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Disparities in adherence to concussion clinical care recommendations in a pediatric population

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Abstract

Objective: To characterize the relationship of socio-demographic factors to adherence to provider recommendations for pediatric concussion.

Setting: Primary care (PC) practices within The Children's Hospital of Philadelphia network.

Participants: Patients ages 5-18 years old who presented to any PC site for concussion from 9/26/2019-12/31/2019.

Design: Retrospective chart review.

Main measures: The primary outcome was adherence to follow up recommendations as defined by: 1) Continued follow up until provider clearance to return to full activity; 2) No more than two no-show visits); and 3) For those referred to specialty care (SC), attending at least 1 visit. We compared adherence by race/ethnicity, insurance, age, sex, injury mechanism, and repeat head injury using bivariate and multivariate analyses. A secondary outcome of referral to SC was compared by socio-demographic factors.

Results: A total of 755 patients were included. Overall, 80.5% of the patients met adherence criteria. Following adjustment, non-Hispanic Black patients and publicly insured/self-pay patients were less likely to adhere to recommendations compared to non-Hispanic White patients (adjusted odds ratio [AOR] 0.60, 95% confidence interval [CI]: 0.37, 1.00) and privately insured patients (AOR 0.48, 95% CI: 0.30, 0.75), respectively. When assessing differences in referral to SC, non-Hispanic Black patients and publicly insured/self-pay patients were more likely to receive a

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referral compared to their non-Hispanic White peers (OR 1.56, 95% CI 1.00, 2.45) and privately insured patients (OR 1.56, 95% CI 1.05, 2.32), respectively.

Conclusion: This study highlights disparities in adherence to concussion care recommendations, with non-Hispanic Black and publicly insured/self-pay patients less likely to adhere to follow up recommendations than non-Hispanic White and privately insured patients, respectively. These disparities may impact recovery trajectories. Future studies should aim to identify specific individual- and system-level barriers preventing adherence to care, to ultimately inform targeted interventions to achieve equity in care delivery and outcomes.

Keywords

brain injuries; traumatic; pediatric; concussion; disparities; health equity

INTRODUCTION:

Concussions, or mild traumatic brain injuries, are a public health problem in children and adolescents, with nearly 2 million injuries occurring annually.[1,2] Concussions can lead to neurological, cognitive, and functional deficits, affecting daily activities and quality of life.[1,3–7] Recovery times are heterogeneous and can be influenced by multiple factors. For example, studies of concussion in children evaluated in a specialty care (SC) setting suggest earlier presentation is associated with faster recovery times.[8,9] Formal visio-vestibular and exercise interventions are associated with symptom improvements and shortened recovery times emphasizing the benefits of active and targeted management.[10–12] Taken together, this previous work emphasizes that timely and proper evaluation and treatment may mitigate the risk for prolonged recovery, thus highlighting the critical nature of access to appropriate specialist care and adherence to care recommendations.

The quality and nature of care for pediatric concussion patients can be impacted by multiple factors. Care can differ by practice location. Primary and acute care clinicians care for the majority of concussions in youth with studies reporting gaps in knowledge, lack of use of established guidelines, challenges with specialist access, and perceived limited training for such providers.[13–15] Ultimately, varied care can lead to socio-demographic disparities related to pediatric concussion care. Specifically, previous studies have found racial disparities in concussion symptom recognition,[16] reporting of concussions,[17] and utilization of the emergency department (ED) for concussion.[18–20] Differences by ethnicity, insurance status, and mechanism of injury have also been discovered, with patients presenting to SC for concussion being less likely to be Hispanic or carry public insurance,[21–23] and those with non-sports related injuries less likely to receive concussion-specific care.[24,25] Geographic location can also influence care, as children with a concussion in rural areas have higher health care costs and lower utilization of services in comparison to children living in urban areas.[26]

Health disparities experienced by various socio-demographic groups are driven by structural system-level factors that adversely impact a patient's experience of care. These drivers are often multifactorial and intersect, such as systemic racism and poverty, which influence socio-economic outcomes that can lead to healthcare- and access-related issues.[27,28] There

may be additional, unmeasured factors that contribute to disparities in outcomes, such as personal and environmental contexts and access to resources (e.g. education, food, transportation). In the context of this complexity, there is a need to establish an initial understanding of where disparities exist across socio-demographic factors, which can then drive further quantitative and qualitative investigation to address the multifactorial nature of clinical outcomes. While socio-demographic characteristics are used as a descriptor for group-level differences, these features often serve as proxies for the socio-cultural constructs that give rise to overall care disparities that influence recovery trajectories among these populations.

