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## Implementation of a Peer to Peer Concussion Management Program and its Effect on Concussion Knowledge and Reporting Behaviors in Collegiate Club Sports Athletes

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IMPLEMENTATION OF A PEER TO PEER CONCUSSION MANAGEMENT PROGRAM AND ITS  
EFFECT ON CONCUSSION KNOWLEDGE AND REPORTING BEHAVIORS IN COLLEGIATE CLUB  
SPORTS ATHLETES

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Accepted by:

Dr. Sabra Custer, Committee Chair

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### **Abstract**

**Problem:** Concussions continue to be a common injury in both athletes and non-athletes across the world. In college, symptoms and recovery time from concussion injuries can lead to loss of social interaction, class time, and participation in school events such as sports. For collegiate club athletes at the University of Pittsburgh, there is currently no mandated concussion protocol, making injury management more difficult. **Purpose:** This project's purpose was to determine whether a peer-to-peer concussion education tool is a viable implementation option to improve the concussion environment for this population compared to their current structure with no protocol. **Method(s):** A five-step peer to peer concussion program developed by Chestnut Hill College for intercollegiate athletes was implemented with club sports teams. Participants completed a survey about concussion attitudes and knowledge before and after the program's implementation. **Inclusion Criteria:** Only collegiate club sport athletes at the University of Pittsburgh were included in this DNP project. The projected timeline had this study occurring in the spring sports season, but clubs active during the spring semester and participating in regular off-season competition and practice were invited to participate. **Analysis:** Statistical analysis included descriptive statistics and a paired sample t-test. The t-test was completed to determine any statistically significant difference between survey results at the start of implementation compared to the survey results at its conclusion.

## **Implementation of a Peer-to-Peer Concussion Education Model and its Effect on Concussion Knowledge and Reporting Behaviors in Collegiate Club Sports Athletes**

### **Introduction**

Approximately 223,135 traumatic brain injury (TBI) related hospitalizations occurred in 2019. However, this number does not include the brain injuries that came through the emergency department or those left unreported (CDC, 2022). According to the National Safety Council, that estimate rises to between 1.6 and 3.8 million people that annually suffer from concussion injuries. To improve prevention, those who participate in athletics under the National Collegiate Athletic Association (NCAA) umbrella receive mandated concussion education and protocol prior to participation in school events.

However, this practice becomes less mandatory in collegiate club athletics where the clubs and organizations often govern their own injury maintenance. Attempts to improve concussion awareness within this population have been made to encourage safer and more effective management. A study completed in 2020 revealed that an approach highlighting consequence based social-marketing campaigns increase positive reporting beliefs amongst collegiate club athletes (Warmath and Winterstein, 2020). The program utilized in this project focused on giving materials and protocols to the players themselves and observed whether or not player to player interactions would increase these reporting behaviors. The program followed a five-step approach developed by Chestnut Hill College (CHC) that utilized team leadership to encourage team members to reframe the way they understand concussion injuries and management. According to Pittsburgh's club sports handbook, athletes must educate themselves on injury prevention and report any injuries that may occur during club

activities (University of Pittsburgh, 2022). The handbook does not specifically mention concussions and there are no mandated preseason educational activities. Since there is no mandated concussion protocol to provide athletes with guidance on these injuries, implementation of this concussion program provided these athletes with protocols and procedures as well as educational materials so that they were better able to recognize, react, and manage any concussion injuries that occurred or that do occur in the future.

