Creating a continuum of care for concussions

In recent years, rehabilitation research has increasingly focused attention on concussions. Yet among health care professionals, there has been some uncertainty and variability in approaches to manage and detect these injuries. Baylor Institute for Rehabilitation has distinguished itself by offering uniquely specialized services in concussion needs, as well as a continuum of care that is provided through its relationship with Baylor Scott & White Health, that maximizes restoration of functioning.

**Timing is Everything**

For someone with a concussion, the path from diagnosis to full recovery can be as intricate as the brain itself. As mild traumatic brain injuries (TBIs), concussions often present in an emergency department, appearing as a constellation of signs and symptoms that can range from frustratingly vague (such as having a headache or feeling groggy) to disturbingly obvious (like “seeing stars” or experiencing disorientation).

But physicians often do not recognize concussions, in part because telltale indicators like focal neurological defects and structural abnormalities are typically absent. Consequently, referral to neurorehabilitation usually does not occur until patients—or concerned family members—complain to their primary care physician of marked changes in functioning or personality.

This delay is problematic because, for concussions, failure to act quickly can set off an unsavory domino effect of lags in care that thwart healing. The first three months post-injury represent the optimal window in which the brain is most receptive to intervention, so timely recognition that a concussion has even occurred is crucial (see page 4 for a description of symptoms).

Once that acute phase reaches the six-month mark, though, prognosis...
becomes more difficult, because the symptoms have become chronic and are harder to treat. One of the most common post-injury problems occurs when patients—eager to return to their daily lives—engage in activities that could exacerbate symptoms, like participating in contact sports or engaging in cognitively stressful tasks at work or school. These should be suspended sooner rather than later, and individuals should remain inactive until all symptoms have resolved. Without a diagnosis and proper education, people often unknowingly aggravate their injury and delay recovery.

And while less common, second-impact syndrome can occur when an additional TBI is sustained before the initial injury heals, which increases the risk of further neural degeneration, brain swelling and potentially even death.

**Individualized Options**

At Baylor Rehab, concussion care is unique in its scope and number of levels of rehabilitation offered. For severe TBI, inpatient rehabilitation and addressing limitations in memory, motor abilities, swallowing, coordination, balance, sensory dysfunctions and more. The Baylor Rehab Day Neuro Program provides day-long outpatient services in a step-down environment for patients not ready for the less intensive world of traditional outpatient rehabilitation. Weekly outpatient treatment can aid with more mild symptoms in emotional, physical, neurological and cognitive functioning. Home health care services help patients adapt to their living environment and provide therapeutic interventions for outside the hospital setting.

At each stage, injury management usually includes neuropsychological testing to assess gains in cognitive functioning, speech therapy for language deficits; occupational therapy to facilitate recovery of activities of daily living; and physical therapy to address musculoskeletal dysfunctions. Baylor Rehab also offers supportive education to patients and their families to ensure activities are limited as necessary and to provide a better understanding of personality and emotional changes a person may experience post-concussion.

Having multiple experts in concussion management helps facilitate better cross-collaboration in patient care. For instance, treatment for a high school soccer player who sustains a concussion might include an athletic trainer for initial injury assessment, referral and coordination recovery; a pediatric-trained neuropsychologist for continuous re-evaluation of cognitive functioning; a child psychologist to address feelings of depression; a physical therapist for balance and strength recovery; an occupational therapist for vestibular difficulties; and ongoing communications with the student’s teachers to establish classroom and testing accommodations.

**Leaders in the Field**

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**Leaders in the Field**

Many rehabilitation facilities have inpatient and outpatient services, but Baylor Rehab’s use of therapists specialized in TBIs is not typical. Concussions have distinctive diagnostic and treatment demands apart from musculoskeletal dysfunctions. Clinicians trained only in general rehabilitation do not necessarily have the hands-on experience and didactic knowledge to provide the highest level of focused care for these patients. But Baylor Rehab clinicians at every stage of concussion management have been specifically trained in these conditions.

In treating the first concussion, experts agree that prompt and appropriate intervention is critical to prevent long-term consequences. But more movement is needed. As its empirical base continues to grow, the diagnosis and treatment of concussions should similarly advance, particularly as greater efforts are directed toward ensuring physician recognition and timely referral to rehabilitation.