To date, studies that have assessed adherence to concussion care recommendations have primarily focused on ED discharge instructions, compliance with specific protocols, or relied on self-reported outcomes, without consideration to groups (socio-demographic and economic) at risk for care inequities.[29–33] No study has completed an in-depth evaluation comparing an objective measure of adherence to clinical care recommendations among varied socio-demographic groups. By assessing for adherence across the continuum of care, we will begin to elucidate where, and which, patients may be experiencing barriers to necessary follow up care. Therefore, the primary objective of this study was to comprehensively characterize disparities in adherence to care recommendations among a sample of children presenting to the primary care (PC) practices of The Children's Hospital of Philadelphia (CHOP) network for concussion. In light of previous work on disparities in concussion care, we hypothesized that children with public insurance (as compared to private insurance) and non-Hispanic Black and Hispanic children (as compared to non-Hispanic White children) would have lower rates of adherence, with additional possible differences by sex, age, injury mechanism, and repeat head injury. Our secondary objective was to compare differences in referral patterns to SC from the PC setting by patient socio-demographic factors.

METHODS:

Study Design, Setting, and Participants

This study consisted of a retrospective review using CHOP's electronic health record (EHR; EpicCare, Verona, WI). We assessed all patients, aged 5-18, who presented, from 9/26/2019 through 12/31/2019, to any of the 31 PC sites within our network with a concussion determined based on assigned International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) diagnosis codes.[34] We chose PC as the setting of focus as it represents the patient's medical home and our previous work demonstrated that over 80% of concussion patients in our network initiate care with their PC provider.[35] For those presenting with multiple concussions in the time frame, only the first concussion for patients was selected for analysis. Our chosen time frame was selected to capture a common high-volume concussion season, coinciding with the implementation of an updated concussion care documentation template in the PC EHR.

We excluded patients if they had features consistent with moderate or severe traumatic brain injury, including documentation of: 1) more than 30 minutes of loss of consciousness, 2) more than 24 hours of post-traumatic amnesia, 3) a Glasgow Coma Scale score <13,

4) radiographic evidence of a brain hemorrhage (including subdural hemorrhage, epidural hemorrhage, intraparenchymal hemorrhage, and cerebral or cerebellar contusion), 4) need for surgical intervention, 5) intensive care unit admission, and 6) post-injury hospitalization > 48 hours. We also excluded patients being seen for post-concussion syndrome, since they likely received clinical care for their injury prior. We identified additional exclusionary criteria during the screening and abstraction process, such as a lack of clarity around the concussion diagnosis, initial treatment for the injury with a specialist prior to seeing their primary care provider (aside from ED/UC visits) at another general pediatric diagnostic site outside of primary care, no injury details in the visit encounters, and patients for whom it was documented in the EHR that SC was sought outside of our institution (as we could not determine if those patients continued to seek care with the outside specialist through clearance). See Figure 1 for details regarding inclusion and exclusion. This study was approved by CHOP's Institutional Review Board.

Main Measures

Adherence Definition—The primary outcome variable was adherence to follow up recommendations, defined by the following criteria: 1) Continued follow up until provider clearance to return to full activity; 2) No more than two no-show visits; and 3) For those referred to specialty care, attending at least 1 specialty care visit. We required all 3 conditions be met for a subject to be deemed adherent to clinical care recommendations.

