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Guest Editorial

Pediatric Traumatic Brain Injury – Are We Making Progress Toward Evaluating Rehabilitation Efficacy?

Traumatic brain injury (TBI) is the most common condition associated with acquired disability in childhood and the #1 diagnosis encountered by the pediatric physiatrist on the inpatient rehabilitation unit. Many children experience long-term sequelae of TBI affecting some or all domains of function that persist well beyond the acute stage of recovery, with implications for their full participation in age-appropriate life roles in and beyond school to employment and social and economic independence. Important knowledge gaps remain regarding the mechanisms of post-injury neurologic and functional recovery and of the role of rehabilitation interventions in impacting recovery in both the acute and chronic stages after pediatric TBI. Pre-injury factors including developmental factors, injury-related factors, factors in acute management, and factors in the post-acute rehabilitation environment are all known to play a role in outcomes after pediatric TBI [1]. Well-designed pediatric TBI intervention studies that could advance rehabilitation care are few, with obstacles to progress including heterogeneity of injury severity, type, and extent; paucity of clinical measures; lack of specific and replicable interventions; and lack of a critical mass of clinical researchers to implement such studies.

In this issue of *JPRM* dedicated to pediatric TBI, each of the articles addresses one or more of these obstacles to progress in improving evaluation of rehabilitation efficacy. Suskauer and colleagues assessed injury severity variables as predictors of outcomes as measured by the Functional Independence Measure for Children (WeeFIM) and found that time to follow commands was the best, in comparison to Glasgow Coma Scale score or post-traumatic amnesia. These investigators suggest that time to follow commands should be consistently and carefully evaluated for more accurate and earlier prediction of functional outcomes.

Emerging neuroimaging technology offers another tool to measure neurologic function after pediatric TBI. Kurowski et al. demonstrated relationships between fractional anisotropy on diffusion tensor imaging, especially in frontal white matter tracts, and executive function and attention measures at least 12 months post-TBI in children injured at 3–7 years of age. Also using neuroimaging, Kramer and her team applied functional magnetic resonance imaging (fMRI) to measure differences between children with moderate TBI and healthy controls following a cognitive rehabilitation intervention. Their use of instruction in an associative memory strategy in children with TBI in comparison to control children represents the first examination of brain structures supporting associative learning in either children or adults with acquired brain injuries. Both healthy children and those with TBI remembered more word pairs when using an associative (imagery) strategy in comparison to word pairs recalled when using a repetition condition. While behavioral performance was similar between the two groups of injured and control children, the children with TBI demonstrated several areas of increased neural activation relative to control children. As these investigators observe, imaging studies like this have great potential to inform the development of cognitive rehabilitation strategies aiming to remediate both behavioral and neural changes following pediatric TBI.

Interventions in the pre-rehabilitation stages of care also have potential to influence long-term outcomes after brain injury in children. Use of therapeutic hy-

pothermia is discussed in a review article in this issue by Fink and colleagues.

Finally, Walz and co-investigators examined social information processing (SIP) skills, behavior problems, and social competence post-TBI in adolescents and found SIP skills to be strong predictors of behavior problems and social competence in adolescents with TBI. Development and evaluation of interventions to modify SIP skills and improve social outcomes for youth with TBI is a much needed future research direction, as suggested by this group.

Are we making progress toward evaluating rehabilitation efficacy? I hope that the reader will agree that, while many challenges remain, the contributors to this issue of *JPRM* dedicated to pediatric TBI are reducing the obstacles to progress. Most of the first-author contributors are members of a new generation of pediatric physiatrists and psychologists for whom clinical research is or will soon be a part of their future careers. Most of the articles in this issue represent original work supported by the NIH. The majority of articles have a co-author with K23 or K12 support for development as career researchers in pediatric rehabilitation. Look for the collaborators in this issue to contribute to inspiring and transforming our future efforts to improve the quality of life for children with TBI and their families.

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Reference

[1] L.J. Michaud, Evaluating efficacy of rehabilitation after pediatric traumatic brain injury, in: *Traumatic Head Injury in Children*, S.H. Broman and M.E. Michel, eds, New York, Oxford Press, 1995, pp. 247–257.