**“Move aHead NC”**

Concussion Education for 7th Grade Students in North Carolina Public Schools

**Statement of Need:**

There is an estimated 3.8 million concussions each year in the United States.1 In 2009, sports and recreation-related concussions accounted for 250,000 emergency department visits.2 Youth represented greater than 40% of diagnosed concussions in the ER; 30-60% of those were from sports.20 The 10-19 age group comprised the largest percentage of sports-related concussions, but data on elementary and middle school students are lacking completeness.2 53% of 9th grade student-athletes report already having had a concussion.3 As such, concussion prevention and education programs should begin prior to participation in high school athletics. In the North Carolina Public Schools, head injuries were 13% of all reported injuries in 2010-2011. Head injuries were second only to sprains or strains.4 In spite of the large number of injuries, the incidence of concussions is likely even higher than reported due to difficulty diagnosing concussions and the underreporting of concussions.5

Concussions can have significant short-term and long-term neurologic consequences requiring medical attention and proper management. Concussions temporarily affect how the brain works, and they can be as mild as temporary memory lapses and as severe as fatal brain swelling.7 Symptoms of concussion can be invisible, but head injuries need time to heal completely or more severe consequences may occur if a child returns to play too soon.6 Second impact syndrome is when a second head injury occurs while the initial concussion is still healing and causes severe brain swelling that is fatal.7 Post-concussion syndrome can also occur in youth with concussion, which causes persistent symptoms like headaches, dizziness, and difficulty thinking.7 The effects of multiple concussions are cumulative, so education about prevention for coaches, parents and children is important to ensure that neurologic damage doesn’t cause negative long-term effects in children.6

Education in pediatric populations is important since medical coverage is less available at younger athletic competitions, and because school learning is a centerpiece of adolescent growth and development.5, 22 Many youth coaches lack the proper education to correctly assess and manage concussions.8 One study found that 42% of youth coaches thought loss of consciousness was required for a diagnosis of concussion, 26% thought youth athletes could return to competition before resolution of symptoms, and only 61% of coaches correctly identified signs and symptoms of concussion.6 Additionally, many concussions occur during unorganized sporting activities,1 which substantiates the need to educate all youth, not just youth athletes.

The State of North Carolina passed the Gfeller-Waller Concussion Awareness Act in June, 2011 in response to the death of two high school football players in 2008.  The act emphasizes concussion education as a means to reduce and increase recognition of concussion injuries.9 A concussion information sheet is provided to all public school student-athletes and parents prior to sports participation.  However, education is not provided to students, including those who play non-scholastic or recreational sports.9 No formal student concussion education exists to ensure that the student athletes understand the information sheet. Approximately 31 states have passed laws about concussion education, but policy implementation is still limited, leaving coaches uninformed on concussion even in states with a concussion in sports law in place.5

In North Carolina, participation in interscholastic athletic competition is limited to grades 7-12.10 Concussion education also aligns with the 7th grade Healthful Living curriculum, specifically Competency goal 2: "the learner will develop knowledge and skills to enhance personal and consumer health" and objective 2.05 "demonstrate techniques for basic first aid and procedures for treating injuries and other emergencies.11 **The** high incidence of concussions in youth, the inconsistent awareness of coaches, parents, and youth, and the North Carolina state regulations and educational curriculum, all support the development and implementation of a 7th grade concussion education program that will be piloted at Orange County public middle schools (Stanback, Stanford, and Gravelly Hill) for the 2013-2014 school year with potential to expand. **Background: TRANSITION SENTENCES!**

Many middle school educational programs have been shown to effectively educate adolescents about negative behaviors, such as drinking, smoking, or depression. Besides effectively educating youth, these interventions also show decreased participation in negative behaviors after completion of the programs.12-17 These programs range from brief interventions to long educational programs, and both short and long programs have been shown to effectively improve educational outcomes.14 More research needs to be done to determine the optimal length of an educational program for middle school adolescents. Another study discussed the benefits of an active instead of a passive education program on using diet to improve management of celiac symptoms. Results point to the benefit of active participation to improve outcomes.19

A concussion education program was implemented by the Sports Legacy Institute Community Educators (SLICE) for students aged 9 to 18 in Boston, MA.1 The SLICE curriculum found improved pretest to posttest scores following a 40-60 minutes presentation by medical students.  Of the students aged 9-12, 73% had a passing posttest score compared to 17% with passing pretest scores.  The 13-15 and 16-18 age groups had 84-85% of students with passing post-scores, but the 9-12 age group showed the greatest overall improvement.1 Thus, a concussion education program for middle school students seems likely to be effective.