Patient and Injury Characteristics—We abstracted socio-demographic and socio-economic factors including sex, age, race/ethnicity, and insurance status from the PC and SC records of the EHR. Patient demographic and socio-economic factors are recorded in the EHR either via hospital registration staff asking verbally and entering the data into the EHR system or by patients and families directly through a secure online portal. However, our EHR does not distinguish who (registration staff as opposed to families) enters such information. We collected additional characteristics of mechanism of injury, repeat head injury during the course of concussion care, return and discharge instructions, and referrals to and attendance at SC. From both PC and SC, we also obtained scheduled, but unattended visits ("no-show" visits), documented clearance by either PC or SC provider, and time from injury to clearance. Data was abstracted into a secure Research Electronic Data Capture (REDCap) database,[36,37] and abstraction was completed by three abstractors, led by study first author (FM) and co-authors (SS, BK). We utilized an abstraction manual and completed in-depth training, including practice abstractions with review. Additionally, we conducted an inter-rater reliability (IRR)[38] check of the primary study outcome variables on 20 abstracted records each at the start of the study. We assessed IRR in pairs among the three abstractors and found IRR scores to be strong (Cohen's kappa: 0.85-0.92), with the observed percentage of agreement ≥97%.

Statistical analysis—We used standard descriptive statistics to summarize demographic data. For the primary objective, we conducted the following unadjusted bivariate analyses, comparing the odds ratios (ORs) (with associated 95% confidence intervals [CI]) of meeting criteria for adherence, among the following groups: (1) Sex (male vs. female); (2) Insurance (public/self-pay vs. private); (3) Race/ethnicity (non-Hispanic White vs. non-Hispanic Black

vs. Hispanic); (4) Injury mechanism (Sports vs. non-sports); (5) Age (14 years and older vs. 10 - <14 years vs. less than 10 years), generally chosen to mark the division between elementary school, middle school, and high school; (6) Repeat head injury during course of care (yes vs. no). We conducted a multivariate logistic regression to determine which factors were most strongly associated with adherence; those with missing or unknown values for predictors, including race/ethnicity, insurance, or injury mechanism, were excluded from our multivariate modeling. Given our a priori hypotheses regarding the influence of these factors on care adherence, all were included in the multivariate model. A likelihood ratio test was conducted to evaluate the interaction between race/ethnicity and insurance status. We also conducted a post-hoc analysis evaluating differences in each of the three individual adherence components by race/ethnicity and insurance. For the secondary objective, ORs with 95% CI were used to compare referral to SC care by race/ethnicity (non-Hispanic White vs. non-Hispanic Black vs. Hispanic) and insurance status (public/self-pay vs. private). All analyses were conducted in Stata Version 14.2 (StataCorp, College Station, TX).

RESULTS:

Figure 1 provides details for the derivation of our cohort for analysis; the final analytic sample included 755 patients.

Patient Demographics

A total of 755 patients were included (46.2% female, median age 13.9 years, interquartile range 11.9,16.1). Of those, 70.7% (n= 534) were non-Hispanic White, 14.4% (n= 109) non-Hispanic Black, and 6.4% (n= 48) Hispanic; 79.6% (n= 601) were privately insured and 19.3% (n= 146) were publicly insured/self-pay; and 57.9% (n= 437) had a sport or recreation-related injury. See Table 1 for the full demographic characteristics of the study population.

Primary Outcome

In the 755 patients, 80.5% were adherent to recommendations. See Table 2 for unadjusted and adjusted odds ratios and 95% CI for adherence. In the bivariate analysis, we found fewer patients with public insurance (70.6%) were likely to adhere to follow up recommendations vs. patients with private insurance (82.9%), unadjusted OR 0.50, 95% CI (0.33, 0.75). We additionally found fewer non-Hispanic Black (70.6%) patients were likely to adhere to follow up recommendations compared to non-Hispanic White patients (83.5%), unadjusted OR 0.47, 95% CI (0.30, 0.76). Following adjustment, publicly insured/self-pay patients remained less likely to adhere to follow up recommendations than privately insured (adjusted odds ratio (AOR) 0.48, 95% CI: 0.30, 0.75). Non-Hispanic Black patients were also less likely to adhere to follow up recommendations compared to non-Hispanic White patients (AOR 0.60, 95% CI: 0.37, 1.00) following adjustment. There were no statistically significant differences by sex, injury mechanism, age, or repeat head injury in either unadjusted or adjusted analyses. No interaction was found for the likelihood ratio test between race/ethnicity and insurance (LR chi-square test 0.88, p=0.6435).

