Association Between Student- Athletes' Demographics, Injury Factors and Post-Concussion Symptom Burden in the Primary Care Setting

Phillips K, Fonseca J, Herzog MM, Bloom OJ, De Maio VJ, Register-Mihalik JK: Carolina Family Practice & Sports Medicine, Cary, NC, and University of North Carolina at Chapel Hill, Chapel Hill, NC

Context: Concussions are a growing concern among youth athletes and are often evaluated and treated in primary care clinics, yet few studies have examined concussions in this setting. In order to improve clinical decision making, it is imperative to better understand factors that affect initial concussion presentation and patient outcomes.

Objective: To examine the relationship between demographic factors, injury factors, and symptom burden presentation at initial concussion office visit among pediatric and adolescent student-athletes.

Design: Prospective cohort study.

Setting: Primary Care Clinic.

Patients or Other Participants: A prospective cohort of pediatric and adolescent student- athletes ages 8-18 years, presenting to the primary care setting within 3 days of a sport-related concussion, and consenting to participate in the study (n = 133; age = 14.3 ± 2.0 years).

Interventions: Participants completed a standardized initial concussion visit, including a thorough medical and injury history, clinical exam, symptom checklist, and standardized testing. Certified athletic trainers completed data collection at the initial visit. Predictor variables in the multiple linear regression models included gender (female vs. male), age (8-14 years vs. 15-18 years), history of head injury (yes vs. no), amnesia (yes vs. no), and loss of consciousness (yes vs. no).

Main Outcome Measures: The primary outcome was total symptom burden at initial clinical presentation. Secondary outcomes were symptom cluster burdens at initial presentation: cognitive-migraine-fatigue (CMF–headache, dizziness, fatigue, drowsiness, sensitivity to light/noise, feeling slowed down, and difficulty remembering/concentrating), affective (AFF–sadness, nervousness, feeling more emotional), somatic (SOM–vomiting, numbness/tingling), and sleep (SLP–trouble falling asleep, sleeping less than usual). Five separate multiple linear regression models were used to predict total symptom burden and symptom cluster burdens (CMF, SOM, AFF, SLP) at initial visit. An a priori alpha level of 0.05 was used. **Results:** A total of 131/133 patients had valid outcomes for study variables. Fifty-six (42.8%) were female, 16 (12.2%) had amnesia, 10 (7.9%) had LOC, and 46 (35.1%) had a previous history of head injury/concussion. Average total symptom cluster burdens in the sample were: Total burden = 27.3 ± 21.3; CMF burden = 17.3 ± 11.5; AFF burden = 1.2 ± 2.6; SOM burden = 0.3 ± 0.9; SLP burden = 1.1 ± 2.3. In the models with all predictors, being female was associated with greater total symptom burden
(Beta = 11.9; P = 0.001; Female = 34.1 ± 25.1 vs. Male = 22.3 ± 16.4), greater CMF symptom burden (Beta = 6.1 ; P = 0.002; Female = 20.7 ± 12.5 vs. Male = 14.6 ± 9.9), AFF symptom burden (Beta = 1.6 ; P = 0.001; Female = 2.1 ± 3.5 vs Male = 0.5 ± 1.3), and SLP symptom burden (Beta = 0.9 ; P = 0.024; Female = 1.7 ± 2.8 vs. Male = 0.7 ± 1.7). No other associations with symptom burden were observed.

Conclusions: Gender is the factor most strongly associated with symptom burden and burden of symptoms in specified clusters. These findings further support the importance of considering gender in clinical decision making post-concussion.