

Quality Improvement: Implementation of Individualized Concussion Patient Education and Rehabilitation Treatment Plans

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ABSTRACT

Concussion is a significant health issue at all levels of sports participation. At Saint Luke's Health System (SLHS) in Kansas City, Missouri, the sports medicine and concussion team discovered an issue with dissemination of patient education for concussion rehabilitation plans. A quality improvement project was launched in August 2019 to develop concussion educational rehabilitation plans, incorporating cluster symptoms into concussion profiles and improving communication during follow-up care. The project promoted improvement of patient understanding of individualized rehabilitation plans and effective communication for the treatment management team. Three cycles of a Plan-Do-Study-Act (PDSA) quality improvement project were completed over 6 months. The physicians and athletic trainers reviewed literature and treatment plan recommendations for patients. Comparison of pre-PDSA and post-PDSA adherence to charting standards was performed. Before this project, patients had insufficient documentation of the education they were receiving. Additional implementations included education, Patient Health Questionnaire (PHQ-9) score, graded symptom scale (GSS) score, and changes to the documentation template. Eighty patients (46 male, 34 female) were included in the 6-month project. Of pre-PDSA (control) concussion patients, 71% (n=29) were male football players. After the PDSA cycles were completed, only 18% (n=7) of patients were football players. The season had no effect between the number of patients included pre-PDSA or PDSA cycles 1-3. For PDSA cycle 1, the pre-PDSA goal was surpassed, and 100% of new concussion patients received concussion education during their initial visit. During the 3-month data collection period for that cycle, only 10.5% (2/19) of follow-up patients received a concussion information packet during their visit. After completion of PDSA cycle 2, 100% of patients received education pamphlets; initially, only 85% received pamphlets. Finally, PDSA cycle 3 successfully implemented the use of the new concussion template system-wide and the addition of concussion symptom profiles for patient education and individualized treatment planning.

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CURRENT MODEL

The original process for concussion rehabilitation at SLHS in Kansas City, Missouri, involved an initial clinical examination consisting of a physical examination, ImpACT test, Balance Error Scoring System test, and symptom score. Patients were then provided with academic supports, concussion education, and a signed Missouri State High School Activities Association or Kansas State High School Athletic Association concussion form for the school, which allowed the patient to begin the return-to-play progression with the athletic trainer once free of symptoms. If there were referrals to other providers for therapy, patient education was limited. The main therapies considered were vestibular/oculomotor (after 7 days), manual therapy for the cervical spine (if the patient had cervical pain), and neuropsychological evaluation for patients with persistent symptoms that did not resolve using alternative treatment plans.

The primary issue addressed in this quality improvement project was the lack of individualized concussion rehabilitation treatment plans and patient education for these plans. Initially, the concussion rehabilitation treatment process at SLHS was limited, referring patients for a few therapy techniques while neglecting others. Typical treatment recommendations for patients were rest followed by a progression back to sport that gradually increased exertion.¹ The primary method used to assess patient status was a self-reported

symptom questionnaire.² The Post-Concussion Symptom Scale was used for tracking symptoms throughout the recovery phase and has been reported as a useful tool for assessing concussions;^{3,4} however, it was only used to determine when symptoms resolved rather than to direct therapy. As concussion treatment evidence continues to emerge, we felt we should be constantly innovating new ideas and processes throughout our sports medicine program. Recent evidence has identified presentations of SRC that have been termed profiles⁵ or subtypes.⁶ Various taxonomies have been developed that categorize symptoms in a somewhat different manner; but many include similar constructs, such as cognitive, emotional, vestibular, and ocular.⁷ Furthermore, sleep and cervicogenic injury have been implicated as modifiers for any concussion profile.⁶ We identified a gap in patient care from the resting phase through return to sport beyond the progression of exertion.