The SLICE program consisted of a Powerpoint presentation, video clips, case examples of athletes, and interactive demonstrations and discussion period with the students.1 The variety of educational formats aligns with the theory of multiple intelligences which proposes that each individual possesses distinct areas of skills to different degrees.8 According to this theory, an educational program should accommodate the seven areas of intelligence: linguistic, logical-mathematical, spatial, musical, bodily-kinesthetic, intrapersonal, and interpersonal.8 The social cognitive theory also applies with the use of case examples and video clips of both professional athletes and student athletes. Research supports components of social cognitive theory related to physical activity among adolescents, so integrating self-efficacy, situation, social support, behavioral strategies, and outcome expectations will guide how to appropriately present information to improve education about concussion.18

Directly educating youth has been shown to improve safety in sports.23 A brain and spinal cord injury educational video shown to Canadian youth hockey players aged 11-12 resulted in fewer high risk penalties over the course of the season compared to teams serving as controls.  The players also demonstrated improved knowledge of the video content at 3-month follow up.23

The CDC has created a thorough concussion initiative called the Heads Up program.21 This program aims to educate coaches about concussion prevention and management. Results of the initiative suggest positive changes in knowledge, attitudes, and behaviors regarding concussion management.21 Information from the Heads Up program educates parents and youth. However, finding ways to provide youth, parents, and coaches with the resources available has not been effectively promoted. By bringing concussion education into schools, this program bridges the gap between available resources and implementing educational initiatives to an at-risk population.

**Program Objectives**

The primary goal of “Move aHead NC” is to educate 7th grade students, starting in Orange County public schools, about concussion awareness and prevention. Increased awareness about concussion in middle school youth through education is critical to promote long-term health of youth athletes and controlling health care costs associated with concussion.1,2,6 Our program provides two short educational interventions for 7th grade youth.14 The proposed intervention section includes objectives, intervention description, and anticipated outcomes.

**Program Goals/Aims:**  
1. To implement an educational program for 7th grade students to educate participants on: concussion prevention, concussion symptoms, and age appropriate concussion management.

2.  To utilize role models via video and a guest speaker to encourage students to modify behaviors that will reduce their risk of concussion injuries.  
3.  To provide handouts, resources, and a group work assignment to encourage continued learning in the classroom between intervention phases.  
4.  To increase participants knowledge of concussion prevention, symptoms, and management as measured by pretest scores compared to first and second administration of the posttest.23  
**Proposed Intervention:**

The Move aHead NC concussion education program has three phases.  Phase one is baseline testing and initial educational session.  Phase two is the second educational session and posttest.  Phase three is a 3-month re-administration of the posttest. The interventions will occur in Orange County public middle schools during school.  Each school will choose to administer the program during health or PE.  The chosen class will be consistent within each school.  
**Site Parameters:**

There are three public middle schools22 in the Orange County public school system (Stanback, Stanford, and Gravelly Hill) where 7th grade students are enrolled.  The educational program will take place in standard health or PE classrooms or in alternate locations that are appropriate for class size with sufficient room for interactive participation.19 Technology needs include a computer with Powerpoint and projector with screen or large television.  Students will create 5-7 posters in groups.  The site will need adequate wall space for the posters.16 Teachers will remain in the classroom to participate in the program, supporting the learning objectives of the program within their curriculum, and managing discipline concerns should they arise.18   
**Intervention Phase I: Pretest and Educational Session #1**

