009). However, after being introduced to the Vienna guidelines (one of the many available return-to-play guidelines), nearly 75% of the participants stated they would utilize these guidelines, and 84% reported they would teach the use of these guidelines to their peers.

Not only is there a lack of a standard definition of a concussion, there is also controversy regarding the ideal management of concussions in sports. Most notably, there is a lack of objective data available to the health care practitioner in guiding them to return-to-play decisions (Kohler, 2004). Broad guidelines currently available may not be appropriate for each athlete suffering a concussion. Studies in this meta-analysis showed the majority of return-to-play guidelines are rigid and leave no room for the practitioner to incorporate their specific treatment judgment to the guidelines. Findings from the study tend to show the severity of the concussion should decide how the patient should be treated. A few available guidelines do address the severity of the concussion as being a major factor in the treatment and management of concussed athletes. Despite the lack of objective data available from the use of concussion guidelines, Kohler stressed a return-to-play protocol is necessary to optimally manage these athletes and return them to play safely. The combination of clinical and cognitive recovery must be used for a practitioner to come to a sound return-to-play decision.

Case Study

Despite the universal agreement that return-to-play guidelines are a necessary part of the athlete's recovery process, no one single return-to-play guideline has been identified as the "gold standard." In a case study by Ferullo and Green (2010), their conclusion, following a review of the literature was:

> Each of the proposed return-to-play guidelines has been based on expert opinion and no single set of guidelines has ever been proven to be accurate. There is, therefore, no universally accepted guide for making the decision of when an athlete can safely return to play (p. 431)

Ferullo and Green further highlighted their research study by recommending the combination of neuropsychological testing in conjunction with continued clinical assessment for objective measurements in determining how safely an athlete may return to play. These objective clinical assessments include the use of a return-to-play guideline that ideally would be universal as well as evidence-based. The lack of evidence-based return-to-play guidelines was noted to be a major gap in the knowledge and management of concussions.

Meta-analysis

A meta-analysis concluded return-to-play guidelines are needed to manage patients who have suffered a concussion to reduce the risk of second-impact syndrome (Wiebe, Comstock, and Nance, 2011). Second impact syndrome is a phenomenon that results from premature return to play, which results in a second concussion (often with a less severe head impact). This second impact catches the brain in a "vulnerable" state which causes a rapid onset of increased intracranial pressure, brain stem herniation, and in the most dramatic cases, death. The analysis

went on to say return-to-play guidelines help to assist the clinician in objectively determining a safe time period for the athlete to return to their sport.

Another retrospective review paper that focused on return-to-play guidelines in the management of sports-related concussion was recently conducted in 2011. This study identified more than twenty-five current return-to-play guidelines that are being used in the US. Again, none of these guidelines are evidence-based and none have been identified as being able to be developed into a universal return-to-play guideline. The review also recognized the need for a universal guideline due to the inconsistencies that are currently seen by using multiple guidelines to manage concussed athletes. "While the development of multiple guidelines have resulted in a wide variety of objective measures, it can further complicate management" (Doolan, et al. 2011). With further emphasis placed on medically clearing an athlete to be able to rejoin their athletic team, the need for an appropriate universal evidence-based return-to-play guideline is urgent. Medical professionals need to clearly understand concussion recognition and appropriate management techniques in order to care for these athletes safely.

In 1986, R.C. Cantu developed the first set of return-to-play guidelines for concussed athletes that become widely used throughout the US and Canada. In 1991, the Colorado Medical Society Guidelines were published due to the high incidence of head injuries among high school football players in the state of Colorado. Both guidelines have been published and adopted by the National Collegiate Athletic Association (NCAA), as well as the American Academy of Neurology (AAN). However, no consensus between the two sets of guidelines exists, and research has not proven which set of guidelines is the most appropriate. A review of these guidelines was conducted by Harmon (1999), which found "the plethora of guidelines reflects the lack of consensus, which results from the absence of evidence-based data" (p. 887).

Recently, the AAN has published their own set of return-to-play guidelines, which further creates confusion as to which guideline is most appropriate for health care providers to use.