### **Background**

Concussion injuries can occur in both non-contact and contact sports at any age level. In the NCAA athlete population, these injuries are closely monitored and managed to protect the athletes that participate in these sports. According to the most recent statistics provided by the NCAA, there are on average 10,500 sport related concussions in this population each year (NCAA, 2017). As mentioned, these athletes are closely monitored by the NCAA governing body, so injuries are reported consistently. This is not the case when it comes to club collegiate athletes. There is little to no data about the specific number of concussions that occur in this population each year. The voluntary, self-governing nature of club sports allows these injuries to go unreported and therefore mismanaged. Although there are no studies on numbers, there have been studies regarding the behaviors and attitudes surrounding concussions in this population. In a sample population of collegiate club athletes, more than 50% of the athletes stated that they did not report a sport related concussion injury to an authority figure. The main cited reasons for such behavior are “concussion injuries are not serious enough to report”, “fear of losing playing time”, and “did not realize that they had an injury” (Beidler, et al., 2018). One of the most cited hurdles for lack of concussion reporting amongst collegiate

athletes is pressure from both peers and coaches (Acord-Vira, 2021). Due to concussion behaviors being reported across all populations, including club sports athletes, CHC focused on cognitive-behavioral theory during their program's development. They thought that if they could change how athletes think about these types of injuries, the associated behaviors would change too. Therefore, this project aimed to utilize this theory and change the way that club sports athletes at the University of Pittsburgh perceived these injuries hoping that their reporting behaviors, concussion knowledge, and injury management would all change as well. Behaviors learning from peers have been observed and reported on as well. A 2019 study amongst patients with spinal cord injuries (SCI's) in an inpatient rehabilitation facility showed that when injury management classes were taught by their peers vs. Healthcare professionals there was significantly higher positive engagement responses (Gassaway et al., 2019). A study involving nursing students in their eight semesters of their curriculum claims that their "peer-assistant education program strengthened their relationship with peers due to the increasing range of joint activities..." (Nazari, 2021). A program specifically catered to college students with concussion injuries, Success in College after Concussion with Effective Student Supports (SUCCESS), focuses its model on peer interaction. This model aligns those with recent concussion injuries with mentors that have had similar experiences via mobile health (Mhealth). Through this, mentors and mentees can have discussions about how to handle the responsibility of college life following concussion injuries. Results of a study surrounding this program showed that this peer-lead model improved academic and psychosocial recovery for those who experience concussion injuries. (O'Brien, 2021).

With these frameworks in mind, Chestnut Hill College's (CHC) program was considered for the collegiate club population at the University of Pittsburgh. Evidence has shown that through peer-lead discussion and education, the largest behavioral hurdles that come with concussion reporting and management can be effectively endured. The purpose of this quality improvement DNP project was to implement the concussion tool developed by (CHC) focused on peer-to-peer concussion education at the University of Pittsburgh with the intention of long-term use for its club sports programs.

The intervention itself was developed by Chestnut Hill College (CHC) following a combination of a "top down" and "bottom up" approach to education. The "top down" approach is what most current concussion protocols (such as "Don't Hide it. Report it. Take Time to Recover", and "Concussion: A Fact Sheet for Student Athletes") follow and focuses on information being disseminated and distributed by experts in the field (athletic trainers and doctors). The "bottom-up" approach allows the athletes themselves to assist each other in the understanding of these injuries while still having access to these experts as an additional resource if needed (Chestnut Hill College, 2022). This approach has shown effectiveness across multiple populations including school age children, college students, and adult veterans (Chestnut Hill College, 2022). Their five-step program focuses on peer-peer education of concussion topics to make the environment surrounding these injuries more comfortable by reducing the common barriers with reporting behaviors. These barriers include pressure from coaches, parents, and athletic trainers, fear of ridicule by teammates, and simple misunderstanding of symptoms or injury management (Weber-Rawlins, 2021). The key

components of the program are separated into three groups: interdisciplinary, peer mediated, and cognitive-behavioral (Chestnut Hill College, 2022).

The central question of this project was, “will implementation of a peer-to-peer concussion education program developed by Chestnut Hill College improve concussion knowledge and reporting behaviors within the club sports population at the University of Pittsburgh?” The population for this project was University of Pittsburgh collegiate club athletes. The intervention was providing these athletes with the peer-to-peer concussion program developed by CHC, with the intention of comparing how well they were able to identify concussion symptoms, how their attitudes and behaviors changed, and if their injury management skills improved versus their current state of having no concussion protocol at all. Outcomes were measured via survey responses, where a paired t-test was used to observe for any statistically significant changes over time from the baseline survey to the end of program. Due to some unforeseen conflicts, this project occurred over the span of four months of the athletes’ season (February—May) rather than the full season starting in January. This DNP project was supported by the UPMC Sports Medicine Concussion Program (and research director, Dr. Anthony Kontos) and will follow the Plan-Do-Study-Act (PDSA) model of quality improvement to provide the University of Pittsburgh’s club sports population with sufficient resources to educate themselves on concussion injuries and management through long-term implementation.