Evaluating the individual components of the adherence definition (Table 3), we found for criteria 1 (continued follow up until provider clearance to return to full activity), non-Hispanic Black (73.4%) were less likely to follow up through clearance compared to non-Hispanic White patients (85.8%), OR 0.46, 95% CI (0.28, 0.75). Additionally, publicly insured/self-pay patients (75.3%) were less likely to follow up through clearance in comparison to privately insured patients (85.2%), OR 0.53, 95% CI (0.34, 0.82). There were no statistically significant differences by race/ethnicity or insurance for adherence criteria 2 (<=2 no show visits) or 3 (for those referred, scheduling and attendance at a specialty appointment).

Secondary Outcomes

Of the study sample, 24.4% (n=184) were referred to SC. We found significantly more non-Hispanic Black patients (32.1%) were referred than non-Hispanic White patients (23.2%), OR 1.56 (95% CI 1.00, 2.45). We also found that significantly more patients who were publicly insured/self-pay (31.5%) were referred to SC in comparison to privately insured patients (22.8%), OR 1.56 (95% CI 1.05, 2.32). Full results are displayed in Table 4.

DISCUSSION:

Overall, this study found a high rate of adherence (80.5%) to clinical recommendations in the study population of pediatric concussion patients, while highlighting key differences in adherence by race/ethnicity and insurance status. In our sample, non-Hispanic Black patients and patients with public insurance/self-pay were less likely to adhere to recommendations for follow up in comparison to non-Hispanic White and privately insured patients, respectively, specifically with continuing to follow up with the medical provider through clearance.

These disparities follow trends previously described in the literature showing race/ethnicity and insurance status are associated with differences in concussion care, including differences in symptom recognition (Black athletes recognizing concussion symptoms less frequently than White athletes),[16] and differences in healthcare utilization and diagnosis (Black children are less likely to utilize the ED for a head injury and less likely to be diagnosed with a concussion in comparison to non-Hispanic White children, [18–21] and youth being seen for a concussion at a specialty clinic being more likely to have private insurance).[21,22] As data from this study further reveals that disparities pervade the clinical care trajectory, it is important to continue to emphasize that these socio-demographic characteristics are proxies for a multitude of systemic, social, and cultural constructs that can influence health outcomes. Ultimately, assessing for the causes of disparities requires a multi-pronged approach of evaluating barriers at various points, such as at the societal, institutional, and individual level. While this study focuses on describing where disparities exist with adherence to concussion care and continuing to seek care through recovery, further work is needed to establish the drivers behind these disparities.

There are few studies assessing completion of follow up with concussion clinical care recommendations. Moor et al. assessed adherence behaviors in a pediatric population presenting with a concussion to a sports medicine clinic.[29] Adherence was measured via

self-report with relation to specific recommendations such as physical and cognitive rest, and referrals to specialists. The study found high levels of self-reported adherence; however, the study was focused on adherence and recovery time among patients who completed care with their sports medicine provider, which excludes those experiencing various challenges in attending a SC visit.[29] Additionally, the study was conducted among patients presenting with a sport-related injury, where a return to athletics may serve as an impetus for higher levels of adherence. Our study provides broader data assessing adherence among pediatric patients presenting to their PC provider for any injury mechanism and identifying socio-demographic and socio-economic differences in completion of care. A study by Wallace et al. assessed patterns of health care navigation among Black and White adolescents following a sport-related concussion.[39] Contrary to our study, they found few differences between Black and White athletes in initial contact and presentation to health care, referral patterns, and follow up rates within a concussion clinic, despite fewer Black athletes having private insurance in comparison to White athletes.[39] Wallace et al. suggest one potential reason for this outcome could be that participating in school sports may facilitate better access to healthcare. Importantly, our study included all injury mechanisms, with over 40% being from non-sport mechanisms.

Adherence to concussion care recommendations plays an important part in concussion recovery. Recovery time from a concussion can vary; while the majority of children recover within four weeks, approximately 30% of concussed youth will experience symptoms beyond one month following injury.[40,41] Previously, passive rest was the standard of care for concussion management,[42] however, more recently, active management utilizing aerobic exercise and visio-vestibular exercises have shown a significant improvement in outcomes.[10–12,43] Based on the efficacy of these treatments, differences in adherence to treatment plans have the potential to directly lead to disparities in recovery trajectories.

