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Title: An Interdisciplinary Approach to Concussion Rehabilitation

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Under the direction of the faculty capstone advisor:

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A Capstone Project
An Interdisciplinary Approach to Concussion Rehabilitation

Submitted to the School of Occupational Therapy at University of Indianapolis in partial fulfillment for the requirements of the Doctor of Occupational Therapy degree.

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Abstract

The purpose of the Doctoral Capstone at the Rehabilitation hospital of Indiana Northwest Brain Injury Center (INBIC) was to complete the initial stages of program development for a concussion clinic. Educational resources were developed and an evidence based presentation was provided for the staff at INBIC. The DCE student developed a needs assessment, to gain an understanding of the background therapists at the facility had for treating patients diagnosed with post-concussion syndrome (PCS), and to identify what resources staff would like to have at the facility. To meet the demands identified in the needs assessment several educational resources were developed for the therapists to utilize when treating patients diagnosed with PCS. In total eight resources were created including: 1) Facts about concussions, 2) vision, 3) vestibular, 4) cognitive, 5) healthy sleep/stress, 6) return to school, 7) return to work, 8) work ergonomics. After the completion of the evidence based presentation, staff reported a 100% satisfaction level with the resources created by the DCE student. Therapists at the facility have access to the resources through the online drive. Sustainability and carryover was discussed with the therapy manager, who is responsible for continuation.

Interdisciplinary Approach to Concussion Care

Concussions, also known as a mild traumatic brain injury (mTBI) are becoming a more common injury in the United States, with at least 3 million reported cases each year (Difazio, Silverberg, Kirkwood, Bernier & Iverson, 2016). A concussion/mTBI “involves a complex pathophysiological process induced by biomechanical forces” (Leddy, Baker & Willer, 2016 pg. 438). A concussion can result from a force to the head sustained during typical everyday activities such as, playing sports, driving, or while completing activities at work. (Acord-Vira, Davis, Wheeler & Cannoy, 2018).

There are several ways to measure the severity of a brain injury. First a physician can measure an individual’s level of consciousness using the Glasgow Coma Scale (GCS); a score between 13-15 is considered mild on the GCS (Wäljas et al, 2015). Second, duration of loss of consciousness can be used as a measurement of severity. Loss of consciousness lasting less than 30 minutes can be diagnosed as a mTBI (Wäljas et al, 2015). Lastly, post traumatic amnesia (PTA), measured from the time the injury occurs, to when an individual regains continuous memory; using this measurement a mTBI is diagnosed if continuous memory returns within 24 hours (Wäljas et al, 2015).

The initial symptoms following a concussion include: physical (eg., headache, dizziness, nausea), vestibular (eg, balance, ocular reflex, saccades), and cognitive (eg, reaction time, processing speeds, and memory) (Pearce, Sufrinko, Lau, Henry, Collins & Kontos, 2015). Evidence shows the majority of individuals recover from the injury after a brief period of time, however, researchers have found that 14-26% of individuals diagnosed will have persistent symptoms (Losoi et al, 2016). Another study, conducted in a military concussion clinic by Cogan

and colleagues (2018), provided evidence that 15-20% of individuals recovering from a mTBI experienced persistent physical, cognitive, and emotional symptoms.

When concussion symptoms are prolonged, persisting for greater than three months, an individual may be diagnosed with post-concussion syndrome (PCS) (Leddy, et al, 2016). It is important to note that PCS is not a single pathophysiological entity. “It is a term used to describe a constellation of nonspecific symptoms.” (Leddy, et al, 2016 pg. 438). The typical PCS symptoms include headache, poor concentration, fatigue, visual disturbances, decreased memory, and slowed thinking, however, there are a variety of physiological and psychological symptoms that in many cases can complicate an individual a recovery (Snell, Macleod & Anderson, 2016). The variety of symptoms creates a challenge for clinicians to determine whether symptoms are prolonged from the concussion/mTBI, or associated with premorbid conditions that may or may not be associated with the injury (Leddy, et al, 2016). Evidence shows that due to the complexity of this diagnoses, providing evidence-supported treatment early in the rehabilitation process is critical in the recovery process (Losoi et al, 2016).

Role of Occupational Therapy

The PCS symptoms noted above can lead to a variety of occupational deficits in activities of daily living (ADLs) and instrumental activities of daily living (IADLs), such as sleep, work, leisure, and school (Cogan, Huang & Philip, 2018). Occupational Therapy practitioners have unique qualifications to assist individuals suffering from PCS symptoms regain independence in their ADLs and IADLs (Brayton-Chung, Finch & Keilty, 2016).