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But Baylor Rehab clinicians at every stage of concussion management have been specifically trained in these conditions. For example, to better address athletic injuries, many of the hospital’s neuropsychologists and rehabilitation specialists have attained certification and experience in sports medicine. They also maintain a strong presence in the community by contracting with Baylor SportsCare USA, which supplies a link to local athletes and athletic trainers for providing education and services. This includes administering baseline neurocognitive testing and accommodations working closely with schools to appropriately implement academic concussion oversight teams.

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Efforts to improve the diagnosis and management of sports concussions

According to the Centers for Disease Control and Prevention, between 1.6 and 3.8 million cases of sports-related concussions are reported each year among all age groups. Thanks in part to increased media focus on concussions sustained as part of professional sports, athletes of all ages and skill levels are benefitting from an improved awareness and management of these injuries.

A National Concern
An estimated 10 percent of athletes in contact sports will sustain a concussion during a season of play. While the number of these injuries is not necessarily on the rise, improvements in how they are recognized have made the prevalence seem somewhat larger than in reality.

Historically, concussions have not been regarded with the same degree of seriousness as today. In the past, an athlete who sustained an impact to the head would often be sent back onto the field with little, if any, rest on the sidelines. Even as recently as 10 years ago it was common for a concussed player to routinely sit out seven days from activity, but this number was largely arbitrary and failed to account for an individual’s unique recovery needs.

Injuries were diagnosed using a level-based, return-to-play protocol (1, 2 and 3 with 3 being loss of consciousness), which wasn’t as objective as current standards. Also, this was unaccompanied by any standardized medical protocol to ensure neurological readiness to resume participation.

Now, in part due to recent media coverage of concussions in the National Football League, these patients have become a regular part of our national dialogue—both within sports medicine and among the general public. As of 2013, every state in the U.S. plus the District of Columbia has passed concussion legislation at the high school level (often termed Return to Play laws), while the National Collegiate Athletic Association also provides management rules for its 1,200-plus member institutions. Guidelines for youth below the high school level are not as universally present, but are increasing in number. Generally, such rules include some combination of the following: education for coaches, parents and athletes; immediate removal from play if a concussion is suspected; and return-to-play that is contingent upon assessment by a health care professional, along with completion of a peer-reviewed, evidence-based, return-to-play protocol.

Separating Fact from Fiction
A cornerstone of the education process has focused on teaching coaches, parents and players not just what a concussion is but what it is not.

It is not necessarily a direct blow to the head. Concussions are a type of mild traumatic brain injury (TBI) and can occur from any forceful strike to the body, including to the shoulders, chest or legs. Concussions are not synonymous with loss of consciousness.

While loss of consciousness certainly can and does occur, concussions are highly individual and can include seemingly unconnected phenomena, such as irritability, sleepiness, depression, suicidal ideation or speech disturbances.

Unlike musculoskeletal injuries, concussions are not structural in nature—that is, presence cannot solely be assessed using brain imaging.

Concussions significantly disrupt the electrical and chemical activity of neural cells and pathways, which can evade detection through MRI or CT scan. This is why the use of neuropsychological testing to assess cognitive function, as opposed to just physiology, is vital for assessing readiness to return to play.

Finally, concussions are not merely a concern for football players. Other sports including soccer, hockey, basketball, baseball, lacrosse and cheerleading all carry a risk of TBI and require the same dedicated attention as in football.

Local Impact
In conjunction with national efforts to help mitigate the effects of these injuries, experts in sports medicine and neuroscience from Baylor Health Care System, including Baylor SportsCare and Baylor Institute for Rehabilitation, are spearheading regional efforts in the Dallas-Fort Worth area. Community education has been a significant priority, and Baylor Rehab is among the leaders disseminating the concussion curriculum mandated for all high school coaches by Texas House Bill No. 2038 (“Natasha’s Law”). Because student athletes who sustain concussions sometimes struggle with deficits in memory, concentration, processing speed and other areas of cognition, Baylor Rehab collaborates with teachers to ensure classroom accommodations are in place as needed. This can include extended testing time, using a tape recorder to take notes rather than writing, special seating accommodations within the classroom, and extended deadlines for assignments.