We specifically evaluated scheduling and attending a follow up visit for those referred to SC, where the majority of these active therapeutics are currently prescribed, as an adherence measure. We interestingly found that non-Hispanic Black patients were more likely to be referred when compared to their non-Hispanic White peers (perhaps suggesting a more prolonged recovery trajectory for non-Hispanic Black patients) and did not find differences in race/ethnicity or insurance status in scheduling/attending the specialty visit. While few studies have directly measured disparities in access to specialty concussion care services across various socio-demographic factors, studies have shown demographic differences in those who present to different clinical sites for a concussion.[21,35] Copley et al. compared characteristics of adolescents being seen at sports medicine clinics for a concussion with those being seen for a fracture, and found that patients being seen for a concussion were less likely to be Hispanic and less likely to have private insurance.[21] Their findings suggest these barriers to access may be concussion specific and not general barriers of accessing the healthcare system for traumatic injury care. Given the complex pathophysiology of a concussion and various deficits that might follow the injury, it is critical to establish methods for supporting patients in following up with clinical care for concussion recovery and ensuring appropriate access to services for equitable care.

An important avenue for investigating barriers to adherence is through the lens of social determinants of health (SDOH). Social determinants of health are the social structures and environments that can impact one's health outcomes, and therefore can contribute to health inequities through multiple avenues. Structural racism, limited educational opportunities, limited access to resources, and poverty are but a few drivers of SDOH that can have expanding ramifications on health outcomes and overall quality of life.[27] For example, Gutierrez-Colina et al. assessed racial disparities in barriers to medication adherence among pediatric epilepsy.[44] The study found that Black children had significantly lower rates of adherence in comparison to White children, and barriers identified more often among the Black youth were related to health system and community-level factors such as access to services and competing demands.[44] Studies such as this highlight the need to integrate assessments of the various determinants of health into clinical practice to work towards health equity in pediatric clinical care.[45] Structural, healthcare system level factors are also likely contributing to differences in adherence, including parameters such as location, distance, and timing of in-person appointments as well as insurance coverage and cost.[46] Healthcare system-level factors may also include implicit bias among providers, which may impact the treatment and instruction patients are provided, and can ultimately play a role in adherence to clinical care recommendations.[47,48] By assessing individual, community, organizational, and societal-level health determinants through frameworks such as the social-ecological model of health, studies can further categorize the points at which clinicians can intervene and where additional, collaborative intervention efforts are needed on a larger scale.[49] There is a growing body of research utilizing tools such as telemedicine and remote patient monitoring, which could be useful avenues to explore to bridge gaps in care.[50–52] As we found non-Hispanic Black patients and publicly insured/self-pay patients were less likely to continue to follow up until provider clearance, these avenues may specifically help rectify the ability to continue to follow up with the medical team through clearance. Ultimately, evidence-based approaches that address disparities are needed to ensure improved health outcomes for all children.

This study carried several limitations. First, we may have introduced sampling bias given the selected period of time for abstraction; however, we reviewed all patients during the included time frame to minimize this bias. We appreciate that there may be several drivers of adherence that we were unable to measure in this study. Specifically, there may have been various historical events that may occur and may impact adherence with clinical care. Additional limitations included EHR documentation where providers did not utilize the standardized template for some clinical encounters, however our previous work shows primary care providers utilize standardized concussion documentation tools in the EHR with extremely high frequency (>80%).[53] Further limitations with the use of EHR data is related to possible inconsistencies with accuracy and completeness related to reporting of these variables.[54] Lastly, the inability to follow patients outside of our healthcare network posed limitations to our ability to completely assess follow up clinical care when referred to specialty concussion services, however there were few that chose to receive care outside the network. The utilization of data from our expansive pediatric care network, with EHR data spanning primary care and specialty care sites in fact served as a strength of our study.[35]

In summary, we found disparities by race/ethnicity and insurance status in the adherence to clinical care recommendations among patients presenting to the PC network of CHOP for concussion evaluation. These results highlight the importance of ensuring families have the support to adhere to concussion care recommendations until clearance. Public health efforts have focused on reducing and eliminating health disparities over the last few decades; however, inequities continue to exist due to their complex and multi-factorial nature which are often tied to SDOH. Due to the disparities across the spectrum of concussion care highlighted in this study, future studies should aim to identify specific barriers preventing adherence to care, ultimately allowing for targeted interventions to achieve equity in care delivery and outcomes.