Harmon focused his research on providing the health care practitioner with the most current and appropriate management techniques for care of the concussed patient, and concluded that the health care practitioner must realize that return-to-play decisions are very difficult to make, and until there is a universal return-to-play guideline, the practitioner must be familiar with the various guidelines available. For a practitioner who only manages a concussed athlete one or two times per year, this could be a difficult task to achieve, since more recent guidelines are continually being published.

Research is suggesting that not only a universal return-to-play guideline should be implemented, but the guideline should be evidence-based. A meta-analysis reviewed several models of evidence-based-practice (EBP) that are used in a variety of clinical settings. Evidence-based return-to-play guidelines will not only assure that an athlete suffering from a concussion will receive appropriate care, but the evidence-based guideline will more quickly be adapted by numerous health care providers due to the research behind it. "Members of a social system (nurses, physicians) influence how quickly and widely EBPs are adopted. Audit and feedback, performance gap assessment, and trying the EBP are strategies that have been tested, and they have consistently shown a positive effect on changing the practice behavior of providers" (Titler, 2008). Titler went on to discuss further research that is needed to begin to implement evidence-based changes in the health care system. The large percentage of primary health care providers who are not using return-to-play guidelines (up to 61% based on a previously discussed study), because of their own beliefs, will find it hard to ignore evidence-based return-to-play guidelines. Evidence-based practice (EBP) is not always easy to implement,

as this study found out. Some cons to implementing EBP according to Titler consist of time and money. EBP can be costly and time consuming to implement. Education is needed at each step of the implementation process, which may take months to years to finalize. Also, once the EBP is implemented, the new practice needs to be evaluated and outcomes need to be measured, which again results in higher cost and increased time commitments.

Clearly, after reviewing the literature, return-to-play guidelines should be utilized by primary health care providers in the management of returning the concussed athlete back to the field of play. Current US guidelines are available to assist the practitioner in determining the most objective reasoning as to when the athlete is able to safely return to their sport. However, with the large number of recently developed guidelines available (currently over 25), no one guideline has been identified as being the "gold-standard," which can lead to confusion for health care providers in determining which guideline to use. The development of a return to play guideline will be aimed at limiting the current inconsistencies found with the management of concussed athletes. Patient outcomes are largely based on the practitioner's medical opinion, as well as which guideline was utilized. Some of these outcomes have proven to be positive, however, numerous negative outcomes are still being seen. The need for education in the use of return-to-play guidelines has also been identified in the literature. Once a universal return-to-play guideline is developed or identified, comprehensive education will need to be implemented to assure this guideline is being utilized by the appropriate health care providers.

Discussion

Dissemination

The proposed deliverable based on the outcomes of the research done in the need for the development of a universal return-to-play guideline is an op-ed paper. An op-ed (see appendix), which will be submitted to the professional journal *The American Journal of Public Health*, will bring attention to the literature search that was done in order to stimulate further research on this topic, and hopefully, the development of identification of a universal evidence-based return-to-play guideline. The rationale for choosing this deliverable was to convey the findings in this project to clinicians who are in a position to implement the proposed changes. An op-ed will be able to reach a large number of health care professionals and researches who are directly involved with the management of the concussed patient. For professionals who are not involved with research, but are responsible for medically managing concussed athletes, the information found in this project will inform them of the importance of utilizing a current return-to-play guideline in order to safely allow an athlete to return to their sport without suffering the effects of postconcussive syndrome.

Interpretation

Research has shown the use of return-to-play guidelines are beneficial in the management of return-to-play decisions for the primary health care provider. Despite the benefits of utilizing return-to-play guidelines to assist the practitioner of objectively making the decision an athlete is able to safely return to their sport, they are widely underused. Numerous return-to-play guidelines combined with no single guideline being deemed the "gold-standard" or evidence-based has resulted in the omission of these guidelines for many health care providers. The

development of a universal, evidence-based return-to-play guideline will be more accepted by health care providers due to the research behind the evidence-based guideline as well as knowing which guideline is considered to be the "gold-standard" for post-concussion management.