Initially, an occupational therapist will focus on developing rapport and identifying the individual's goals (Brayton-Chung, et al, 2016). A qualitative research study completed with military personnel showed that the positive therapeutic relationship developed between the

occupational therapist and the patient was one of the most beneficial aspects of therapy (Cogan, et al, 2018). Once goals are identified, the occupational therapist will address performance patterns and skills that will increase engagement in an individual's meaningful daily activities (Brayton-Chung, et al, 2016). Occupational therapy alone however, will not be effective in treating the variety of PCS symptoms. Individuals recovering from PCS symptoms require a multidisciplinary team consisting of an occupational therapist, a speech therapist, a physical therapist, as well as physicians to develop an effective rehabilitation plan (Brayton-Chung, et al, 2016).

Physical Symptoms

Following a concussion, an individual may have such as dizziness, fatigue, balance problems, and headaches (CDC, 2016). Collaboration between the occupational and physical therapist helps to create a holistic rehabilitation plan to treat these physical symptoms (Brayton-Chung, et al, 2016). Much research has been focused on physical rest and its use as an intervention for individuals recovering from concussions (DiFazio, et al, 2016). The amount of rest recommended has not been established, however, researchers have shown 24-48 hours may be beneficial when followed by a gradual return to daily activities (Leddy, et al, 2016). Thomas and colleagues (2015) compared individuals prescribed with strict rest and individuals prescribed with a gradual return to activity. The study found that individuals prescribed with strict rest reported more post concussive symptoms over the course of the study. The study supports prescribing a graded return to activity following a concussion (Thomas, et al, 2015)

Fatigue may be addressed by the occupational and the physical therapist. The occupational therapist initially may have an individual complete a daily or weekly schedule to identify which activities may cause symptoms to appear (Brayton-Chung, et al, 2016). Many

individuals with PCS symptoms have difficulty falling asleep or they are sleeping less than before their injury (Wickwire, et al, 2016 & Sullivan, Berndt, Edmend, Smith & Allan, 2016). Occupational therapists can provide individuals with education on the role of sleep during the recovery process and the importance of developing healthy sleep habits by planning rest breaks during the day, and making environmental modifications to help manage the symptoms (Brayton-Chung, et al, 2016).

Recent research has shown that controlled exercise, for individuals with PCS symptoms may enhance their recovery (Leddy, Hinds, Sirica & Willer, 2016). Physical therapists use their expertise to develop various exercise tests to provoke PCS symptoms that may not be seen at rest (Kozlowski, Graham, Leddy, Devinney-Boymel & Willer, 2013). Stroth and colleagues (2009) suggested that exercise improves brain function and has favorable effects on neuroplasticity six to eight weeks after starting exercise. The Zurich guidelines currently advise to begin light aerobic activity such as walking or a stationary bike, once an individual is asymptomatic (McCrory et al, 2013).

One reliable exercise test currently being used is the Buffalo Concussion Treadmill Test (BCTT). The BCTT was utilized in a recent study to reveal physiological dysfunction after a concussion (Leddy, et al, 2016). A lack of symptom exacerbation seen during the BCTT may be useful in identifying other diagnoses outside of PCS to account for an individual's resting symptoms (Kozlowski, et al, 2013). The results from graded exercise testing can also be used by occupational therapists to design interventions to allow a safe return to meaningful occupations (Brayton-Chung, et al, 2016).

Vision/Vestibular Dysfunction

Visual deficits and vestibular dysfunction related to the head and neck are also common PCS symptoms that require a collaborative approach between the occupational and physical therapist (Brayton-Chung, et al, 2016). The vestibular system plays a vital role maintaining spatial orientation, visual orientation, and balance function (Broglia, Collins, Williams, Mucha & Kontos, 2015). A recent study found that (30-65%) of individuals with a mTBI report oculomotor problems such as blurred vision, diplopia, difficulty tracking a moving target, and difficulty reading (Pearce, et al, 2015). If an individual report one or more of the above deficits, it is likely to have adverse consequences in the individual's performance of ADL's and IADI's (Brayton-Chung, et al, 2016).