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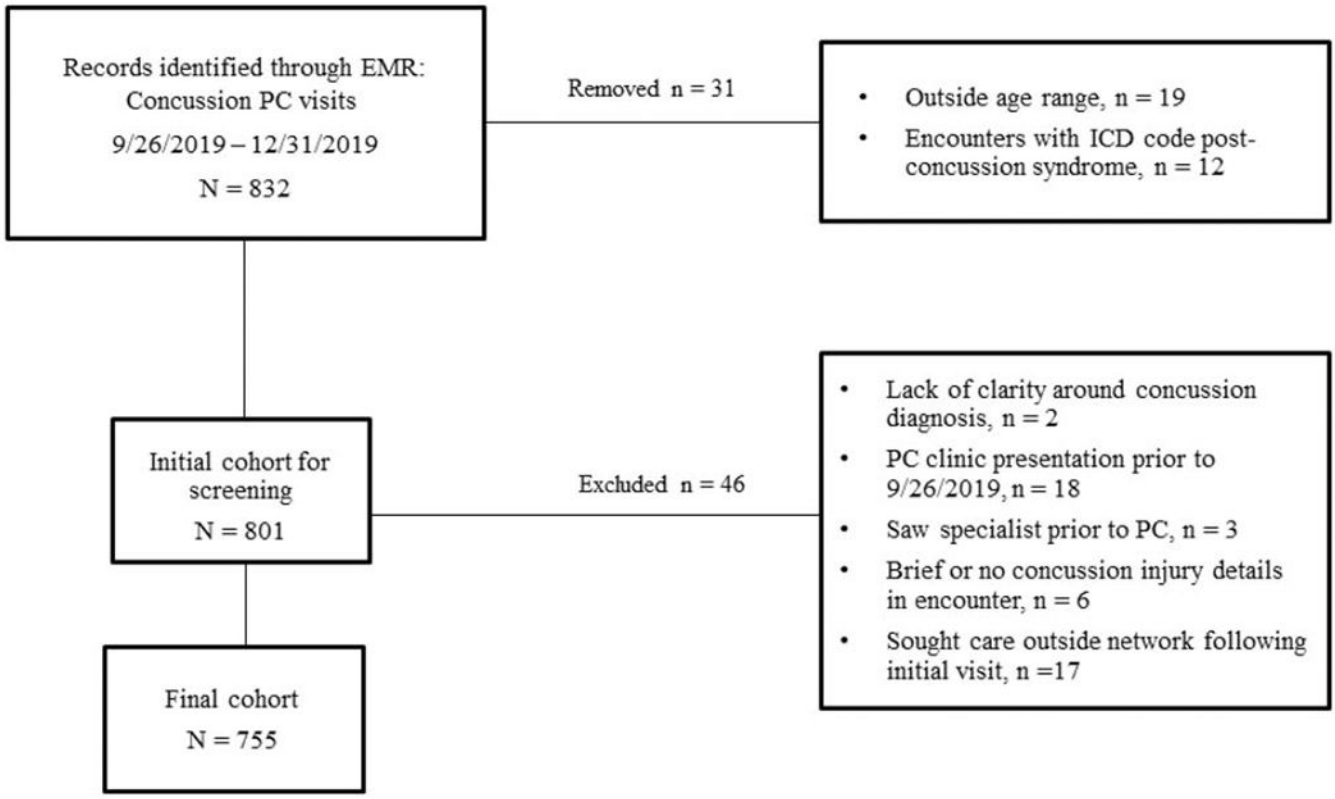

Figure 1.

Flow diagram of patient inclusion/exclusion

EMR= electronic medical record; ICD = International Classification of Diseases, Version 10; PC= primary care

Table 1.

Patient characteristics at time of clinic presentation to primary care.

Characteristic	N (%)
Sex	
Female	349 (46.2%)
Male	406 (53.8%)
Insurance	
Private	601 (79.6%)
Public/Self-pay	146 (19.3%)
Unknown	8 (1.1%)
Race/Ethnicity	
NH White	534 (70.7%)
NH Black or African American	109 (14.4%)
Hispanic or Latino	48 (6.4%)
Other/Unknown	64 (8.5%)
Injury Mechanism	
Sport	437 (57.9%)
Non-sport	313 (41.5%)
Unknown	5 (0.7%)
Median age, years (IQR)	13.9 (11.9, 16.1)
14-<18 years	374 (49.5%)
10-<14 years	291 (38.5%)
5-<10 years	90 (11.9%)
Repeat Head Injury	
No	705 (93.4%)
Yes	50 (6.6%)

IQR = interquartile range; NH = non-Hispanic

Table 2.