Secondarily, there was limited communication with the patient and parents about the necessary steps required after initial evaluation. Patients did not take home any written information about their current rehabilitation plan. If a patient needed a specific therapy, the specialized office would call to schedule the therapy. The physician educated the patient and the parents in the office; but once they left the clinic, it was assumed they understood the next steps of the rehabilitation plan. The majority of the time the patients would call and ask additional questions because they forgot when they should begin therapy or when they could start their return-to-play progression.

Therefore, the two primary aims of this quality improvement project were to (1) establish symptom profiles as part of each patient's individualized treatment plan and (2) improve patient and parent education and understanding of concussion treatments and return to play. To identify changes that addressed the project aims, information from the comprehensive physical examination at the initial visit, adjunct assessments, and the symptom scale was used to assign a symptom profile to each patient. Ideally, the symptom profile would result in an appropriate individualized approach to the concussion treatment and management plan. A second change required using the information from the symptom profile assignment to better educate patients and parents about the next steps in their care and expectations for the recovery process. Measurable outcomes for this project included improving the percentage of patients assigned a concussion symptom profile and providing patient educational materials at the initial visit.

PLAN-DO-STUDY-ACT (PDSA) CYCLES

Baseline Evaluation

Pre-PDSA (baseline) data were analyzed from August-September 2019 and included data from every concussion patient seen by SLHS sports medicine department during that period. An assessment of the treatment and rehabilitation plans that patients received was also performed. Three PDSA cycles were then used to establish necessary changes for improvements to patients' concussion education, communication of rehabilitation and treatment plans, and electronic medical record (EMR) template changes for staff to ensure assignment of a concussion symptom profile. A summary of the sports patients participated in during the 6-month project is presented in **Figure 1**.

To complete the three PDSA cycles during the project, there was a 6-week delay, where no data were collected. Before the PDSA cycle 1 data collection period, 41 patients were identified as meeting inclusion criteria. However, 2 cases were excluded because the concussion was caused by a motor vehicle accident and the patient was not attending school.

