Driving After Concussion: Advice by Nurse Practitioners

Tracy Klein, PhD, ARNP, FAAN, FAANP
Janessa Graves, PhD, MPH
Assistant Professors
Washington State University College of Nursing
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Driving After Adolescent Concussion: Advice From Nurse Practitioners in the Absence of Standardized Recommendations

Tracy A. Klein, PhD, ARNP; FAANP; PAAN; Jamieson M. Groves, PhD, MPHS; J. Jacqueline Y. Graham, ASS

ABSTRACT

Introduction. Nurse practitioners (NPs) are located in multiple settings and see adolescent patients with a wide array of injuries. Often, these nurses do not have access to an injury prevention specialist. This article reviews the literature related to adolescent concussion and offers guidance on managing adolescent concussions in the absence of standardized recommendations. We discuss the role of NPs in managing adolescent concussion and provide evidence-based recommendations for managing adolescent concussion.

Keywords: adolescent concussion, NPs, guideline development, education, evidence-based practice

KEYWORDS

Adolescent, concussion, driving, sports medicine, teen brain injury

All 50 states and the District of Columbia have enacted state laws regarding impaired driving among injured adolescent patients. The laws vary widely in their scope and requirements, with some states requiring mandatory reporting and others allowing for voluntary reporting. The laws are intended to ensure that injured adolescents receive appropriate medical care and are encouraged to seek medical attention if they have suffered an injury. The laws also include provisions for drivers who have been involved in a crash, including requirements for reporting the crash to the police and receiving appropriate medical care. The laws are intended to ensure that injured adolescents receive appropriate medical care and are encouraged to seek medical attention if they have suffered an injury. The laws also include provisions for drivers who have been involved in a crash, including requirements for reporting the crash to the police and receiving appropriate medical care.
Initial Study Purpose

- The **PRACTICE study** (Provider Recommendations for Adolescent Concussions: The Impact of patient Characteristics) examined variation in adolescent sports-related concussion assessment and management recommendations among nurse practitioners (NPs) in Washington and Oregon.
- A web-based survey included randomly assigned, standardized patient scenario video mapped to standardized criteria for concussion assessment.
- Four videos were produced, wherein patient characteristics (sex or sport type) varied; patients did not vary in terms of symptoms, physical signs, and history.
Methods

- NPs completed a web based questionnaire after viewing a scripted video of an adolescent seeking care with a parent for a concussion occurring 72 hours prior.

- The questionnaire was developed by the researchers based on CDC Heads Up Guidelines and the ACE Care Plan (Giola & Collins, 2006). One version does not mention driving while the other prohibits it, but does not provide guidance.

- Driving responses were collected using open ended response to the following question:

> What would you recommend for this patient in terms of driving?
ACE Care Plan (Giola & Collins, 2006)*

Work
“You should not participate in high risk activities (e.g. sports, physical education, riding a bike) if you have any of the symptoms below”

“No Driving”

School
“You should not participate in any high risk activities (e.g. sports, physical education, riding a bike) if you still have any of the symptoms below”

* The ACE Physician/Clinician office version (Giola & Collins, 2006) does not mention driving or screening for driving (see: https://www.cdc.gov/headsup/pdfs/providers/ace_v2-a.pdf)
• Components which predict fitness to drive for adults include executive function, processing speed, visuo-spatial skills, attention, memory and mental flexibility (Fields & Unsworth, 2017).

• Components which contribute to crash and near crash risk for teens include secondary task engagement, *kinematic risky driving*, low stress responsiveness, and risky social norms (Simons-Morton et al., 2015).

• Neuro-integration of visual and motor action of adolescents can be impaired in adolescents with a history of concussion, even if they are without symptoms (Brown et al., 2015; Delecki et al, 2016).

• Sleep disturbance and disruption can be present up to one year after concussion including *hypersomnolence* and *fatigue* (Imbach et al, 2016; Tham, Fales & Palermo, 2015; Brown et al., 2014).
Examples of “Kinematic Risky Driving”

- Hard stops
- Rapid turns
- Rapid starts
- Hard braking
- Turn correction
- Rapid acceleration
Preece, Horswell and Geffen (2010) compared 42 adult patients with mild TBI and 43 patients with mild orthopedic injury.

Participants were asked to complete a hazard identification computerized exercise 24 hours after injury. Those with mild TBI (concussion) were significantly slower to respond to traffic hazards than participants with minor orthopedic injuries ($p = .03$, $d = .48$)

Study suggests rationale for restricting driving 24 hours after injury.

Did not study adolescents.

Did not advise longer term driving recommendations.
Review of the Literature: Driving After Concussion

- Schmidt et al (2017) compared 14 patients with concussion (20.2 ± 0.9 years old) and 14 non-concussed age and driving experience matched controls.

- Participants completed a graded symptom checklist, a brief neuropsychological exam, and a 20.5 km driving simulation test (concussion subjects were within 48 hours of becoming asymptomatic).

- Despite being asymptomatic, concussed patients exhibited poor vehicle control, especially when navigating curves.
Summary of the Literature

- There are no clear guidelines regarding when, how, or for what period of time driving should be restricted after concussion.
- Research on driving after concussion tends to focus on adult rather than adolescent injury.
- Methodological challenges include lack of homogenous controls, lack of differentiation between mild and moderate TBI, lack of baseline comparisons, and differences in recovery between sports and non-sports etiologies, as well as incongruities between tools and assessment outcomes.
Problem Statement

There is no evidence based guidance for adolescents regarding return to driving after a concussion, although driving is a common activity for adolescents which requires cognitive effort and psychomotor skill.