### **Methods**

The project followed the PDSA model of quality improvement. This model focuses on first planning action and needed steps for data collection. Due to the lack of a concussion



protocol for club sport athletes at the University of Pittsburgh, the student determined that the suitable action was to provide these athletes with a protocol to assist in their concussion management. The next step, “Do”, was to implement the concussion protocol within the population of club sports athletes. The “Study” step took the data collected throughout the previous step and analyzed it, looking for relationships between time spent using the protocol and survey answers. Finally, the “Act” stage involved deciding how the results of the previous three steps affect plans with the protocol. The goal of this project is long-term integration of the protocol at the same university so that it is available for club sports athletes indefinitely.

As discussed above, this project will implement the five-step program developed by CHC that proceeds as follows: The first step was establishing an interdisciplinary team in charge of implementation and assessment and selecting a participant population. This team involved the principal student investigator and his chairpersons. Participation was voluntary, and at any time students were able to withdraw without any effect on their standing with their club team or university. Step two provided the program with its peer concussion leaders that were responsible for providing education materials to their teammates. The third step provided team leaders with protocols and procedures necessary for the program. The interdisciplinary team provided these leaders with the program manual and management resources provided by CHC. Step four began when the leaders returned to their teams and presented their peers with modules regarding concussion education, symptom identification, and reporting behaviors. Step five was an informal debriefing meeting in which the principal investigator met again with the team leaders and discussed how the protocol was implemented within their teams.

The project followed CHC's program very closely with subtle differences made in favor of logistics. Pen and paper acquisition of survey results were not used and instead were completed via REDCap survey for accessibility and data security. Surveys were distributed via student email. A demographics portion of the survey requested students' club sport played and gender. Survey questions consisted of material from a modified ACE checklist (McLeod et. al., 2007) and a 3-item questionnaire from Register-Mihalik's 2013 study. Part one included 14 questions regarding concussion reporting feelings and behaviors. Part two involved identifying real concussion symptoms from a list of 27 (19 true, 8 false). Part three included 2 select all questions with 6 answers each and 1 general knowledge question. All surveys are provided via CHC's program manual under "All Materials and Videos". The surveys were administered twice, prior to implementation and at the conclusion of the season. The pre-implementation point was used as the baseline for comparison and statistical analysis at the program's conclusion.

Demographic information for each participant included which club sport they participated in and which gender they identify as. For the survey responses in part one, a paired t-test was conducted to observe the average Likert scale scores and report any statistically significant changes between them with a significance value of  $p=0.05$ . Parts two and three were analyzed by calculating the percentage of correct responses for each question then observing any trends between baseline and end of season percentages. All data were shared with members of the project committee as well as the University of Pittsburgh and the UPMC Concussion Research Program. At the conclusion of the program, team leaders were debriefed on trends in data with hopes that the program provided improvements in concussion

knowledge and behavior, providing rationale for long-term integration within the university's club sports organizations.

Beginning with IRB submission in November (both to the University of South Carolina and the University of Pittsburgh), the project timeline had six major milestones (Gantt Chart seen in Appendix A, full timeline Appendix B). The second milestone was contact with club sports organizations and starts shortly after IRB submission running through until the start of the spring season in late January. Due to some unforeseen circumstances, the pre-implementation timepoint occurred at the midpoint of the season rather than the start. Therefore, the first survey was distributed near the end of February, acting as the third milestone. The fourth milestone then became discussions with the team and presentations of the material to the team leaders so that they could return to their teams and redistribute the information. Finally, the fifth and sixth milestone, post-season data collection and data analysis, began in early April as the season ended and ran through the end of the semester in early May.