Baylor Rehab has facilitated the integration of objective neuropsychological assessment tools into Dallas area schools and outpatient rehabilitation clinics, so that diagnosis and trajectory of recovery can be achieved more quickly and accurately. One such measure, the Sideline Concussion Assessment Tool 3 (SCAT3™), is being used post-injury to aid athletic trainers and team physicians in quantitatively determining whether a concussion has occurred, rather than relying exclusively on self-report of symptoms. Conversely, despite its name, the Immediate Post-Concussion Assessment and Cognitive Testing (ImpACT) is now being used prior to injury in order to establish baseline neurocognition among athletes. Thus, if a concussion occurs in the future, the premorbid data can help clarify the degree to which impairments are present and attributable to the TBI, and assist in return-to-play decisions.

Head injuries are an unavoidable consequence of competitive sports. But these and future initiatives are helping safeguard athletes of today and tomorrow from the potential lasting effects of concussions.
Applications beyond motor recovery after spinal cord injury

H ealth care continues to be one of the primary beneficiaries of technological advances. A few notable mentions in this past decade alone include the refinement of minimally invasive robotic therapy, personalized medicine efforts of genome sequencing and the continued integration of electronic medical records. As technology trickles down through the subspecialties of health care, the promise of benefit to spinal cord injury (SCI) patients continues to garner strong interest.

**Mind Matters**
Assistive technology targeting SCI is advancing treatment and independence. Adaptive driving controls, computer interfaces to facilitate communication and sophisticated wheelchair technology are prime examples of commonplace interventions to improve quality of life after an injury.

The promise of brain-computer interface (BCI) used within a virtual reality environment could revolutionize SCI rehabilitation and represents some of the most innovative approaches to assistive devices today. With this technology, the brain's electrical activity and patterns are linked, through internal or externally placed electrodes, to the user's mental intent, bypassing an injured spinal cord. For example, exciting case examples of BCI prosthetic movement and limb movement in SCI patients are appearing more regularly.

**Pioneering the Future**
A collaborative research project between Baylor Institute for Rehabilitation and the University of North Texas (UNT) is examining BCI application in what is believed to be the first systematic exploration using such technology on an inpatient SCI rehabilitation population. This feasibility study will assess whether a simple paradigm involving rotating objects by mental intent in a virtual environment (that is, on a computer screen), using the Emotiv Epoq wireless headset, is well-tolerated.

Although the study is only exploratory, outcomes could be informative in multiple ways. First, it will be essential to understand if this technology is user-friendly across varying ages and backgrounds. The modality is likely interesting and appealing to the largest SCI demographic, younger males, but it is unclear if individuals with less technology exposure will find it user-friendly. Second, if the paradigm is free of adverse effects, it could potentially be applied to interventions for SCI patients to help manage pain, control stress or assess cognition.

**Next Phase**
Results should provide a better understanding of whether or not this technology can be used successfully by the inpatient SCI rehabilitation population and the degree to which it can be integrated into traditional rehabilitation therapies. If results are promising, the next phase would be to modify the visual paradigm based on therapeutic goals. Given the lack of attention to BCI for clinical goals other than improvement of motor and communication outcomes, Baylor and UNT researchers plan to focus on other frequently cited predictors of quality of life, such as stress management, pain management and leisure activity exploration after SCI.

**Pioneering the Future**

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**Mountain High Camp offers fun, relaxation and support for TBI patients and their families**

R esearch suggests that survivors of traumatic brain injury (TBI) often grapple with psychosocial maladjustment throughout the recovery process, including the onset of mood and anxiety symptoms, difficulty with work or school, strained interpersonal relationships, decreased quality of life and poor self-esteem. These difficulties can be compounded by negative public attitudes and misconceptions about individuals living with TBI as well as perceived stigma associated with having a brain disorder and/or accompanying psychiatric difficulties. In an effort to help TBI patients experience greater feelings of normalcy and engage with others who can share in and empathize with their daily challenges, Baylor Institute for Rehabilitation helps support a yearly excursion for brain injury patients, reflecting their dedication to not only treating the diagnosis but also treating the person as a whole.

