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More Than Skin Deep: Patient-Provider Racial and Ethnic Concordance and Discordance in Collegiate Athletics and Concussion Management

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Context: There is strong evidence that racial and ethnic disparities exist in multiple arenas of health and wellness. The causes of racial and ethnic differences in health care are multidimensional; one factor that may affect injury/illness communication, interactions, and outcomes is patient-provider racial and ethnic concordance. At present, it is unclear what role patient-provider racial and ethnic concordance and discordance plays in facilitating concussion care for collegiate athletes.

Objective: To investigate the presence of athlete–athletic trainer (AT) racial and ethnic concordance and discordance among diagnosed concussion cases and examine if racial and ethnic concordance and discordance influences time (in days) until diagnosis, symptom resolution, or return-to-sport clinical milestones in collegiate athletes.

Design: Retrospective cohort study.

Setting: Collegiate athletics.

Patients or Other Participants: A total of 694 concussion cases (38.6% [n = 268] sustained by women, 61.4% [n = 426] sustained by men) that occurred within the 2015–2016 through 2019–2020 sport seasons at 9 institutions.

Main Outcome Measure(s): The number of days from the date of injury to diagnosis, symptom resolution, and return to sport and from the date of diagnosis to symptom resolution and return to sport.

Results: Overall, 68.4% (n = 475) of concussion cases had patient-provider racial and ethnic concordance, and 31.6% (n = 219) were discordant. All concordant pairs included a White athlete and White AT. Time to diagnosis differed between the concordant and discordant groups (median [interquartile range] = 1 [0–2] versus 0 [0–1], respectively) only in the model adjusted for sex, sport type, and availability of an AT (odds ratio [95% CI] = 1.46 [1.07–1.85]). There were no other group differences.

Conclusions: One-third of concussion cases had athlete-AT racial and ethnic discordance. Although this group was diagnosed with a concussion 1 day sooner than the concordant group, no differences were observed for any concussion recovery milestones. These findings suggest that patient-provider racial and ethnic concordance may play a minor role in concussion recognition or reporting but not necessarily in the management and recovery thereafter.

Key Words: health equity, social determinants of health, diversity

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Key Points

- All concordant concussion cases were White athlete–White athletic trainer dyads, whereas most of the discordant cases were Black or African American athletes paired with a White athletic trainer.
- Although a 1-day discrepancy in concussion diagnosis timing was observed, the overall results of this study were favorable given the consistent concussion recovery timelines between the patient-provider racially and ethnically concordant and discordant groups.

Race and ethnicity are complex operationalized social constructs and determinants of health that are often compounded by structural factors such as income, educational resources, access to nutritious food, transportation, and social support that have been documented in community, education, and health care contexts.[1] Race is categorized based upon shared physical characteristics (eg, skin color, hair color and texture), and ethnicity reflects common cultural factors that specific communities share (eg, language, religion, ancestry).[2] Strong evidence exists that racial and ethnic disparities are present in multiple domains of health and wellness.[3–7] For example, there is a growing body of literature focused on racial and ethnic disparities in patients with traumatic brain injuries, with the majority of findings showing more favorable diagnosis, management, and recovery practices and outcomes in non-Hispanic White individuals compared with those from other racial and ethnic groups.[8] Although the causes of racial and ethnic differences in health care are multidimensional, one factor that may affect injury/illness communication, interactions, and outcomes that warrants consideration is patient-provider racial and ethnic concordance and discordance.

Racial and ethnic concordance occurs when the race and ethnicity of a patient matches the race and ethnicity of their health care provider. Conversely, discordance occurs when these social identities do not match.[9] Researchers have suggested an association between racial and ethnic concordance and discordance and health-related outcomes. Specifically, patient-provider racial and ethnic concordance is associated with improved communication, medication adherence, the completion of preventative health screenings, increased shared decision-making, better patient illness/injury comprehension, and a reduction in the incidence of implicit bias by clinicians.[10–15] Patient-provider racial and ethnic concordance may allow for individuals to communicate more comfortably through shared cultural understanding, which may explain why patients with a choice prefer racial and ethnic concordance with their health care providers.[16,17] Racial and ethnic concordance may lead to improved patient-provider relationships by enabling a pathway for patients to disclose pertinent health care information and encourage them to continue seeking care throughout illness/injury recovery. Additionally, providing information regarding racial and ethnic concordance and discordance to health care providers may enhance their awareness of potential implicit bias in care delivery. Having this knowledge may enable them to proactively improve their patient-centered communication skills to build trust and bolster care continuation with patients whose racial and ethnic identities differ from their own.[10]