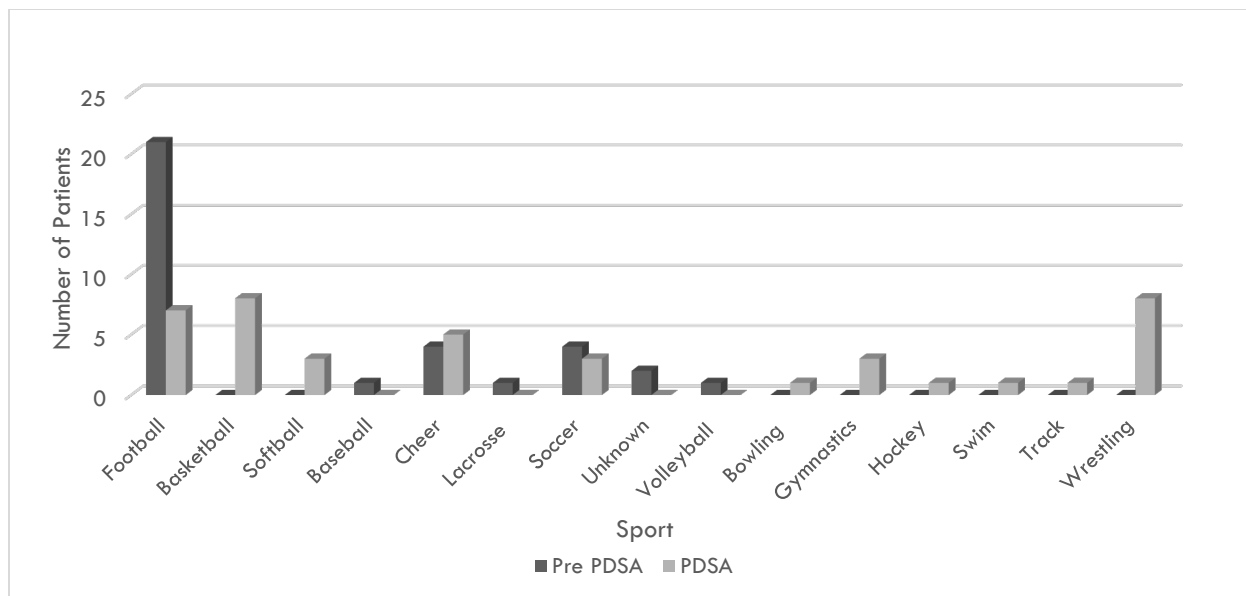


Figure 1. Patient demographics per their sport. Blue: Pre PDSA1 Aug-Sept 2019 controlled data patients. Orange: PDSA2 Dec-Feb 2020 patient’s data.

In 15% (n=6/41) of pre-PDSA cases, it was unclear whether the patient received any concussion education material because that information was not documented in the EMR. For the other 85% of cases, it was clearly documented that the patient received concussion education.

PDSA Cycle 1

The first PDSA cycle focused on improvements in the use of concussion symptom scores through the development of concussion symptom profiles and modifications to the EMR.

Plan: To implement concussion symptom profiles based on concussion symptom scores and physical examination findings for each patient, the clinical athletic trainer was responsible for obtaining the physical findings and categorizing patients into profiles after each examination. After the profiles were established, the implementation process took less than 5 minutes. Resources needed for PDSA cycle 1 included an up-to-date concussion literature review, EMR training, and instruction from the information technology team to change the templates. This cycle was expected to require a month to plan because of constraints related to scheduling with others.

Do: Five concussion symptom profiles were established to drive treatment plans. The concussion symptom profiles were discussed among the entire sports medicine team and informed by the concussion symptom cluster of the GSS. After the 5 symptom profiles were established, changes were made to the EMR template (**Table 1**) to create symptom profile groups within the documentation; the previous EMR template included only a total symptom severity score. Thus, PDSA cycle 1 resulted in changes to the entire healthcare EMR system that were not limited to the sports medicine physicians. More specifically, the templates were changed

so, the exact symptoms that patients were experiencing reflected their symptom profile. One unexpected finding was the placement of a symptom in the correct profile when the symptom could be categorized in multiple profiles. For example, headache could arise from lack of sleep but is still a physical symptom.

Study: Following this EMR change, we compared data from concussion patients evaluated during the current football season with those from the prior season (before individual plans were developed based on the symptom profile).

Act: Based on the patient concussion symptom profiles, the sports medicine staff at SLHS developed and delivered individualized concussion treatment and rehabilitation plans, and concussion education for at least 90% of all new concussion patients during a 3-month period.

According to PDSA cycle 1 data, in 66% (n=14) of pre-PDSA cases, patients received recommendations for academic supports during their visit with the physician. However, 50% of patients who did not receive temporary academic adjustments were follow-up patients with a symptom score of 0 who were ready to be cleared for return to play. Changes between the proposed process map to the post-PDSA cycle process are presented in **Figure 2**.

PDSA Cycle 2

The second PDSA cycle was directed specifically toward staff communication and education training and how to effectively educate patients and parents about the individualized concussion rehabilitation and treatment plans. The addition of patient-reported outcomes (PROs) facilitated communication among the staff and improved visualization of patients' documented outcomes.

Plan: To build new concussion templates within the EMR, the sports medicine staff met weekly before clinic. These weekly meetings were needed to discuss the new templates and answer any questions about them. Saint Luke's medical liaisons were part of the implementation process to ensure all concussion specialist physicians had access to the templates. The concussion templates were available for use across the entire health system for any provider who wanted to use the template. In addition to educating the staff about concussion template changes, finalizing the patient education pamphlets was included in the weekly meetings.

Table 1. EMR template changes incorporating concussion symptom profiles.