Research conducted by Gallaway and colleagues (2017), shows the most prevalent post concussive visual diagnoses were accommodative insufficiency (AI) and convergence insufficiency (CI). The researchers examined two hundred and eighteen participants suffering from post-concussion symptoms. Of the participants 47% had CI and 42% had AI. A study involving athletes with sports related concussions completed by Pearce and colleagues, also showed that CI was common in 42% of athletes (Pearce, et al, 2015). Both CI and AI can be treated through vision therapy, where the focus of the rehabilitation is to remediate vergence, versional eye movement, and accommodation. In Gallaway's study (2017), vision therapy was shown to have successful or improved outcomes in the majority of the individuals that completed vision therapy. Some common complaints individuals with PCS report are dizziness and imbalance (Moore, Adams, & Barakatt, 2016). Rehabilitation performed by a licensed physical therapist specializing in vestibular rehab may be used to treat these symptoms (Broglia, et al,

2015). Common vestibular impairments an individual may have include benign paroxysmal positional vertigo, impaired postural control, exercise induced dizziness, and cervicogenic (Broglio, et al, 2015). Physical therapy often utilizes intervention strategies such as dynamic balance training, and manual therapy for the cervical spine, to remediate balance difficulties. (Broglio, et al, 2015). Communication between all members of the rehabilitation team, is vital to ensure a patient's symptoms are being treated appropriately (Brayton-Chung, et al, 2016). As an individual progress, the occupational therapist can design a graded intervention to increase participation in meaningful occupations (Brayton-Chung, et al, 2016).

Cognitive Symptoms

Cognitive rehabilitation is a significant component in the collaborative approach needed to treat individuals suffering from mTBI (Moore, et al, 2010). Cognitive symptoms such as difficulty concentrating, difficulty thinking clearly, feeling slowed down, and having difficulty remembering new information (Brayton-Chung, et al, 2016) may be persistent following a concussion . Mental fatigue is also a common complaint individuals report who have been diagnosed with a mTBI (Johansson, Bergund & Rönnbäck, 2019). Speech language pathologists design interventions to correct deficits in executive function, cognitive endurance and memory (Brayton-Chung, et al, 2016).

An individual's cognitive status plays an important role in occupational performance (AOTA, 2013). Moore and colleagues, (2010) demonstrated that a cognitive training program can be used to support attainment of work among veterans suffering from persistent cognitive symptoms resulting from a mTBI (Moore, et al, 2010). More research is needed to show the effectiveness in neurocognitive rehabilitation for individuals suffering from PCS symptoms.

Return to Work/School

Much research has been completed to examine how PCS symptoms impact an individual's return to work and school. Wäljas and colleagues (2015) examined 109 individuals who suffered a mTBI and the factors involved with returning to work. The study found that two weeks following the injury 59.6% of individuals returned to work, at 4 weeks 70.6%, at 2 months 91.7%, and at 1 year 97.2% (Wäljas et al, 2015). This specific study found that there were four crucial variables that impacted the return to work timeframe. The participants age, fatigue rating, intracranial abnormality at the day of injury, and multiple bodily injuries. Although nearly all individuals return to work, one should consider the perceived productivity loss that may occur due to these injuries. Silverberg and colleagues (2018) examined work productivity loss in 46 individuals recovering from a mTBI. In this study 60.6% of the participants reported getting less work done when returning to their job, and 42.4% reported "making more mistakes" (Silverberg, Panenka & Iverson, 2018). This data suggest that even after returning to work, the PCS symptoms may still be affecting an individual's ability to perform at their highest level. Occupational therapists are trained to address performance skills and patterns, and can assist these individuals in designing return to work guidelines, (Acord-Vira, et al, 2018). This may be accomplished through activity analysis, activity grading, and environmental modifications (Acord-Vira, et al, 2018).

A recent poll completed by 2,000 adults in the United States showed that 70% of the participants did not realize that concussions are treatable (Kontos & Collins, 2018). INBIC is an outpatient facility designed to assist individuals recovering from a variety of neurological injuries reach their highest potential for independence. The staff at INBIC consist of clinical

neuropsychologists, physical therapists, occupational therapists and Speech therapists. The variety of disciplines available make the facility a great resource for individuals with PCS. The purpose of the Doctoral Capstone at INBIC is to complete the initial stages of program development for a concussion clinic at INBIC. Educational resources will be developed and an evidence based presentation will be provided for the staff at INBIC.

Theoretical Basis

The Person-Environment-Occupation-Performance (PEOP) model emphasizes an individual's daily occupations and the factors that influence the individual's performance (Cole & Tufano, 2008). There is a dynamic relationship between the person, occupation, and environment that influences an individual's occupational performance (Reed & Lee, 2012). An occupational therapist treating individuals suffering from PCS can use the PEOP model to increase an individual's occupational performance by examining the factors related to the person, environment, and occupation. The person is made up of the psychological, cognitive, physiological, and spiritual factors. The environment consists of the physical, cultural, and societal factors of an individual's life (Cole, et al, 2008). PCS can result in physical, vestibular, and cognitive changes that will impact an individual's ability to participate in occupations and the environment in which these occupations are performed. An occupational therapist using this model with this population must consider these changes when designing evidence based interventions.