Evidence-based research not only results in the most appropriate treatment or management of patients, it also simplifies the implementation process due to the amount of research that goes into it, allowing it to be more acceptable to health care professionals. With an evidence-based universal return-to-play guideline, health care providers will be able to identify which guideline should be utilized to manage their specific patient, and which guideline will result in more positive outcomes for their patient. Once a universal guideline has been in practice for some time, this guideline will then be able to be further analyzed for its effectiveness. Over time, this universal guideline will be able to be improved upon based on health care provider preference and patient outcomes.

The need is not only for the development of a universal guideline, but also for more research to be done on the study of return-to-play guidelines and their ability to effectively protect athletes from suffering postconcussive syndrome, which may lead to permanent brain dysfunction and even death. With the incidence of concussions on the rise over the past decade, the need for this research and guideline design is urgent. Moreover, with more states mandating the management of concussions to be taken over by health care providers, the number of concussed athletes seen in health care clinics and hospitals is going to increase.

Implications for Nursing

The findings of this project have direct implications for nursing. With an increasing number of nurse practitioners assuming the role of primary care providers in the clinic setting,

these nurse practitioners will be directly responsible for the management of the concussed athlete. Speaking of North Dakota specifically, the Legislature has recently mandated that athletes who exhibit signs and symptoms of a concussion cannot resume their sport until they have been medically cleared by a health care professional. The nurse practitioner falls into this role and thus, will be responsible for many of these athletes. With the lack of a universal evidence-based return-to-play guideline, the nurse practitioner may be put in a difficult situation of having to make an objective decision as to when an athlete is safely able to return to their sport. Until a universal return-to-play guideline is implemented, the nurse practitioner will be required to make a clinical judgment on their own, which current return-to-play guideline they wish to use, and will also be responsible to monitor the outcome of each patient to assure their guideline chosen has been used appropriately and that the guideline accomplished what it was designed to do. Until a universal guideline is developed, nurse practitioners should familiarize themselves with the local and regional practices currently being utilized by other health care providers managing concussions.

Research implications for the management of concussions have also been brought out due to the results of this project. Currently no U.S. return-to-play guideline has been designed from evidence-based research. Furthermore, the outcomes of post-concussion athletes are widely inconsistent based upon which guideline was used to manage their care. Further research is needed to not only develop or identify a universal, evidence-based return-to-play guideline, but also to further analyze the effects multiple concussions can have on the athletes' brain function and development. To date, research has suggested the initial concussion suffered is not nearly as detrimental to the function of the brain as the incidence of repeat concussions, or the incidence of

postconcussion syndrome, which occurs when an athlete is allowed to return to their sport prematurely or before their original concussion symptoms have subsided.

Education in the management of concussions is another implication for nursing. Studies analyzed in this paper have shown that up to 66% of health care providers do not utilize a return-to-play guideline in any part of the treatment process despite the guideline's proven benefit. While many state's Legislatures have mandated the need for medical clearance from a health care professional before an athlete is allowed to return to play after suffering a concussion, it is not mandated that these health care providers utilize a return-to-play guideline. A return-to-play guideline is designed to assist the clinician to make the most objective decision possible when allowing an athlete to safely return to play. The guideline is not meant to take the place of clinical judgment or a thorough history and physical exam. Studies in this paper have also analyzed the lack of knowledge about how to use a guideline once one is chosen. With the implementation of a future universal return-to-play guideline, education also needs to be involved to be sure the health care providers are using the guideline appropriately, and that it is being used to assist their decision, not make their decision.

This study has already shown how concussion management has gotten the attention of policy makers and each states legislature. As stated previously, states have mandated the management of concussed athletes to be the responsibility of health care providers. Each state has its own specific laws and terminology to accomplish this mandate. Further policy making should be aimed at analyzing the outcomes of patients treated by already available guidelines in an attempt to correlate which parts of various guidelines lead to positive outcomes for concussed athletes. By tracking the outcomes of these athletes, more data will be available to not only suggest continued research is necessary, but also to identify certain aspects of return-to-play

guidelines currently being used in an attempt to create a universal guideline. With future funding allocated for new research, the creation of an evidence-based, universal return-to-play guideline will hopefully be on the horizon.