Patient-provider racial and ethnic concordance and discordance has yet to be considered through a sports medicine lens. Drawing from current publicly available data, most National Collegiate Athletic Association (NCAA) athletes from underrepresented groups may experience patient-provider racial and ethnic discordance during their athletic career.[18] The most recent NCAA demographic database shows that 9 of every 10 athletic trainers (ATs) identify as non-Hispanic White, which has remained relatively unchanged over time. In comparison, NCAA athletes from underrepresented racial and ethnic backgrounds account for approximately 25% of the total NCAA athlete population. Figure 1 provides the percentages of racial and ethnic identities for NCAA athletes and ATs presented across multiple seasons for comparison.[18] The racial and ethnic makeup of ATs does not proportionally reflect athletes in the NCAA collegiate sport setting. This may contribute to health care environments that foster racial and ethnic discordance between patients and providers, with an unknown extent of prevalence and impact.

Collegiate athletics presents a distinct setting in which athletes from diverse origins and backgrounds converge, and for certain individuals, it may mark their initial exposure to regular access and engagement with health care providers. This may be especially true for athletes coming from underrepresented racial and ethnic communities that have been negatively and disproportionately affected by structural racism that has created societal inequities related to access to affordable health insurance and quality health care resources.[19] In order to provide culturally responsive care, ATs must consider how race and ethnicity may influence not only injury assessment and recovery outcomes but also the role of patient-provider racial and ethnic concordance and discordance in a patient's overall relationship with health care providers and their willingness to voluntarily disclose pertinent health information.

Concussion continues to be a public health concern that is challenging to identify, diagnose, and manage due to its invisible nature coupled with a lack of validated objective clinical assessments.[20,21] Concussion incidence in collegiate sports is increasing, particularly among collision and high-contact sports, including but not limited to football (injury rate [IR] = 6.99 per 10 000 athlete-exposures), men's basketball (IR = 3.35 per 10 000 athlete-exposures), and women's basketball (IR = 3.58 per 10 000 athlete-exposures).[22] Although other sports have higher reported IRs (eg, wrestling, soccer), these specific sports are noteworthy as more than two-thirds of all NCAA athletes who participate in these high-risk sports are from historically underrepresented racial and ethnic groups.[22] Early recognition and immediate removal from sport participation are pivotal secondary prevention steps that aid in optimizing recovery outcomes for patients who have sustained a concussion. Athletes who are delayed in being removed from play after a concussion have longer recovery times and greater symptom severity scores compared with those who are immediately removed.[23]