In a large study of public and private school students grade 9-12, 76.3% of those age 16 and older had driven in the last 30 days (Shults, Olsen, Williams & CDC, 2015)
Examples of Guidelines and Tools
“Increased rest and limited exertion are important to facilitate the patient’s recovery. Physicians should be cautious about allowing patients to return to driving, especially if the patient has problems with attention, processing speed, or reaction time.”

https://www.cdc.gov/headsup/providers/return_to_activities.html
“Athletes with suspected concussion should not drink alcohol, use recreational drugs and should not drive a motor vehicle until cleared to do so by a medical professional.”

http://bjsm.bmj.com/content/early/2017/04/26/bjsports-2017-097506SCAT5
Driving Capacity Assessment Tools

- Useful Field of View

- Simulated Driving Assessment (SDA) has construct and criterion validity for teen driers without concussion (McDonald et al, 2015).

- Multiple other tactile and cognitive tools exist. Tactile detection response task (TDRT) has been validated to test distractions while driving and cognitive load in concussed teens (Gragg, 2017).
Sample and Administration

- Collected as part of a large, cross sectional survey of all actively licensed primary and psychiatric mental health NPs licensed in Oregon and Washington with primary addresses in those states and bordering states and provinces (British Columbia).
- Of 4,849 NPs, 1,056 completed at least partially with 1,051 answering the driving question (23%).
- Most respondents were family NPs (n=668, 63.6%) and psychiatric NPs (n=128, 12.2%).
- Survey administration was electronic with an embedded video and follow-up mailed reminders.
Video Images

First of all, please take a moment and watch the following 4 minute video in its entirety. The video includes an audio portion, so please be sure your speakers or headphones are connected and the volume at an appropriate level.

Group 1: Zoe Hiking

Group 2: Patrrick Soccer

Group 3: Patrrick Hiking

Group 4: Zoe Soccer
Methods

• Mixed methods exploratory analysis was used to evaluate and categorize responses to survey free text question
• Respondent characteristics were quantified
• Text responses were quantified and categorized based on:
  ① whether driving limitation was recommended
  ② the nature of the recommendation
  ③ the basis and characteristics of recommendations related to driving
Analysis

- Participant and practice characteristics of the study sample were defined with descriptive and comparative statistics.
- Content analysis was completed by three researchers using thematic coding and clustered by type and characteristic of recommendation.
- Bivariate analysis was used to evaluate variation in NP specialty and driving guidance using chi-square and Fisher’s exact tests.
Respondent Characteristics

- 64% Family Nurse Practitioners
- 12% Psychiatric Nurse Practitioners
- 11% Pediatric Nurse Practitioners
- 13% Adult or Other Nurse Practitioners

- 50% Had received CE at some time on concussion
- 6% Did not advise driving limitation
- 55% Had seen concussion within the prior 30 days
- 86% Had ever seen concussion in practice
Results: Advice

Time Based
“No driving for one week”

Symptom Based
“Return to driving when headache stops”

Evaluation Based
“No driving until medically cleared”
### Results: Advice

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Based</td>
<td>32.6%</td>
<td>67.4%</td>
</tr>
<tr>
<td>Symptom Based</td>
<td>49.8%</td>
<td>50.2%</td>
</tr>
<tr>
<td>Evaluation Based</td>
<td>28.5%</td>
<td>71.5%</td>
</tr>
<tr>
<td>Behavioral Guidance*</td>
<td>7%</td>
<td>93%</td>
</tr>
</tbody>
</table>

*Behavioral guidance included “drive only while accompanied, drive only during the day etc.”*
Days Recommended to Wait Before Driving

7 or fewer
Of those who recommended a time based limit, 70.7% of participants advised waiting 7 or fewer days before returning to driving.

8-14
Of those who recommended a time based limit, 20.9% of participants advised waiting 8-14 days before returning to driving

More than 14
Of those who recommended a time based limit, 6.2% of participants advised waiting 8-14 days before returning to driving
Symptom Based Limitations

- Headache: 28.7%
- Nausea: 12.2%
- Mood: 5.1%
- Vision: 10.4%
- Reaction Time: 6.3%
- Unspecified: 56.8%*

*Such as “no driving until symptoms resolve”
Medical Evaluation Limitations

- Further Examination: 76.5%
- Medical Clearance: 19.2%
- Specialist Referral: 3.9%
- Protocol: 1.8%
- Imaging: 7.8%
- Evaluation Using SCAT/ACE: 1.1%
Summary of Results

- There were no significant differences across demographic or clinical practice characteristics and driving recommendations or limitations.
- Pediatric or adult specialization was significantly associated with recommending a symptom based driving limitation ($p= .01$).
- NPs without continuing education were more likely to state that they did not know whether or not to limit driving ($p=0.2$).
- Most NPs did not recommend imaging (93.2%).
- Most NPs advised driving 7 or less days after injury (70.2%).
- Few mentioned fatigue as a symptom which would factor into limitations (5.3%).
- Few used standardized tools (1.1%) instead relying primarily on symptom based evaluation.
Conclusions

• NPs used individualized clinical decision-making to evaluate and determine concussion management
• They did not endorse unnecessary imaging
• They may be returning patients to driving too early given evidence of persistent visual, sleep and motor impairment even with mild TBI (concussion)
• Follow-up outside of the typical 7-10 day window may be warranted
• Checklists may be more useful to non-professionals and novice NPs than those in long term practice
• There is a need for more research into driving assessment methodology which is normed and appropriate for teen drivers including developmentally appropriate outcomes