### **Results**

Of the potential patient population of 98, 40 responded to the baseline survey links. From those 40, there were 13 participants that completed the end of season survey as well. The 14 questions in part one were based on a Likert scale response from 1-7, with 1 being associated with negative reporting behaviors and 7 being associated with good behaviors. F-tests were run to determine equal variance for the survey responses. Paired t-tests were run on the responses at baseline and end of season for these 14 questions. Overall, 9 of the 14 questions showed general improvement in their values with the only question with statistically significant increases in scores being, "How important do you think it is to be informed about how

concussions can be prevented?" ( $p=0.034$ ). Part 2 focused on a list of 27 symptoms, with 19 being true concussion symptoms and 8 being false. Using a key, correct responses from the 13 participants were counted and compared for baseline and end of season. Only 4 of those 27 questions showed improvement in percentage correct between the baseline and end of season. 10 of those 27 questions had correct percentages of 62% or less (8/13). Part 3 was relatively successful, with the only primarily incorrectly identified potential sequelae being paralysis (38% correct) and joint pain (62% correct).

### Discussion

There is a trend in the findings that shows deficiencies in concussion symptom identification amongst this population. It is possible that the athletes did not take the survey seriously and decided to fill in random answers just for the sake of reaching completion status. This would explain why some answered the keystone symptoms (headache, dizziness, insomnia) correctly at baseline then changed their answer for the end of season survey. Although small, there were positive changes in average attitude scores amongst this population. More time spent with the protocols or longer timeframes to complete the surveys may have allowed for more significant changes in these scores. The end of season debriefs sessions with each respective team leader showed potential for long term integration into the University. Although participation from each team may have been limited, each leader expressed that those that did take the program seriously felt that it is a good fit for the lifestyle of college students. Both asked if this program would be available in future seasons due to their excitement at the potential of the project. Anecdotes were shared from both teams where concussion injuries had occurred and limited access to injury resources left the team in difficult

management situations. Limitations in this project included both timeline conflicts and participation from college athletes. Miscommunication between the DNP student, the University of Pittsburgh, and the University of South Carolina lead to a necessary alteration in the timeline of the study which resulted in the loss of a data timepoint. That timepoint would have provided additional data for interpretation of the effectiveness of the program materials. The original intention was to provide the participating athletes with the program materials at the beginning of the season, but the timeline alteration reduced the time spent with the materials to a little over a month. More time spent with the materials may have led to greater improvement in concussion knowledge and management. Another major limitation of this study was participation. Nearly twenty team contacts were approached and only four responded with two teams eventually agreeing to participate. From those two teams, there were 98 potential participants with 40 responding to the surveys. Of those 40, 13 ended up taking the end of year survey. Due to the nature of this study, only those that completed both surveys were eligible to be used for data analysis. Without any incentives, it was difficult to encourage continued participation from the athletes. Busy sports schedules, work, schoolwork, or other responsibilities are all reasons that athletes may have refused participation. For future studies, more face-to-face interaction would be encouraged to increase the possibility of continued participation. Even from those that chose to participate it is possible that there was lack of interest in completing the surveys. Pressure from team leaders for the sake of completion may have lead to improper completion of the surveys. Statistical data from this project does not show much improvement in concussion knowledge or reporting behaviors when compared to the baseline prior to implementation. However, the limitations explained

above may have had a significant effect on this data. Longer time spent with the materials, more time for completing the surveys, appropriate incentives, or more face-to-face interaction all could have encouraged more efficient participation in this program.