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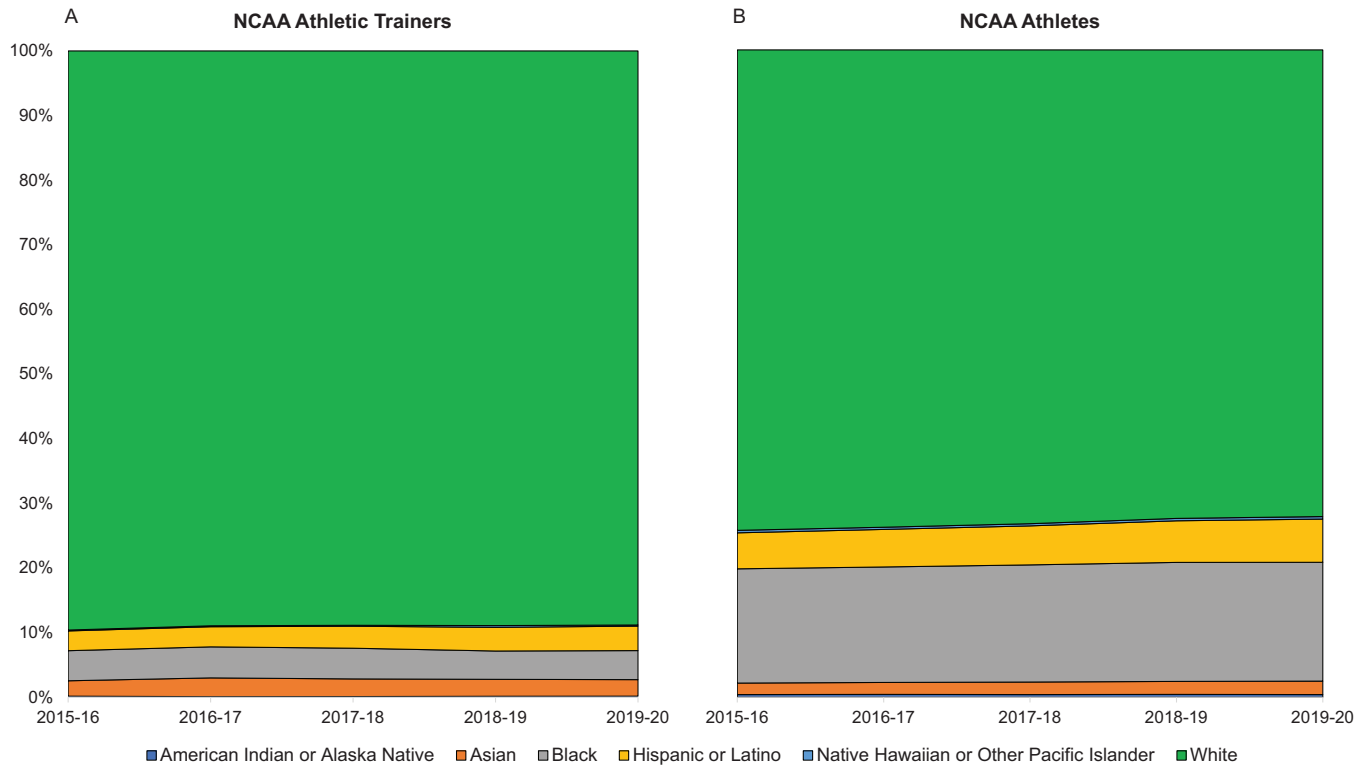

Figure 1. Race and ethnicity frequencies of National Collegiate Athletic Association (NCAA) athletic trainers and athletes from the 2015–2016 through 2019–2020 seasons.

Perceived patient-provider similarity, such as being racially and ethnically concordant, has been linked to increased patient trust, satisfaction, and treatment adherence, which are all desirable outcomes in health care.[24] Creating and maintaining a trusting patient-provider relationship with a shared understanding and open line of communication may be pivotal for effective concussion identification, diagnosis, and recovery. An understanding of how the social identities of a patient and their provider interact to affect health outcomes is a requisite and critical step toward developing and advancing health equity initiatives in sports medicine. Researchers have characterized differences by race for neurocognitive measures, vestibular and oculomotor assessments, symptom knowledge, recovery, and concussion disclosure.[25–29] However, it remains unclear how patient-provider racial and ethnic concordance and discordance could play a role in influencing concussion care for collegiate athletes. Therefore, the purposes of our study were 2-fold: (1) investigate the presence of collegiate athlete and AT racial and ethnic concordance and discordance among concussion cases and (2) examine if racial and ethnic concordance and discordance influenced concussion diagnosis, symptom resolution, or return-to-sport timelines.