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**A Common Bond**
For the past 21 years, Baylor Rehab has helped support Mountain High Camp—a five-day retreat for young adults with TBI. This year, nearly 100 survivors and their families convened in Red River, NM, as an opportunity for patients to experience fellowship and socialization among other individuals who are facing the unique difficulties of living with a TBI. Participants engage in a range of organized group activities, including sports, hiking, church services and a talent show. While the camp is intended as an occasion for recreation and relaxation, these opportunities carry additional meaning and benefit for people who may feel isolated or have experienced hardships in resuming activities and friendships following injury.

All travel, accommodations and meals are paid for thanks to generous donations from Baylor Rehab, Faith Mountain Fellowship Church in Red River and the Texas District Pilot Clubs (community-based volunteer organizations dedicated to improving awareness about certain medical disorders, including TBI).

Physicians, nurses, therapists and other clinicians from Baylor Rehab additionally donate their time to provide medical oversight and reconnect with current and former patients.

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**Rising Reputation**
Feedback from attendees has been exceedingly positive, with many patients returning year after year. Popularity of the camp continues to grow, with more survivor and volunteer applications each year. Baylor Rehab clinicians have voiced equal enthusiasm about participating—and the benefits they experience from doing so. For them, seeing patients thrive is incredibly rewarding, making Mountain High Camp an important reminder as to the significance of not only addressing patient needs during the acute phase of injury but throughout their lives.

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**Rising Reputation**

Rosemary A. Dubiel, DO, is a physicist and the medical director of Traumatic Brain Injury Services at Baylor Institute for Rehabilitation. She is Board Certified by the American Board of Physical Medicine and Rehabilitation. Dr. Dubiel can be reached at RDubiel@bhir-rehab.com.
Research Updates & News

Experts at Baylor Institute for Rehabilitation actively engage in research activities in support of the scientific and clinical mission of Baylor Health Care System. Listed below are some recent notable achievements and acknowledgments.

Papers

Presentations

Awards and Recognitions
- Tracie Betts, PT, DPT, CSS, a Baylor Institute for Rehabilitation physical therapist working with heart and lung transplant patients at Baylor University Medical Center in Dallas, achieved her board certification in Cardiovascular and Pulmonary Physical Therapy (CSS) from the American Board of Physical Therapy Specialties. Betts becomes the 218th CSS therapist in the U.S. and the eighth in Texas. The specialist certification program gives formal recognition to physical therapists with advanced clinical knowledge, experience and skills in a special area of practice. Baylor Rehab now has 25 percent of all the Texas CCS therapists.
- Valerie L. Bobb, PT, MPT, WCSS, ATC, Clinical Manager for Baylor Institute for Rehabilitation and Director of the Baylor Institute for Rehabilitation - Texas Woman’s University Residency in Women’s Health, was appointed to the committee to Re-validate the Description of Specialty Practice (DSP) for the Women’s Health Specialty, a division of the American Board of Physical Therapy Specialists. The DSP is updated every 10 years, and the committee will help determine what is to be included in the new description.
- Ana Lotshaw, PT, PhD, CCS, advanced clinical specialist at Baylor University Medical Center, was appointed to the American Board of Physical Therapy Specialties (ABPTS) for a four-year term, effective July 1, 2014, through June 30, 2018. The ABPTS is the governing body for approval of new specialty areas and certification of clinical specialists in physical therapy.
- Lauren Rachal, PT, DPT, NCS, CBIS, senior physical therapist on the traumatic brain injury (TBI) team at Baylor Rehab, was selected as a recipient of the 2014 Dorn Long Outstanding Clinical Educator Award. In 2013, Rachal became among the first graduates of the Texas Woman’s University-Baylor Institute for Rehabilitation residency program. She is a certified brain injury specialist who is currently conducting research on the effects of TBI on dual-task performance. Dr. Rachal received her award at the Texas Physical Therapists Association’s Annual Conference on Oct. 18.
- James White, PT, DPT, OCS, has been named a Fellow in the American Academy of Orthopaedic Manual Physical Therapists (FAAOMPT) after completing his clinical fellowship in orthopaedic manual physical therapy from Evidence in Motion. This is a distinction that is held by less than 2 percent of physical therapists nationwide.

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