### **Conclusion**

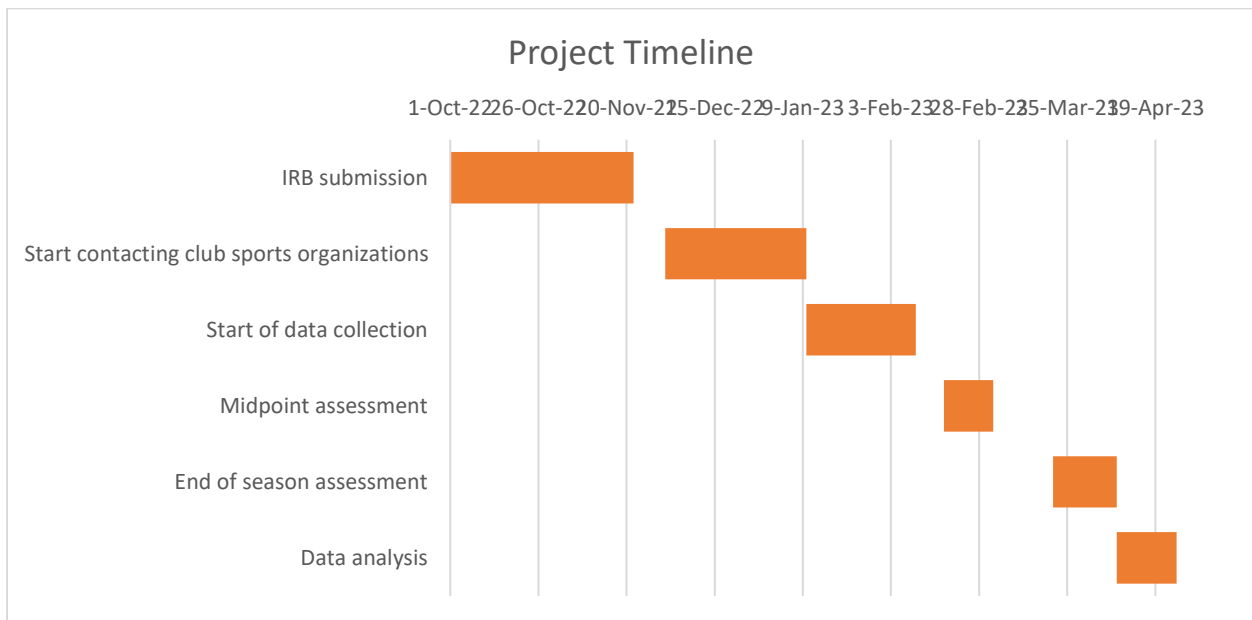
As a concussion protocol for club athletes at the University of Pittsburgh, this project would be very sustainable. All materials used in this project were provided to the team leaders and would be easily accessible for all clubs that are interested. Further discussions with the University of Pittsburgh and the Student Affairs office need to be had to promote the use of this project moving forward. Both participating team leaders showed significant interest in utilizing this protocol in future seasons. The limitations of this project greatly affected the results of the statistical analysis. There are still very little research studies regarding the use of a peer concussion protocol, especially in the club sports realm. Future studies are encouraged to obtain a larger sample population and utilize different strategies to ensure completion of the project. Incentivization, frequent face-to-face check ins, and more frequent email reminders are all possible strategies to increase completion rates. Although statistical data was not favorable, there were still minimal signs of improvement amongst concussion behaviors in this population. A peer-to-peer program may still be warranted, however changes to its delivery or its content may be necessary to pique the interest levels of the athletes. One of the team leaders mentioned that the team paid most attention when discussing the possible short term and long-term negative effects of poor concussion management. As mentioned above, the Warmath study showed positive results when presenting athletes with consequence-based social marketing related to concussion injury reporting. Utilizing this data to adjust the content

of future peer-to-peer programs, or highlighting the consequences of concussions already mentioned in the CHC program could yield more significant results.

**Appendix A**

TASK	START	END	Duration
IRB submission	1-Oct-22	22-Nov-22	52
Start contacting club sports organizations	1-Dec-22	10-Jan-23	40
Start of data collection	10-Jan-23	10-Feb-23	31
Midpoint assessment	18-Feb-23	4-Mar-23	14
End of season assessment	21-Mar-23	8-Apr-23	18
Data analysis	8-Apr-23	25-Apr-23	17

**Appendix B**





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