METHODS

Study Design and Setting

We used a retrospective, cross-sectional design by extracting clinical concussion documentation data from the medical records of NCAA collegiate athletes from 11 institutions (NCAA Division I, n = 8; NCAA Division II, n = 2; and NCAA Division III, n = 3) that are members of the Long-Term Impact of Military-Relevant Brain Injury Consortium Military and Tactical Athlete Research Study (LIMBIC MATARS) consortium. Although all 22 institutions in the LIMBIC MATARS consortium were recruited to participate, only 11 were able to secure institutional approval and complete data use agreements to contribute athlete medical record data to this chart review study. Data extraction occurred for all documented concussions sustained over a 5-year period from the 2015–2016 through 2019–2020 athletic seasons. The exact time range for data extraction was July 2015 through February 2020, as injuries sustained in March 2020 and beyond were excluded due to the onset of the COVID-19 pandemic. The master data file included 1044 total concussion cases.

Consortium Data Extraction Procedures

The methods of the LIMBIC MATARS consortium's data extraction project have been detailed elsewhere.[30] Briefly, the LIMBIC MATARS consortium investigators developed a priori common data elements based on the consortium purpose, goals, and research questions—predominantly encompassing postconcussion clinical outcomes in collegiate athletes. After institutional review board approvals at all partner sites, the establishment of data use agreements, and completion of confidentiality disclosure agreements, investigators reviewed medical records of concussion cases sustained by athletes who were diagnosed by ATs in accordance with protocols specific to each member institution's athletic department. The definition of concussion was consistent, with the definition detailed in the fourth and fifth iterations of the international consensus statement that corresponded to the data extraction time frame.[21,31] Upon review, site investigators gleaned predetermined common data elements (eg, recovery milestone information, athlete demographic information) for each injury that occurred during

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the specified time frame and recorded them in a secure database. Once site investigators completed data extraction and ensured deidentification of the data, the consortium principal investigator combined all individual datasets from each member institution into an anonymized master dataset for distribution and analyses.

Study Data Preparation Procedures

Patient-provider (ie, athlete-AT) racial and ethnic concordance or discordance was the independent variable for this study. Race and ethnicity categories were operationalized according to guidelines from the National Institutes of Health in 2015, which served as the beginning of the time period from which clinical data were extracted.[32] These categories are also consistent with the NCAA race and ethnicity demographics.[18] The race and ethnicity of both the athlete who sustained a concussion and the responding AT were common data elements that were extracted for each concussion case when available. These variables were used to determine patient-provider racial and ethnic concordance/discordance, which we dichotomized as either *yes* (athlete and AT identified as the same race and/or ethnicity) or *no* (athlete and AT identified as different races and/or ethnicities). Self-reported race and ethnicity information was extracted from preexisting institutional documents (eg, preparticipation physical examination forms) at each site. Two of the 11 consortium institutions contributing data did not have documentation of these race and ethnicity variables; thus, our sample included concussion cases that occurred at only 9 institutions. The athletes' biological sex (male or female) was also extracted from their medical files. The concussion diagnosis and recovery dependent variables were based on a number of time points that were extracted as common data elements for each concussion case. These included the date of injury, date of diagnosis, date of symptom resolution, and date of return to sport. Times between clinical milestones were calculated as the number of days from the date of injury to diagnosis, symptom resolution, and return to sport and from the date of diagnosis to symptom resolution and return to sport. Each institution also provided information indicating whether the concussion had occurred to an athlete from a sport that had a *dedicated AT* (*yes*, *no*), which was defined as having the same AT(s) who provided onsite medical care at all practices and competitions. Figure 2 provides a visual overview of the data preparation process.

Statistical Analysis

First, we conducted descriptive statistics for demographic variables, specifically means and SDs for continuous variables and frequencies with percentages for categorical variables. Medians and interquartile ranges (IQRs) were calculated for each dependent variable stratified by racial concordance. With the count nature of the dependent variables (ie, days between milestones) and the overdispersion (ie, unequal mean to variance ratio), negative binomial regression models were used to assess for differences between the racially concordant and discordant groups for 4 of the time frames (days from injury to symptom free, injury to return to play, diagnosis to symptom free, and diagnosis to return to play). Due to the high degree of zero days (n = 350) for participants moving from injury to diagnosis, a zero-inflated regression model was used. Unadjusted and adjusted models, including variables of biological sex and dedicated AT with sport, were constructed along with 95% CIs for the incidence rate ratios from the negative binomial regression models and the odds ratios in the zero-inflated regression models.[33,34] The most parsimonious adjusted model with the lowest Akaike information criterion was maintained. Statistical significance was set a priori as $P < .05$ (pairwise comparisons) or exclusion of 1.0 within the 95% CI (regression models). All analyses were performed using SPSS (version 29; IBM Corp) and the PSCL package in R (version 4.3.2; R Foundation) specifically for the zero-inflated regression models.