The Rehabilitative Frame of Reference (FOR) aims for individuals to reach independence in occupations despite impairments (Cole, et al, 2008). As the research conveys, PCS may result in a variety of deficits that will require multiple rehabilitative strategies (Snell, et al, 2016). An occupational therapist may use the Rehabilitative FOR to develop appropriate interventions,

environmental adaptations, and compensatory strategies to overcome these deficits and reach independence. Using the PEO model and Rehabilitative FOR can assist an occupational therapist working with this population by providing structure and organization, which will result in increased efficacy (Bonnell & Smith 2018)

Screening and Evaluation

Needs Assessment

The DCE student created broad goals and objectives prior to the capstone experience. The goals and objectives were then edited and finalized with approval from the site and faculty mentors within the first two weeks of the DCE. During the first and second week of the DCE the student was introduced to the therapy staff, attended rounds and staff meetings, and completed orientation at INBIC. Following the orientation to the site, a self-created ten-item needs assessment survey was formed (See Appendix A).

According to Stein, Rice, and Cutler (2013) “the main purpose of survey research is to obtain accurate objective descriptions about a specific universe of people or entities” (2013, p. 130). The purpose of the assessment was to determine the therapists’ level of confidence treating Post-Concussion Syndrome (PCS) patients, what experiences the therapist had treating PCS patients, and what resources were being provided for PCS patients. The needs assessment survey for this project aligns with the purpose of survey research (Stein, Rice, & Cutler, 2013).

The survey included a self-developed ten item questionnaire. The DCE student created the survey to identify five topic areas: services provided for PCS patients at INBIC, advanced training on PCS received by staff, each members’ understanding of the services provided by other disciplines, resources provided for PCS patients, and staff perceptions on where there is a need to advocate for PCS patients. The DCE student distributed the survey via email to three occupational therapists, two speech therapists, two physical therapists, one case manager, and

one clinical neuropsychologist at INBIC. Eight of the nine individuals that received the survey, completed the survey. The DCE student and site mentor agreed the sample size was large enough to be generalized for the staff at INBIC.

Needs Assessment Results

Seven of the eight participants reported having experience treating PCS patients (See Appendix A). Confidence was measured on an individual's subjective rating using a one to ten scale. Therapy staff reported a median of seven on a ten point likert scale when assessing confidence. When asked if staff received advanced training, having the ability to choose more than one answer, 62.5% of the participants reported receiving education from a staff member at the facility, 25% completed a web based course, 25% have attended a conference on concussion rehabilitation, and 25% have attended a course specialized in concussion rehabilitation. When asked to rate the participants' understanding of the services offered outside their discipline, 62.5% reported having a "great" understanding of the services offered by other disciplines, and 37.5% reported having an "okay" understanding of the services offered by other disciplines.

The next portion of the needs assessment was focused on the resources provided for patients diagnosed with PCS. When asked how often the staff members provided resources for patients, 37.5% reported for every patient, 50% reported often providing resources, and 12.5% reported "sometimes" providing resources. When asked what resources they are most often providing with the option to choose more than one answer, 25% reported providing information about their profession, 75% reported providing information regarding the patient's diagnoses, 75% reported providing resources on "home modifications and accommodative strategies". Eighty-seven and a half percent reported providing a home exercise program, one participant subjectively reported providing resources through a "facts about concussions booklet".

Therapists were then asked if there were resources currently not provided that they would like the facility to have. Staff were provided with a “yes” or “no” option and an open comment section in which they could describe the resources desired. Eighty-seven and a half percent reported there are resources they would like the facility to have. These included: additional assessment tools, patient/family education information on sleep management and stress management, a concussion protocol, and resources for manual therapy. The final portion of the needs assessment focused on if the staff believed there was a need to advocate for individuals with PCS and where. Staff were provided with a “yes” or “no” option and an open comment section to describe where advocacy may occur. One-hundred percent of the staff reported that “yes” there is a need to advocate. Areas included, practitioners, primary care physicians, emergency departments, employers, and schools (See Appendix A).

The data from the needs assessment identified how treatment for individuals diagnosed with PCS can be enhanced at INBIC. Staff identified the lack of evidence based resources at the site for patients diagnosed with PCS. Research shows the diagnoses of concussions and mTBI is based on subjective information for the majority of patients (Cooksley et al, 2018). As such, many individuals who suffer mTBI may not seek medical treatment, and consequently not receive the appropriate education and treatment they need (Cooksley et al, 2018). Providing education to patients and family members is one of the first steps in providing treatment for patients diagnosed with PCS (Ontario Neurotrauma Foundation, 2018). With many of the therapist on staff at INBIC providing treatment to patients diagnosed with PCS the need for evidence-based resources is crucial for this population to receive the most effective and beneficial care.