The initial phase of the intervention will consist of a 45-minute educational session during health or PE class for 7th graders. The first educational session will begin with a pretest for students to assess baseline knowledge about concussion prevention, identification of signs and symptoms, concussion management, and possible short-term and long-term consequences.1

Following the pre-test, the program with be introduced with a PowerPoint presentation1 providing students with information about Moving aHead NC, concussions, and history of the Gfellar-Waller Concussion Awareness Act.9  The presentation will continue with a focus on concussion prevention including why helmets are important when rollerblading or riding bikes and why it’s important to follow the rules in contact sports.5,9,10 This information will be followed by a short video about the effects of concussions and the role of healthcare professionals in concussion diagnosis and management.22  The video will include case examples of young persons with a history of concussion.18,24 Guided discussion will be intermixed within the presentation, encouraging students to share stories if they have had a concussion, know someone who has had a concussion, or have heard about how concussions happen.19

To conclude this phase, students will be provided folders with educational information and resources.  These will also be emailed to the students and parents.5 The handouts will be adapted from resources available through the CDC’s “Heads up” program which provide information about signs and symptoms of concussion,5 why concussions are not “cool”, what post-concussion syndrome is, and the rationale of missing one or two games instead of an entire season.  Final discussion will answer questions and summarize the key learning objectives.   
**Intervention Phase II: Educational Session #2 and Posttest**

The second 45-minute educational session will occur one to two weeks later.  This session will begin with a review of key points from the previous lecture by asking questions in an interactive game format.  Small prizes will be awarded to students who correctly answer. This phase will feature a high school or college athlete who has had a concussion.  The speaker will tell their story and answer student questions.  Following the speaker, students will be instructed *to work in small groups and create a poster about concussion education, awareness, and/or prevention. Completed posters will be displayed in the classroom.*Finally, students will take a posttest at the end of the second session to measure changes that have resulted.

**Intervention Phase III: Readministration of Posttest**  
 The final component of the intervention will be to return to the public middle schools.  The posttest will be repeated to measure knowledge retention over time. After testing, answers to the test will be reviewed in the same interactive game format as utilized in phase II.  During this time, students will be encouraged to ask any questions they have from the prior 3 months. Additionally, students will be asked to identify how they have or are planning to modify their behavior to reduce concussion risk. Lastly, students will present their poster projects to the class.  
**Outcome Measure**

The pretest and posttest is designed to measure each student’s knowledge of concussions including prevention, signs and symptoms, management, and neurologic consequences.1 The test questions are adapted from the CDC’s “Quiz for Coaches, Athletes, and Parents” and a quiz designed to assess a concussion education program for student-athletes (SLICE).1,26  The pretest/ posttest written includes all students and not just student-athletes. The test will consist of 15 true/false and multiple choice questions.1,26  Ten minutes will be allocated to complete the test.  
**Rationale for Intervention:**

Concussion education for student athletes improves knowledge and reduces the incidence of concussions.1 A concussion education program does not currently exist for the general youth population, but outcomes of programs designed for athletes are generalizable to 7th grade students. Concussion education aligns with the health and physical education curriculum and is a relevant educational topic to administer during school.11To support program design, short educational interventions effectively improve outcomes,14 and active programs succeed more than passive education.19 A 40-60 minute concussion education program by medical students using powerpoint, videos, case examples, and interactive demonstrations improved knowledge in 9-15 year olds.1 Similarly, several presentation styles and educational techniques are used throughout intervention phases I&II.  This multifaceted approach is designed to accommodate the variable learning strengths of each student, according to the theory of multiple intelligences.8

Educational videos effectively decrease incidence of negative behaviors and maintain improvements in knowledge at 3 month follow up.23 The use of video is in line with social cognitive theory which emphasizes observational learning, modeled behavior, and social support to promote self-efficacy. The group project, videos, and interactive discussion align with this theory with the aim to modify behavioral habits of middle school youth.18  Results of the CDC “Heads Up” program show positive changes in concussion awareness, education, and management for student-athletes.21 Implementing this evidence-based concussion education program to 7th grade students in Orange County will serve as a standardized concussion education protocol to expand to all schools in North Carolina.5,9   
**Anticipated Outcomes:**  
Upon conclusion of the Moving aHead NC concussion education program:

* 90% of participants will complete all three phases of the Move aHead NC program.
* 90% of participants will demonstrate understanding of concussion prevention by identifying a behavior they can change to reduce their risk of concussion.
* 80% of participants will increase concussion knowledge with score >75% on posttest #1.1
* 80% of participants will maintain knowledge with score >75% on posttest #2.1,23

**Program Evaluation**  
          “Move aHead NC” educational program will be piloted in Orange County public middle schools with intentions to expand to other counties across North Carolina. Evaluation of program outcomes at pilot sites will help identify areas of improvement for the intervention prior to expansion.  The ability of Move aHead NC to meet program objectives will be assessed.  
           The first objective, "to implement an educational program for 7th grade students to educate participants about: concussion prevention, concussion symptoms, and age appropriate concussion management" will be evaluated by analyzing test results related to question content.  Information covered by questions that were incorrectly answered by >30% participants will be flagged. The second objective, "to utilize role models via video and a guest speaker to encourage students to modify behaviors that will reduce their risk of concussion injuries" will be measured by subjective reports of students to identify behaviors they will modify to reduce concussion risk. It is expected that 90% of participants will be able to identify >1 behavior.  The third objective, "to provide handouts, resources, and a group work assignment to encourage continued learning in the classroom between intervention phases" will be assessed by poster projects and maintained knowledge after posttest #2. This objective ties into the fourth objective, "to increase participants knowledge of concussion prevention, symptoms, and management as measured by pretest scores compared to first and second administration of the posttest."23 It is expected that participants will be able to score at least 75% on both the first and second posttest.  
           Teachers involved will be surveyed.  They will be asked to rate the success of intervention components on a 1-10 scale and provide qualitative feedback on successful aspects of the intervention and needed improvement.  The survey will ask about impact for students, length of program, presenters and educational tools, and required involvement of teacher. Experience and opinions of teachers are valued and will be used to improve the program.  
**Limitations, Relevance, and Synthesis**

It is not known if an increase or decrease in the number of reported injuries at a school will correlate with success of Move aHead NC.  The concussion prevention component of the program will ideally reduce the number of injuries, but improved concussion knowledge may also increase reporting of injuries.  The incidence of head injuries reported in each school will be monitored for change in an attempt to identify a relationship to the program should one exist.

Difficulty coordinating with schools to fit the program into the school day may occur. The program is being implemented during school to improve student turnout and prevent difficulties with transportation and after-school commitments that could limit the heterogeneity of middle school youth reached. Despite the likely interest of schools to host our program, the logistics of incorporating two educational interventions into the school day might be a problem.

Since the program requires involvement of others, potential exists that some teachers won’t support the message of the Move aHead NC curriculum. Also, parents and coaches remain an important part of managing concussions for 7th graders. While middle school students may be more apt to report concussion symptoms, parents and coaches need to promote safety during sports and other activities to ensure that adequate medical services are provided.

The aim of our findings will be to improve the Move aHead NC concussion education program so the number of concussions in middle school youth decreases and awareness about concussion management improves to decrease long-term impact. Not only will students have greater concussion knowledge, they will ideally be more careful when playing sports, use protective equipment if needed, and seek appropriate medical care after concussion has occurred.

Once the success of this program is established, it can be adapted for elementary, high school, collegiate, and professional athletes. It can be implemented in recreational sports leagues or other youth community programs. Adults older than 65 have higher incidence of concussions and mild traumatic brain injuries,25 so adaptation for this population can educate them on the importance of seeking medical care after head injury with changes in physical/mental function.

In conclusion, “Move aHead NC” is a preliminary in-person concussion education program for 7th graders to decrease concussion incidence and increase awareness. As the program improves in Orange County public schools, potential for implementation and adaptation to other audiences will be realized. Long-term goals of this program aim to prevent cumulative effects of concussion and decrease the $76.5 billion in health care costs26 associated with TBI.

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