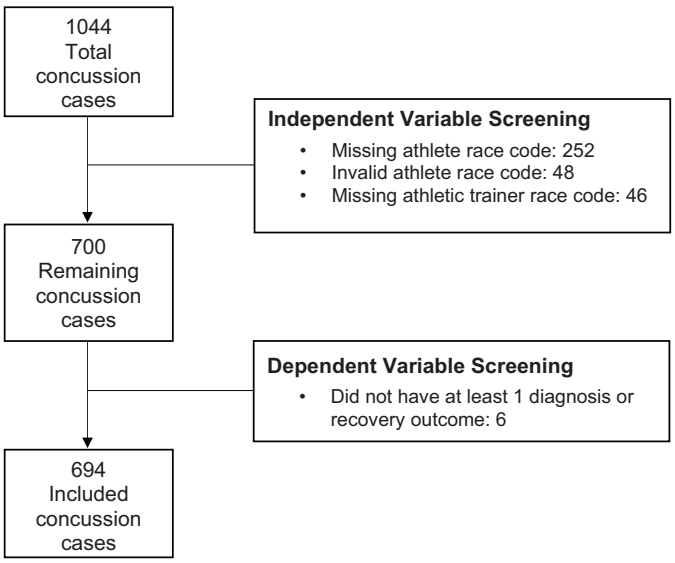

Figure 2. Overview of the data preparation process.

RESULTS

Participants and Racially and Ethnically Concordant/Discordant Frequencies

We analyzed data from 694 concussion cases. Table 1 provides descriptive information for the included concussion cases. In total, 68.4% (n = 475 of 694) of cases were patient-provider racially and ethnically concordant, and 31.6% (n = 219 of 694) were discordant. Most concussion cases in our sample occurred to athletes who identified as White (n = 499, 71.9%) and male (n = 426, 61.4%). All concussion cases in the concordant group occurred to athletes who were White and paired with a White AT (n = 475 of 475, 100%; Figure 3), whereas most concussion cases in the discordant group occurred to athletes who identified as Black or African American (n = 170 of 219, 77.6%) and were most frequently paired with a White AT (n = 186 of 219, 84.9%). Furthermore, the sports most represented in the concordant group were football (n = 140 of 474, 29.5%) and wrestling (n = 39 of 474, 8.2%) and the most represented in the discordant group concussion cases were football (n = 142 of 219, 64.8%) and basketball (n = 26 of 219, 11.8%). See the Supplemental Table (available online at http://dx.doi.org/10.4085/1062-6050-0320.23.S1) for additional information regarding the frequency of ATs, athletes, and included concussion cases per year by LIMBIC MATARS site.

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Table 1. Characteristics of Included Concussion Cases[a]

	All (N = 694)	Patient-Provider Racial and Ethnic Concordance (n = 475)	Patient-Provider Racial and Ethnic Discordance (n = 219)
Age, mean ± SD, y	19.93 ± 1.06	19.85 ± 1.63	20.11 ± 1.55
Biological sex, No. (%)			
Female	268 (38.6)	213 (44.8)	55 (25.1)
Male	426 (61.4)	262 (55.2)	164 (74.9)
Athlete race and ethnicity, No. (%)			
Black or African American	170 (24.5)	NA	170 (77.6)
Hispanic or Latino	10 (1.4)	NA	10 (4.6)
White	499 (71.9)	475 (100.0)	24 (11.0)
Asian	5 (0.7)	NA	5 (2.3)
Native Hawaiian or other Pacific Islander	9 (1.3)	NA	9 (4.1)
American Indian or Alaska Native	1 (0.1)	NA	1 (0.5)
Athletic trainer race and ethnicity, No. (%)			
Black or African American	18 (2.6)	NA	18 (8.2)
Hispanic or Latino	3 (0.4)	NA	3 (1.4)
White	661 (95.2)	475 (100.0)	186 (84.9)
Asian	NA	NA	NA
Native Hawaiian or other Pacific Islander	12 (1.7)	NA	12 (5.5)
American Indian or Alaska Native	NA	NA	NA
Dedicated athletic trainer with sport, No. (%)			
Yes	524 (75.5)	339 (71.4)	185 (84.5)
No	62 (9.8)	53 (11.2)	9 (4.1)
Missing	108 (15.6)	83 (17.3)	25 (11.4)