Implementation

Resource Development

Following the needs assessment, implementation of the DCE project involved four main components: 1) completing continuing education courses with a focus in PCS, 2) observing occupational therapists, speech therapists, and physical therapists at the facility, 3) creating patient resources, 4) providing an evidence based presentation to the staff. The DCE student identified two continuing education courses that allowed him to gain advanced knowledge in PCS rehabilitation. The courses were completed by the DCE student during the third and fourth week of the DCE. The first course completed was: *Mild Traumatic Brain Injury: Acute Management, Differential Diagnoses, Treatment, and Rehabilitation*, taught by Dr. Grant Iverson. The course outlined the identification and diagnoses of mTBI and PCS, and discussed the current evidence for treatment and rehabilitation for mTBI and PCS. The second course completed was: *POST CONCUSSION SYNDROME SERIES: A Four Part Series*, taught by Christina Finn MS, OTR/L. The course identified the impact a concussion may have on the visual, vestibular, and sensory system, provided an overview of treatment and rehabilitation, and discussed strategies to return to school and work. The DCE student utilized the information from these courses to assist with the development of evidence based resources for the facility.

Beginning the third week of the DCE, observation time was scheduled via email with various therapist at the facility. Observation was completed throughout the first nine weeks of the capstone experience. The DCE student observed two occupational therapists, one specialized in vision rehabilitation, one physical therapist with advanced training in vestibular rehabilitation, and two speech therapists. Also, the DCE student observed rounds to gain a better understanding

of each discipline's role at the facility. The observation time allowed the student to gain further insight into the barriers therapists face treating patients with PCS, the challenges patients with PCS have, and the knowledge on how to assist with resource development. This time also allowed the DCE student to network and build rapport with the therapists at the facility and to discover additional resources being provided to patients diagnosed with PCS.

Resources created for the facility took approximately 4 weeks to complete. The two continuing education courses and the concussion guidelines, created by the Ontario Neurotrauma Foundation, were utilized to ensure the resources created were supported by the most up to date literature. In total seven resources were created including: 1) Facts about concussions, 2) vision, 3) vestibular, 4) cognitive, 5) healthy sleep/stress, 6) return to school, 7) return to work, 8) work ergonomics. An example resource can be seen in Appendix C. The resources were stored on the facilities online drive, and also kept in a binder held by the therapy manager. The binder held by the therapy manager also included: current assessment tools being used to evaluate patients diagnosed with PCS and the guidelines for diagnoses and treatment provided by the Ontario Neurotrauma Foundation.

The final component of implementation consisted of providing an evidence based presentation to the facility at INBIC. All members who completed the needs assessment were present at the final presentation. The presentation included: an overview of the literature collected by the DCE student, discussion of the continuing education courses completed, instructions on how best to utilize the resources created, and an overview of the current assessment tools being used to evaluate patients diagnoses with PCS. At this presentation post-presentation surveys (see Appendix B) were passed out to be completed by each staff member.

The surveys provided feedback on the staffs' satisfaction with each resource that was created by the DCE student and recommendations for improvement.

Staff Development and Leadership

The literature review showed evidence of a lack of awareness in the general population that concussions can be treated (Kontos & Collins, 2018). By increasing the amount of resources available on PCS to the facility, the presentation resulted in staff development. The needs assessment was utilized to identify resources the therapists believed would be most beneficial to the facility. The presentation and handouts provided allowed the therapists to better treat individuals diagnosed with PCS. The resources provided will be held by the therapy manager at the facility and will be immediately available for all staff members to use and future staff members.

The DCE required self-direct learning throughout the entire process. The DCE student assumed leadership in identifying goals, completing continuing education courses, developing resources for the facility, and creating an evidence based presentation. The therapy manager at the facility also played a crucial role in the DCE student accomplishing their goals.

Communication became a crucial component of the DCE process. Communicating with the therapist was vital in ensuring the resources developed met the facility's needs. Meetings were held with the therapy manager every week to review and discuss changes that could be made to the resources. The consistent interaction between the DCE student and therapy manager allowed for feedback that led to changes being made when necessary. Organization was also a critical part of the DCE. The DCE student was responsible for developing a schedule that would allow for all goals to be accomplished in a timely manner. During the weekly meetings, the DCE student identified goals that were accomplished and addressed what goals would be completed

next. The growth of leadership skills throughout the DEC provided for a confident presentation of materials to facility staff.