Analysis of adherence to clinical care recommendations by socio-demographic factors and injury mechanism.

Variable	N Meeting Adherence Definition (%)	Unadjusted Odds (95% CI)	Adjusted Odds (95% CI)
Sex			
Female	278 (79.7%)	Ref	Ref
Male	330 (81.3%)	1.11 (0.77, 1.59)	1.11 (0.74, 1.66)
Insurance			
Private	498 (82.9%)	Ref	Ref
Public/Self-pay	103 (70.6%)	**0.50 (0.33, 0.75)**	**0.48 (0.30, 0.75)**
Race/Ethnicity			
NH White	446 (83.5%)	Ref	Ref
NH Black or African American	77 (70.6%)	**0.47 (0.30, 0.76)**	**0.60 (0.37, 1.00)**
Hispanic or Latino	35 (72.9%)	0.52 (0.27, 1.04)	0.74 (0.36, 1.53)
Injury Mechanism			
Sport	361 (82.6%)	Ref	Ref
Non-sport	243 (77.6%)	0.73 (0.50. 1.05)	0.68 (0.45, 1.02)
Age (years)			
14-18	293 (78.3%)	Ref	Ref
10-<14	241 (82.8%)	1.33 (0.90, 1.97)	1.40 (0.92, 2.14)
5-<10	74 (82.2%)	1.28 (0.71, 2.32)	1.59 (0.82, 3.07)
Repeat Head Injury			
No	571 (81.0%)	Ref	Ref
Yes	37 (74.0%)	0.67 (0.35, 1.29)	0.77 (0.36, 1.63)

CI = confidence interval; NH = non-Hispanic

Adjusted odds accounted for all listed variables included in the multivariate model.

Bold text in the odds ratios indicates statistical significance.

Table 3.

Analysis of each component of the adherence definition by race/ethnicity and insurance.

Characteristic	Adherence Definition 1		Adherence Definition 2*	Adherence Definition 3**	
	N (%)	Odds Ratio (95% CI)	N (%)	N (%)	Odds Ratio (95% CI)
Race/Ethnicity					
NH White	458 (85.8%)	Ref	534 (100%)	103 (83.1%)	Ref
NH Black or African American	80 (73.4%)	**0.46 (0.28, 0.75)**	108 (99.1%)	29 (82.9%)	0.98 (0.36, 2.67)
Hispanic or Latino	39 (81.3%)	0.72 (0.33, 1.54)	48 (100%)	8 (61.5%)	0.33 (0.10, 1.10)
Insurance					
Private	512 (85.2%)	Ref	601 (100%)	113 (82.5%)	Ref
Public/Self-pay	110 (75.3%)	**0.53 (0.34, 0.82)**	145 (99.3%)	36 (78.3%)	0.59 (0.28, 1.26)

Adherence definition 1 = Continued follow up until provider clearance to return to full activity

Adherence definition 2 = No more than two no-show visits

Adherence definition 3 = For those referred to specialty care, attending at least 1 specialty care visit

CI = confidence interval; NH = non-Hispanic

*Odds ratio could not be calculated as zero patients in each reference groups were not adherent

**Only includes patients referred to specialty clinic (n=184 patients)

Bold text in the odds ratios indicates statistical significance.

Table 4.

Comparison of referral to specialty concussion clinic by demographic characteristics.

Characteristic	N Referred (%)	Odds of referral (95% CI)
Race/Ethnicity		
NH White	124 (23.2%)	Ref
NH Black or African American	35 (32.1%)	**1.56 (1.00, 2.45)**
Hispanic or Latino	13 (27.1%)	1.23 (0.63, 2.39)
Insurance		
Private	138 (22.8%)	Ref
Public/Self-pay	46 (31.5%)	**1.56 (1.05, 2.32)**

CI = confidence interval; NH = non-Hispanic

Bold text in the odds ratios indicates statistical significance.