Abbreviation: NA, not applicable.

[a] The frequencies provided in this table reflect the characteristics of included concussion cases rather than individuals. For example, 170 concussion cases occurred to athletes who identified as Black or African American. Additionally, 661 concussion cases were managed by athletic trainers who identified as White.

Racial and Ethnic Concordance/Discordance and Time to Reach Clinical Milestones

For the entire sample, the median (IQR) time from injury to diagnosis was 0 (0–2) days, from injury to symptom resolution was 7 (4–12) days, from injury to return to sport was 12 (8–20) days, from diagnosis to symptom resolution was 6 (3–10) days, and from diagnosis to return to sport was 11 (7–18) days. Clinical milestone outcomes stratified by racial concordance can be found in Table 2. Only the number of days from injury to diagnosis differed between the concordant and discordant groups (median [IQR] = 1 [0–2] versus 0 [0–1]) in the final model adjusted for the biological sex and dedicated AT with sport variables (odds ratio [95% CI] = 1.46 [1.07–1.85]). There were no other significant group differences between the concordant and discordant groups for the other clinical milestones (Table 3).

DISCUSSION

Our study was the first to investigate patient-provider racial and ethnic concordance and discordance within the realm of sports medicine. The primary aim of this research was to examine the presence of concordant and discordant cases

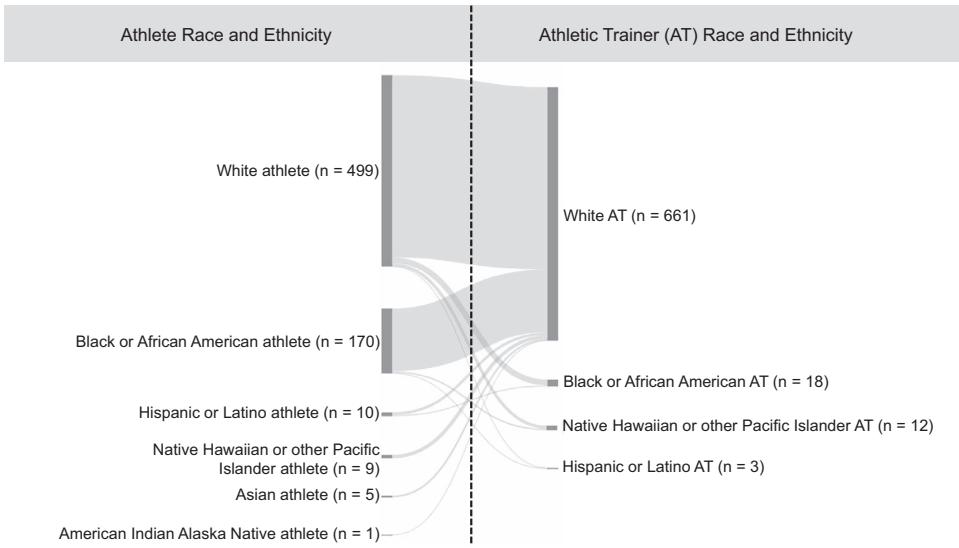

Figure 3. Sankey plot of concordant and discordant pairings of racial and ethnic identities of athletes and athletic trainers for the included concussion cases.