Discontinuation and Outcome

The DCE student developed an outcome tool to measure the satisfaction and efficiency of the resources developed for the staff at the facility. The outcome measure was an eight question survey with a Likert scale to measure the level of satisfaction (See Appendix B). Therapists who attended the presentation received the satisfaction survey after the DCE student's evidenced based presentation on PCS. Therapists were given one week to complete the survey. In total 9 surveys were distributed to the case manager, therapy manager, three occupational therapists, two physical therapists, and two speech therapists completed the survey. All surveys were returned to the DCE student when completed by the staff. The outcome measure, (see Appendix B), had therapists rate satisfaction on all eight resources and the PCS binder created by the DCE student. All staff members responded to the nine questions with complete satisfaction for each question, giving a score of 100% satisfaction.

To ensure the sustainability of the project, the DCE student provided the resources to staff in two binders and uploaded the resources to INBIC's shared drive to ensure the resources would be available at all times. The purpose of the first binder was to provide a background of the literature related to PCS. Forty-one articles were collected and organized into appropriate sections. Sections included: 1) background on mTBI/PCS, 2) systematic reviews on PCS, 3) vision, 4) vestibular, 5) cognition/sleep, 6) vision. All articles were also uploaded to INBIC's shared drive. The purpose of the second binder was to provide the Ontario Neurotrauma guidelines for treatment of PCS, relevant assessment tools to use during evaluation, and the resource handouts developed by the DCE student. All resources included in the binder were

uploaded to INBIC's shared drive. The DCE student and the therapy manager collaborated on the organization of the resources on INBIC's shared drive to ensure sustainability. The therapy manager will add additional information or complete editing as new evidence becomes available in the future.

Any individual who suffers a concussion is at risk for a variety of cognitive, vestibular, visual, or emotional changes. In order for these individuals to recover and return to prior level of function, they must have an understanding of what treatment will look like and what to expect. This capstone allowed the DCE student the opportunity to provide educational resources and ensure that the facility has the most up to date evidence to support rehabilitation for persons who have experienced a concussion in.

Overall Learning

During the initial stages of the DCE, there were five goals with corresponding objectives identified by the DCE student. To accomplish these five goals, effective communication between the DCE student, site mentor, and staff at the facility was crucial. The first goal was for the DCE student to identify occupational therapy's role when working with patients suffering from PCS. The DCE student accomplished this goal by searching current evidence based literature for occupational therapy's role in rehabilitation of PCS, using a survey questionnaire with staff at the facility, and completing a continuing education course on PCS taught by an occupational therapist.

The second, third, and fourth goal, was centered around the DCE student developing educational handouts for the patients at the facility. Initially the DCE student identified the need for a cognitive, vestibular, and vision handout for the facility. Additional resources were identified after the completion of the needs assessment. As previously mentioned eight handouts

were developed including: 1) facts about concussions, 2) vision, 3) vestibular, 4) cognitive, 5) healthy sleep/stress, 6) return to school, 7) return to work, 8) work ergonomics. The DCE student developed the handouts by observing and collaborating with therapists at the facility, reviewing resources already held at the facility, completing continuing education courses, and adapting information provided by the Ontario Neurotrauma foundation.

The final goal for the project, was for the DCE student to present an evidence based presentation to the staff at the facility on PCS. During this presentation the DCE student explained the purpose of his project, and how the needs assessment was utilized to identify what resources would be most beneficial for the facility. The DCE student explained how the resources were developed and what information was utilized during the development. The DCE student answered all questions the staff presented after the completion of the presentation. By answering questions the DCE student strengthens the sustainability of the project.

Throughout the DCE project, it was crucial for the DCE student to demonstrate effective leadership skills, and to advocate for occupational therapy's role in concussion rehabilitation. The DCE student had the opportunity to collaborate with a variety of practitioners with various backgrounds. This allowed the DCE student to continuously advocate for occupational therapy's role, and to gain insight on the unique scope of practice physical and speech therapists possess. During the final presentation the DCE student demonstrated self-confidence that the resources being provided were at the highest quality. By accomplishing the objectives set at the start of the DCE, the DCE student gained knowledge of what initially needs to be accomplished when designing a treatment protocol for a specific population.