Review of symptoms (ROS)

Physical Symptoms
 Headache (yes/no)
 Neck Pain (yes/no)
 Radicular Symptoms (yes/no)
 Vision Complaints (yes/no)
 Sound Complaints (yes/no)

Mood Symptoms
 Sad/Depressed (yes/no)
 Irritable/Angry (yes/no)
 Anxious/Fearful? (yes/no)
 PHQ-9 Modified for Teens Score (0-30)

Sleep Symptoms
 Hard to get sleep? (yes/no)
 Sleeping more than usual? (yes/no)

Cognitive Symptoms
 Missing school/work (yes/no)
 Confusion/memory problems (yes/no)
 Distracted/attention problems (yes/no)
 Feeling foggy/slowed down/groggy (yes/no)
 Normal school grades

Vestibular
 Dizziness (yes/no)
 Balance issues (yes/no)
 Car sickness (yes/no)
 Nausea/vomiting (yes/no)

Physical Education
 Alert and oriented
 Answers questions appropriately

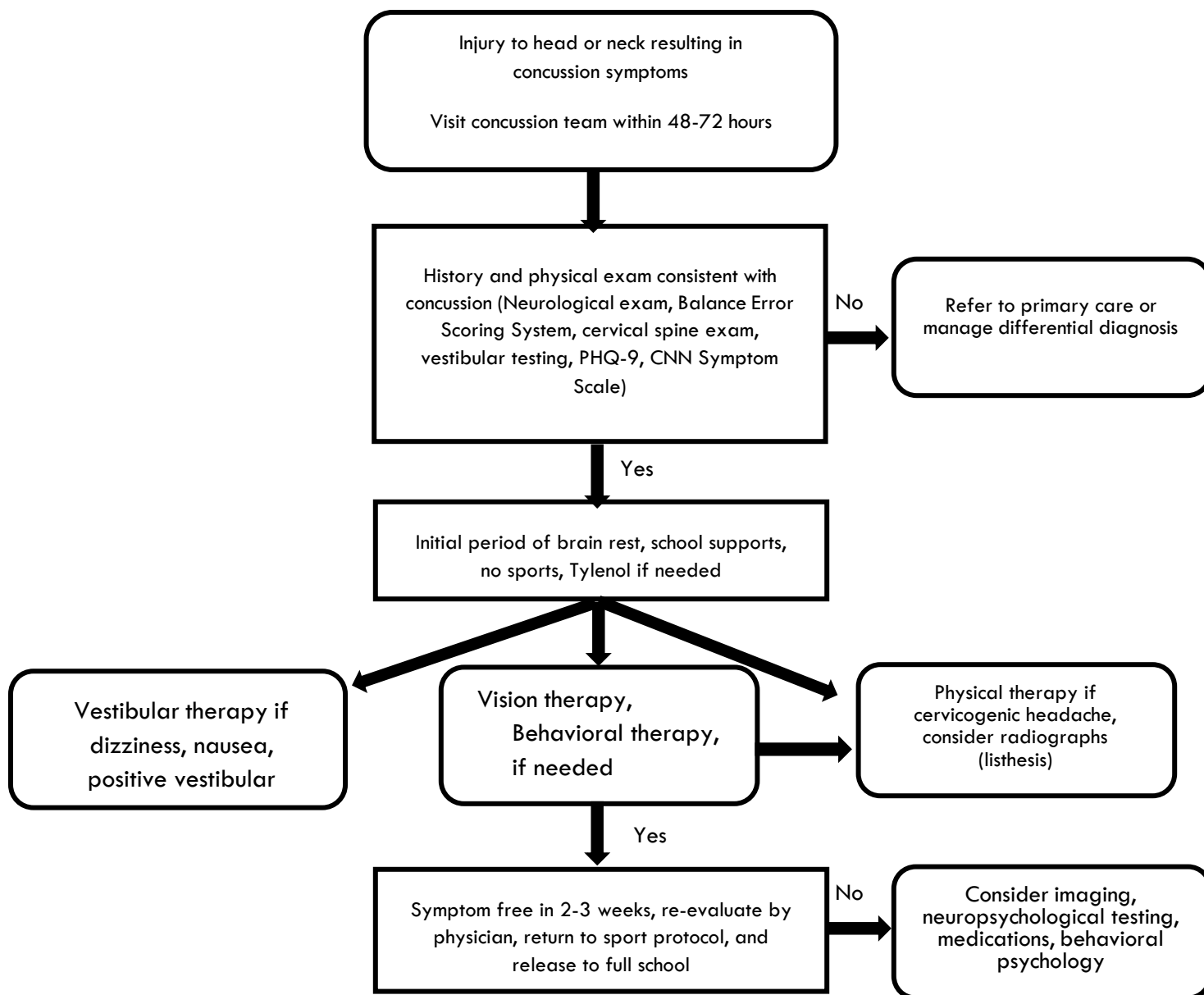


Figure 2. Changes between the proposed process map to the post-PDSA cycle process

Do: Communication and staff education were used to ensure everyone understood and used the templates the same way. The previous concussion template did not include symptom profiles and only included the patient’s graded symptom scale (GSS) total score. Improvements to the EMR template may have affected an observed increase in the number of documented patient PROs. An unexpected finding of this cycle was a lack of GSS scores for follow-up patients, which had been previously recorded. Staff were also unaware of how to document information in the EMR because of lack of training before PDSA cycle 2.

Study: Notable changes were made to the EMR templates and patient education pamphlet. A staff meeting that included all members of the sports medicine and orthopedics team was conducted for staff education and training purposes. Topics discussed during the meeting included wording changes, where to find the new PROs, how to interrupt the PRO results, and the process for neurocognitive testing. The patient education pamphlet also included a change in patient instructions increasing the amount of time allowed for the brain to rest (48-72 hours) before beginning light exercise, the PROs given to the patient (GSS score, Patient Health Questionnaire [PHQ-9]), and the number of times the patient completed neurocognitive testing (baseline, after injury, before return to play, and after clearance for a new baseline).