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Table 2. Summary Statistics for Patient-Provider Racial and Ethnic Concordance/Discordance and Concussion Diagnosis and Recovery Outcomes

	All			Patient-Provider Racial and Ethnic Concordance			Patient-Provider Racial and Ethnic Discordance		
	No.	Median	IQR	No.	Median	IQR	No.	Median	IQR
Time from injury to diagnosis, d	684	0	0–2	468	1	0–2	216	0	0–1
Time from injury to symptom resolution, d	648	7	4–12	444	8	4.25–12	204	7	4–12.75
Time from injury to return to sport, d	419	12	8–20	278	12	8–20	141	11	7.50–19
Time from diagnosis to symptom resolution, d	640	6	3–10	437	6	3–10	203	6	3–12
Time from diagnosis to return to sport, d	416	11	7–18	277	11	7–18	139	10	7–18

Abbreviation: IQR, interquartile range.

among this sample, and our secondary aim was to discern potential disparities between these groups regarding diagnosis and recovery timelines after concussion. Importantly, all cases of patient-provider racial and ethnic concordance occurred exclusively between White athletes and White ATs, whereas athletes of underrepresented backgrounds experienced discordant health care provider matches. Further, a statistically significant, albeit modest, difference was observed between the racially and ethnically concordant and discordant groups concerning the time from date of injury to date of diagnosis, such that discordant pairings had a 1 day shorter (by median estimates) time to diagnosis compared with concordant pairings. However, no significant differences were found between the groups regarding times to symptom resolution and return to sport. Our findings provide an important first look into patient-provider racial and ethnic concordance and discordance within the field of sports medicine, and the lack of clinically meaningful group differences in concussion recovery timelines in our collegiate athlete sample is encouraging. These results also diverge from the patient-provider racial and ethnic concordance and discordance disparity trends observed in other patient populations and fields of health and wellness, which could suggest that the unique day-to-day patient-provider interactions that are intrinsic to the athletic training profession may serve as a protective factor against health disparities at the collegiate sport level.[3–8] Moving forward, further scientific exploration is needed to expand our understanding regarding the role of patient-provider racial and ethnic concordance and discordance in sports medicine health care to inform future approaches geared toward enhancing diversity within the athletic training profession, as well as establishing and advancing equitable care practices for all athletes.

Patient-Provider Racial and Ethnic Concordance and Discordance

The foundational findings from our study shed some light on the current state of patient-provider racial and ethnic concordance and discordance in athletic training, highlighting both complexities (eg, time to diagnosis differences by discordant and concordant groups) and favorable signs of equity (eg, similar recovery timelines by discordant and concordant groups) in concussion care. A substantial proportion of cases in our sample (68.4%) exhibited concordance between patients and health care providers, whereas a minority of cases (31.6%) displayed discordance. It is important to note that the concordant group was composed exclusively of White athletes paired with White ATs. Our observation may show the privilege allotted to White athletes regarding the ability to be cared for by a health care provider who looks like them and may share an understanding of their lived experience. However, this observation does not represent concordance with other racial and ethnic groups, limiting the generalizability of the overarching concordant findings within our study. Moreover, a marked proportion of concussion cases in our study (84.9%) were managed by White ATs, a proportion that aligns closely with the frequency of White ATs employed in NCAA settings (Figure 1). However, the number of individual ATs who provided care to the included concussion cases is unclear based upon the limitations of the dataset, and more research is needed to substantiate and extend these findings.

Overall, the lack of even a singular concordant concussion case of an athlete with an underrepresented racial and ethnic identity being cared for by an AT with an underrepresented racial and ethnic identity was surprising and may be concerning, especially to individuals coming from racial and ethnic

Table 3. Regression Model Estimates of the Impact of Racial and Ethnic Concordance/Discordance on Concussion Diagnosis and Recovery Clinical Milestones[a]

	Unadjusted			Adjusted[b]		
Clinical Milestone	Sample Size (n)	Ratio	Ratio 95% CI	Sample Size (n)	Ratio	Ratio 95% CI
Time from injury to diagnosis[c]	684	1.33	0.94–1.72	576	1.46	1.07–1.85[d]
Time from injury to symptom resolution	648	1.01	0.85–1.20	544	0.99	0.81–1.20
Time from injury to return to sport	419	1.10	0.89–1.35	324	1.06	0.83–1.35
Time from diagnosis to symptom resolution	634	1.07	0.90–1.27	532	1.04	0.86–1.27
Time from diagnosis to return to sport	416	1.13	0.92–1.40	321	1.10	0.85–1.40