Conclusion

As a result of the DCE project, the staff at INBIC now has a resource which provides the most up-to-date information on concussion rehabilitation as well as up-to-date educational handouts for patients recovering from PCS or mTBI. All goals and objectives the DCE student had at the start of the experience were achieved. The DCE student gained valuable leadership skills and also had the opportunity to advocate for his profession throughout the DCE. The therapists at the facility reported a One-hundred percent satisfaction level with the resources provided by the DCE student. The resources will continue to be updated through editing by the site manager at the facility. Providing patients diagnosed with PCS with educational resources during the initial stages of recovery is a great way to ensure a more successful recovery.

Appendix A

Results of Needs Assessment

1. Please list your job title and the population you serve at RHI Northwest Brain Injury Center. Occupational therapist 1: Program Facilitator vision. ½ day inpatient vision pts. ½ day out patient. Majority neuro deficits, some low vision.
Occupational therapist 2: Adults 16-? TBI, NTBI, stroke, PD, MS, other neuro disorders
Occupational therapist 3: Stroke TBI, NTBI
Speech therapist 1: Brain injury and stroke
Speech therapist 2: BI, CVA, BrainCA, Encephalopathy, PCS
Physical therapist: brain injury + vestibular
Case Manager: TBI, CVA, NTBI, PCS
Clinical Neuropsychologist: I serve patients with TBI, concussions, and other acquired brain injuries. I also serve their family members/caregivers
2. During your time at the Neurorehabilitation center have you had any experiences working with individuals diagnosed with post-concussion syndrome (PCS)? If so, please provide a brief description of your experience's.
Occupational therapist 1: Yes, many have visual deficits dealing with eye strain, fatigue, double vision, convergence insufficiency. I give out a lot of adaptations and strategies to reduce eye strain. Refer to eye care physician functional visual talks.
Occupational therapist 2: Yes, but very little. The few pts I've seen for OT have not been able to tolerate my sessions due to pain or psych issues.
Occupational therapist 3: no
Speech therapist 1: Yes, evaluation is a combination of clinical interview, patient report, standardized assessment. Goals focus on strategies and self-monitoring tools.
Speech therapist 2: Yes, evaluation treatment, education and training of strategies
Physical therapist: Yes- generally treating these individuals from a vestibular standpoint
Case Manager: Yes, it has been my experience that the majority PCS patients have a significant psych history
Clinical neuropsychologist: Yes. I perform diagnostic evaluations to detect if they have problems consistent with PCS, provide appropriate recommendations for obtaining evidence based treatments, and used to do a lot of individual psychotherapy with these patients.
3. How would you rate your confidence level when working with individuals diagnosed with PCS? (1- no confidence, 10- extremely confident)
Occupational therapist 1: 6/10- Each one can be so different
Occupational therapist 2: 5
Occupational therapist 3: 7/10
Speech therapist 1: 9
Speech therapist 2: 7
Physical therapist: 7
Case Manager: 7
Clinical Neuropsychologist: 8

Appendix A (Continued)

4. Have you completed any advanced training in terms of working with individuals diagnosed with PCS? If you select other, please provide a brief description of the training completed.
 - a. Web based course (2)
 - b. Attended a conference on concussion rehabilitation (2)
 - c. Attended a course specialized in concussion rehabilitation (2)
 - d. None (0)
 - e. Other (5)
occupational therapist 2: Training from clinical neuropsychologist on staff.
occupational therapist 3: CBIS training
speech therapist 1: Education provided by clinic staff
speech therapist 2: Training from clinical neuropsychologist on staff
case manager: Training from clinical neuropsychologist on staff
5. If you have not completed advanced training in terms of working with this population, what type of training would you find most beneficial? If you select other, please provide a brief description of the training desired.
 - a. Web based course (1)
 - b. Attended a conference on concussion rehabilitation (2)
 - c. Attended a course specialized in concussion rehabilitation (4)
 - d. None (0)
 - e. Other (3)
occupational therapist 2: Continued training from clinical neuropsychologist
speech therapist 2: Continued training from clinical neuropsychologist
clinical neuropsychologist: More education regarding recent studies that have looked at PCS recovery and things that can improve headaches, fatigue, dizziness mental fog, and cognitive overload, and more exercise tolerance strategies. Also want to learn more about the cumulative effect of multiple concussions.
6. How would you rate your understanding of the services offered by staff outside of your discipline?
 - a. I have a great understanding of the services offered by other disciplines (5)
 - b. I have an okay understanding of the services offered by other disciplines (3)
 - c. I know very little about the services offered by other disciplines (0)
clinical neuropsychologist: Not always sure what the staff here at INBIC feel equipped or competent to treat. Unclear about our staff training and specialization.
7. How often do you provide resources to your patient's/ patient's families during individual treatment sessions?
 - a. For every patient (3)
 - b. Often (4)
 - c. Sometimes (1)
 - d. Rarely (0)

Appendix A (Continued)

8. If you do provided resources, which resources do you provided the most. Select all that apply. Feel free to provide a description if you feel your resource does not fit into one of the descriptions provided below.