Act: **Table 2** presents data for this cycle (December 2019-February 2020). Improvements were made to the concussion education material the patient received and, subsequently, to the rehabilitation and treatment plans. New PRO measures, including the PHQ-9, were also added. Before PDSA cycle 2, 85% of patients received patient education; however, this number increased to 100% after the PDSA cycle 2.

Table 2. Change in the percentage of patients with documented outcome measures prior to and following PDSA Cycle 2.

Outcome Variable	Pre-PDSA2	Post-PDSA2
Patient education	85	100
GSS	86	95
PHQ-9	0	80

PDSA Cycle 3

The third PDSA cycle was structured to implement all the concussion education changes in the updated pamphlet that the patients and parents received.

Plan: Individualized plans were highlighted on the concussion education handout for each patient. The concussion symptom profiles were listed using the American Medical Society for Sports Medicine overlapping symptom profiles, which is an emerging concept to facilitate individualized management after sport-related concussion.⁵⁻⁷

Study: Marketing reviewed the size, color, and number of pages of the pamphlet before it was sent to production for printing.

Do: Information was condensed in order to make the handout smaller. Further, all pictures were removed from the original concussion education handout to limit the number of pages.

Act: Results for PDSA cycle 3 indicated the pre-PDSA goal was surpassed and 100% of new concussion patients received concussion education during their initial visit. During the 3-month PDSA cycle 1 data collection period, only 10.5% (2/19) of follow-up patients received a concussion information packet during their follow-up visit. Both of those follow-up patients were still experiencing symptoms. The new education handouts started being used after completion of PDSA cycle 3.

LESSONS AND LIMITATIONS

While we successfully made improvements during this quality improvement project, several lessons were learned during the process, some of which were specific to our situation and some of which may benefit others interested in a quality improvement initiative at their institution. The first lesson learned was to extract data from the same season, same sport, and same time of year for better comparisons. Because of time constraints on the project, we were limited in this ability. However, we were fortunate that the population of pre-PDSA concussion patients during football season was similar to the population of post-PDSA concussion patients during the winter sports season.

