Driving After Adolescent Concussion: Advice From Nurse Practitioners in the Absence of Standardized Recommendations

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ABSTRACT

Introduction: Nurse practitioners (NPs) are authorized to manage concussion recovery. Common adolescent activities, like driving, are omitted from guidelines. We investigated NP driving guidance and its clinical basis for restriction or limitation following adolescent concussion.

Method: NPs completed a web-based questionnaire after viewing a scripted video scenario of an adolescent describing symptoms of concussion occurring 72 hours prior. Driving recommendations were collected using an open-ended query, then coded and categorized by type, characteristic, and basis.

Results: 1,051 (20%) responded to the question of interest. The majority (93.8%) provided driving recommendations: 32.6% based on time, 49.8% based on symptoms, and 28.5% based on health care utilization. 5.3% mentioned fatigue and sleep symptoms. 1% advised use of a standardized assessment tool.

Discussion: Symptomatology, examination, and time were key factors in clinical decision-making for post-concussion driving, rather than use of standardized tools. Persistent symptoms that can impact driving, such as sleep and visual disturbances, may warrant consideration. J Pediatr Health Care. (2017) *31*, 441-451.

KEY WORDS

Adolescent, concussion, driving, nurse practitioner, traumatic brain injury

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All 50 states and the District of Columbia have now enacted youth-focused concussion safety laws focusing on injury sustained from sports-related concussion. Most states (n = 37) provide for both screening and "return to play" by a licensed health care provider, including statutory recognition of the authorization by nurse practitioners (NPs; National Conference of State Legislatures, 2016a). NPs may also authorize work or school modifications after sports-related concussion, as the care provider of record for many adolescents. Although some states identify specific clinician qualifications in statute (National Conference of State Legislatures, 2016a), authority to do so is generally

broad for both medical doctors and NPs. Statutory authorization regarding concussion assessment and management is, therefore, not typically limited by NP specialty, education, or expertise regarding concussion assessment and management. Adolescents with concussion may be medically evaluated by NPs with pediatric, adult, women's health, psychiatric, family, or other NP certification and expertise.

PROBLEM STATEMENT

Clinicians, such as NPs, are advised by awareness campaigns regarding the need for stepwise return to cognitive activity after concussion (Halstead et al., 2013). In adolescents, this guidance typically focuses on return to school and sport (Centers for Disease Control and Prevention [CDC], n.d.; Giola & Collins, 2006). The option to prohibit driving is offered on standardized care plan tools such as the Acute Concussion Evaluation (ACE) Care Plan, widely distributed by the CDC (Giola & Collins, 2006). However, there is a lack of specific stepwise activity recommendations regarding when an adolescent with a concussion should drive, although driving is a common activity for an adolescent that requires cognitive acuity and effort.

Neurocognitive Effects Present After Concussion That May Affect Driving

Symptomology after concussion varies depending on individual and temporal factors, including time since injury occurrence. There are also recovery differences in sport- versus non–sport-related concussion (Rabinowitz, Li, & Levin, 2014). Disturbances in sleep and visual processing are well documented as present after concussion. Visual effects include convergence insufficiency (Kansagara et al., 2014; Pearce et al., 2015), photophobia, difficulty with reading, and deficiencies in field of vision and color vision (Barnett & Singman, 2015; Master et al., 2016). Neurointegration of visual and motor action can be impaired in adolescents with a history of concussion, even if they are asymptomatic (Brown, Dalecki, Hughes, Macpherson & Sergio, 2015). Sleep disturbance is also reported as a common symptom after concussion in adolescents in the acute and long-term phases after injury (Jaffee, Winter, Jones & Ling, 2015; Kaufman et al., 2001). Some studies show that sleep disruption is limited to 3 months after concussion (Schmidt et al., 2015), but others note its presence for up to a year or more after injury (Imbach et al., 2016; Tham, Fales, & Palermo, 2015; Imbach et al., 2016). Sleep disturbance can include hypersomnolence (Brown et al., 2014; Verma, Anand, & Verma, 2007) with mild traumatic brain injury patients frequently expressing subjective sleep complaints such as insomnia or excessive daytime sleepiness. Fatigue is a prevalent symptom for most adolescents injured by concussion (Kontos et al., 2012).

Safety and Adolescent Driving

A large national survey of public and private school students in grades 9 through 12 showed that 76.3% of high school students age 16 years and older had driven within the prior 30 days (Shults, Olsen, Williams, & Centers for Disease Control and Prevention, 2015). Factors that affect adolescent driving safety include a passenger presence, distractors, hazard anticipation, and sleep (Foss & Williams, 2015; Garner et al., 2015). Visual factors correlated with driving competency for adolescents include visual inattention (Kingery et al., 2015) and selective attention (McManus, Cox, Vance, & Stavrinos, 2015). Research on driving competence after concussion tends to focus on adult rather than adolescent driving (Baker, Unsworth, & Lannin, 2015; Cullen, Krakowski, &Taggart, 2014; Preece, Horswill, & Geffen, 2010; Rike, Ulleberg, Schultheis, Lundqvist, & Schanke, 2014). Lack of self-regulation, a potential symptom after concussion, is associated with aberrant driving behavior in adults (Baker et al., 2015a, 2015b). The impact of sleep restriction has been studied on a small sample of adolescent drivers, suggesting that vulnerability to sleep restriction may vary and affect attention to driving (Garner et al., 2015) and that short sleep duration is a risk for crash (Martiniuk et al., 2013). Preinjury sleep difficulties may exacerbate neurocognitive impairment and symptoms after concussion (Sufrinko et al., 2015). The CDC instructs parents of adolescents with concussion to "only ask about sleep symptoms if the injury occurred on a prior day" (CDC, n.d., p. 1).

Current Guidelines on Return to Driving after Concussion

Cognitive guidance on driving is often omitted by physicians offering counseling after mild traumatic brain injury (Baker et al., 2015a). Driving safety requires consideration of individual, patient-level factors and developmental factors, which determine whether an adolescent is safe to drive when cognitively intact (Baker et al., 2015a; Foss & Williams 2015). To our knowledge, the nature and content of advice to adolescents regarding driving after a sports-related concussion provided by NPs has not been explored to date.

National guidelines on concussion evaluation and management for clinicians lack recommendations regarding driving (AAN, 2013; Giola & Collins, 2006; Harmon et al., 2013). There is limited clinical evidence supporting refraining from driving for 24 hours after mild traumatic brain injury (Baker et al., 2015; Preece et al., 2010), and studies on prognostic indicators of driving fitness after traumatic brain injury are limited in strength and quality (Ortoleva, Brugger, Van der Linden, & Walder, 2012). Advice to parents related to return to driving is absent from parent and athlete concussion information sheets distributed by the CDC (n.d.). Some recommendations include follow-up or a phone call 24 hours after injury (Shultzman, 2016) despite