- a. Practitioner information (2)
- b. Information regarding a patient's diagnoses (6)
- c. Home modification/accommodation strategies (6)
- d. Home exercise program (7)
- e. Other (3)

speech therapist 2: Benefits of referrals to other disciplines

case manager: Facts about concussion booklet

clinical neuropsychologist: Psychological strategies, Nutrition, sleep, ect.

9. Are there resources for this population that you would like the facility to have that they currently do not have? If yes, please explain

- a. Yes (7)
- b. No (1)

occupational therapist 1: More resources on healthy sleep

occupational therapist 2: Assessment tools for post-concussion patients

occupational therapist 3: probably

speech therapist 1: Additional printer information for patients and family education.

physical therapist 1: Information on stress management, and prognosis

case manager: Yes, an actual PCS protocol and what the patients can expect about the recovery process. The referring physicians never give the patients any information on what to expect.

clinical neuropsychologist: Yes, do we have Neurocomm here? Also dry needling and more training in manual therapies for headache management has been used and found to be beneficial in treating this population. Otherwise I have been referring out.

Appendix A (Continued)

10. Do you believe there is a need to advocate for patients experiencing post-concussion like symptoms outside of RHI Northwest Brain Injury Center? If yes, please explain where and why?

a. Yes (8)

b. No (0)

occupational therapist 1: This is not a very recognized diagnoses and is difficult to diagnose, which I believe leaves lots of people dealing without services they need and could benefit from.

occupational therapist 2: Yes, because they get labeled as fakers and malingerers. More health care workers need education and resources in order to better treat PCS patients.

occupational therapist 3: Yes, due to limited practitioner knowledge

speech therapist 1: yes, primary care and MD's

speech therapist 2: Increased awareness of PCS and available treatment, support, and resources

physical therapist 1: Emergency department would be a good place to start, emergency doctors especially

case manager: Yes, because most of these patients are still trying to work or missing due to PCS. Community needs more education about PCS as well as employers and their families.

clinical neuropsychologist: Yes, employers, school, and family members need greater education to help support the patient, so the symptoms do not become persistent.

Appendix B

Outcome Measure

1= not satisfied at all, 5= completely satisfied

1. Please rate your satisfaction with Facts about Concussion Resource

1 2 3 4 5

2. Please rate your satisfaction with the Vision Resource

1 2 3 4 5

3. Please rate your satisfaction with the Vestibular Resource

1 2 3 4 5

4. Please rate your satisfaction with the Cognition Resource

1 2 3 4 5

5. Please rate your satisfaction with the Healthy Sleep/Fatigue Resource.

1 2 3 4 5

6. Please rate your satisfaction with the Return to School Resource.

1 2 3 4 5

7. Please rate your satisfaction with the Return to Work Resource.

1 2 3 4 5

8. Please rate your satisfaction with the Work Ergonomics Resource.

1 2 3 4 5

9. Please rate your satisfaction with PCS Binder.

1 2 3 4 5

Appendix C Example Resource

Appendix C Continued Example Resource



Stress Management

What is Stress?

- Stress is our bodies response to the demands we face in our everyday lives.
- It's important to be able to identify when you have symptoms that may be caused from stress.
- Symptoms fall under four categories: physical, behavioral, thoughts, and emotions.

Stress Warning signs and Symptoms**Cognitive**

- Difficulty concentrating
- Forgetfulness
- Fear of Failure
- Repetitive thoughts

Emotional

- Anxiety
- Irritability
- Mood Changes

Physical

- Fatigue
- Sleep Disturbances
- Tight Muscles
- Back or neck problems

Behavioral

- Appetite Changes
- Crying
- Acting impulsively
- Prone to more accidents

Healthy vs. Unhealthy Coping Strategies

Healthy Coping	Unhealthy Coping
<ul style="list-style-type: none"> • Exercise • Balance work and play • Time management • Mindfulness techniques • Focus on self 	<ul style="list-style-type: none"> • Alcohol/Drug use • Avoidance • Procrastination • Self-Injury • Over eating

**Mindfulness Techniques****Body Scan**

- Slowly sweep attention through body
- Move from toes to head
- Focus on sensations breathing, and relaxation

Breathing Exercise

- Exhale through your mouth.
- Inhale through your nose for a count of 4
- Hold breath for a count of 7
- Exhale through mouth for a count of 8.
- Repeat



Appendix C Example Resource

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Images

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