The second lesson learned was to involve other hospital system departments, such as marketing, before making specific pamphlet changes to ensure all formatting requirements of the organization were followed appropriately. The revision of the education pamphlet in PDSA cycle 3 was completed by department clinicians without consulting the hospital system's marketing department. In hindsight, the sports medicine department should have focused solely on updating the content and then working collaboratively with marketing to ensure compliance with hospital branding, thus decreasing the number of edits required before printing.

There are plans to continue this quality improvement project with a fourth PDSA cycle to facilitate to improve the nationwide implementation of the new SRC symptom profile and individualized concussion rehabilitation and treatment plans throughout the EMRs of this healthcare system. The EMR template changes can be shared system-wide and could also be used by providers in other healthcare networks that use the same EMR. Further, using the same template may decrease documentation errors and result in better patient care. It may also decrease the amount of time it takes clinicians to review previous patient records before follow-up appointments. Financial savings may be another benefit resulting from decreases in documentation errors and the amount of time spent on documentation.

Although this project focused solely on a single hospital department, the changes made and lessons learned can be applied to concussion protocols of other institutions. A similar concussion template could be used in other settings, such as industrial, performing arts, military, hospital, secondary school, or collegiate settings. The development of similar educational materials to improve patient understanding of other elements of concussion treatment and rehabilitation plans can also be replicated by other institutions.

The evaluation and management of concussion has changed markedly in the past several years, and with our increased understanding of the effectiveness of active rehabilitation and treatment plans, we can expect these changes to continue. Active and targeted rehabilitation strategies, such as vestibular and oculomotor rehabilitation and pharmacological interventions, have emerging evidence supporting their use.⁸ The use of quality improvement processes to evaluate the concussion protocols of an institution or individual clinician is an important way to ensure contemporary practice and the provision of evidence-informed patient care. Further, continuously evaluating aspects of concussion management using PDSA cycles can help clinicians effect small changes over short periods to ease implementation burden. For this particular project, our focus was on simple changes to the educational materials provided to patients regarding their treatment plans; however, quality improvement strategies have also been used for the treatment of concussion to improve management of academic considerations⁹ and to ensure patients are provided education about driving.¹⁰ To evaluate potential gaps in protocols, clinicians should review their concussion protocols annually and when

updated consensus or position statements are published. A quality improvement process can then be initiated for implementation of those changes.

CONCLUSION

From a team approach perspective, miscommunication and lack of documentation for a patients with concussion may be detrimental to patient care. Since concussion patients are often treated by more than one healthcare professional, it is imperative that all healthcare professionals communicate with each other about the patient's rehabilitation and treatment plan and, perhaps more importantly, that patients understand their follow-up care plans. This quality improvement project showed that modifications to the EMR to capture symptom clusters and assign symptom profiles and that revision of patient educational materials were effective improvements for concussion care.

Utilizing a multidisciplinary approach and having effective communication among athletic trainers, coaches, and parents will ensure the patient's concussion rehabilitation and treatment plans are implemented as prescribed. For athletic trainers in states that allow them to treat concussions on their own, symptom concussion profiles can be used to drive the treatment plans for each individual patient. Further, the concussion symptom profiles, and individualized treatment approach allow the patient to visualize their plan and helps them create short-term goals for each therapy session. Importantly, these goals can be shared and viewed by other healthcare professionals on the patient's treatment team. Using concussion symptom profiles as a part of the SRC treatment plan can also guide athletic trainers when deciding whether it is appropriate to refer patients to specialty providers. Ultimately, a quality improvement approach is ideal because it allows clinicians to evaluate their protocols in relation to best practice documents and emerging evidence and to implement small changes for evaluation of outcomes in their specific setting.

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