Summary/Conclusions

Concussions are going to continue to be a major health factor for athletes participating in contact sports. The prevention of concussions would be the optimal treatment for this population, and work is currently being done to improve protective equipment and also in changing the rules of many contact sports in an attempt to protect participants even further. However, the current incidence of concussions is on the rise and health care practitioners are being called upon to manage these athletes so that they are able to participate in sports safely.

In order for health care providers to manage these athletes safely, they need to be able to determine when it is safe for an athlete to be able to return to play after suffering a concussion. This decision can be difficult to make as is often based on subjective symptoms and criteria. A return-to-play guideline will assist the practitioner in making the most objective decision possible on deciding when an athlete is able to return to their sport safely. Unfortunately, there are numerous guidelines currently available for practitioners to use, with none of them being evidence-based and with research showing that positive or negative patient outcomes are related to which guideline is chosen. A universal, evidence-based, return-to-play guideline will assist the practitioner to make the most informed decision about the safety of the athlete returning to their sport. Because the guideline is evidence-based, efficient implementation, education, and follow-up of patient outcomes will be included. Also, because this guideline is universal, the

practitioner will not spend valuable time choosing which guideline to use with the risk of utilizing a return-to-play guideline that may not necessarily be in the patient's best interest.

States' legislatures have recently mandated that athletes suffering from concussion-like symptoms need to be medically cleared by a health care professional prior to being able to return to their sport. The management of these patients will fall directly into the hands of primary health care providers, many of whom are nurse practitioners. By the nurse practitioner being able to utilize a universal, evidence-based, return-to-play guideline, these athletes will be properly managed and the guideline will greatly assist the health practitioner to make the most informed and objective return-to-play decision possible.

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Appendix

Development of a Universal Return-to-play Guideline Following a Concussion for Athletes of Contact Sports

Sports-related concussions remain the most common head injury among athletes of contact sports. The incidence of sport-related concussions has been recently estimated at 1.6 to 3.8 million cases per year in the US. The importance of appropriate medical management of these patients is vital to their overall health and they should be allowed to return to their sport only after medical clearance. Furthermore, with an increasing number of states' legislatures mandating that athletes suffering from concussion-like symptoms need to be medically cleared by a health care professional prior to being able to return to their sport, a guideline as to the appropriate management of these patients is urgent.

The medical management of athletes who have suffered a concussion remains controversial, however. Studies have shown the use of a return-to-play guideline is useful to primary health care providers as a guide to assist them in making the most objective decision as to whether an athlete is safe to return to their sport. Several return-to-play guidelines exist and are in current use, although the use of these guidelines is considered to be lacking. Furthermore, a universal, evidence-based return-to-play guideline has not been identified and patient outcomes have been inconsistent as a result. The development of such a guideline will assist the practitioner to make the most informed decision about the safety of the athlete returning to their sport. Because the guideline is evidence-based, efficient implementation, education, and follow-up of patient outcomes will be included. Also, because this guideline is universal, the practitioner will not spend valuable time choosing which guideline to use with the risk of utilizing a return-to-play guideline that may not necessarily be in the patient's best interest.

Concussions are going to continue to be a major health factor for athletes participating in contact sports. The prevention of concussions would be the optimal treatment for this population, and work is currently being done to improve protective equipment and also in changing the rules of many contact sports in an attempt to protect participants even further. However, the current incidence of concussions is on the rise and health care practitioners are being called upon to manage these athletes so that they are able to participate in sports safely.

In order for health care providers to manage these athletes safely, they need to be able to determine when it is safe for an athlete to be able to return to play after suffering a concussion. This decision can be difficult to make as is often based on subjective symptoms and criteria. A universal return-to-play guideline will assist the practitioner in making the most objective decision possible on deciding when an athlete is able to return to their sport safely.