[a] The patient-provider racial and ethnic discordant group served as the reference group in all models.
[b] The final adjusted model included biological sex (male, female) and dedicated athletic trainer with sport (yes, no).
[c] Results from zero-inflated regression models with odds ratios. All other models are presented as negative binomial regression models and incidence rate ratios.
[d] Statistically significant, as the 95% CI does not contain 1.00.

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communities that have historically been negatively affected by health disparities. This result adds support to the need to recruit more athletic training health care professionals from Black or African American, Asian, American Indian/Alaska Native, and Hispanic or Latino backgrounds to serve the diverse athlete populations found at all levels of sport and physical activity. This aligns with recent calls and initiatives geared toward increasing student diversity within medical education and training programs, including athletic training.[35–38] Proactive recruitment and retention initiatives should continue to be undertaken, involving multimodal, evidence-informed strategies aimed at supporting early interest in the athletic training profession, recruiting diverse students into professional programs, engaging in retention efforts within professional programs, and providing mentorship to early-career professionals as they transition to practice.[37–41] For example, these efforts could include the development of formal affiliation agreements between professional master of science in athletic training programs and minority-serving institutions, Hispanic-serving institutions, and historically Black colleges and universities to create direct pathways for students from these institutions into the profession. Additionally, the National Athletic Trainers' Association's Ethnic Diversity Advisory Committee provides resources for cultivating diversity within the athletic training profession, which include concordant mentoring opportunities, scholarships for members of underrepresented groups, and grants aimed at supporting scholarship and initiatives related to advancing ethnic diversity.[42] By creating a scaffolding of assistance to support the success of racially and ethnically diverse students, we can start to dismantle educational systems of oppression and associated financial barriers to make the athletic training profession more accessible and inclusive.

Concussion Clinical Milestones

Our findings regarding concussion clinical milestones were relatively favorable. When considering the entire sample, the median number of days from injury to diagnosis was 0, to symptom resolution was 7, and to return to sport was 12. Both the concordant and discordant groups were within 1 day of the overall sample findings for these clinical milestones. The symptom resolution and return-to-sport recovery timelines are within the expected time frame for collegiate athletes and reflect those found in previous investigations.[43,44] The only significant patient-provider racial and ethnic concordant and discordant group difference we observed was for the diagnosis timepoint, with the discordant group being diagnosed most frequently on the day of injury, a median of 1 day earlier as compared with the concordant group, which was diagnosed the day after injury. The same-day diagnosis of concussion on the day the injury was sustained in the discordant group is an ideal finding given that prior research has noted the importance of immediate recognition of concussion and removal from activity to promote the most favorable injury outcomes.[23,43] However, although a significant group difference to time to diagnosis was identified, our observed 1-day difference should be interpreted with caution due to its small effect and lack of corroborating findings in the time-to-recovery outcomes. As stated previously, the concordant group in our sample was entirely composed of White athletes with White ATs. Therefore, generalized discussion of racial and ethnic concordance across athletes' and ATs' racial and ethnic identities is not possible at this time.

A 1-day delay in diagnosis timing could be due to a multitude of reasons, some of which may be benign and not impede concussion recovery. Collectively, the diagnosis timing for athletes from both the racial and ethnic concordant and discordant groups occurred in a reasonable amount of time from a clinical perspective, which is positive. Given the racial and ethnic homogeneity of the concordant group in this study, we could consider how general sport culture among different groups of people may affect our findings. We did include sport type as a covariate in our analyses, but perhaps categorizing sports into the 3 tiers of sport collision/impact expectation as defined within the NCAA Sports Medicine Handbook was not granular enough in this case.[45] The number of football concussion cases was nearly identical between the concordant and discordant groups; however, they accounted for 64.8% (n = 142 of 219) of the total discordant cases compared with only 29.5% (n = 140 of 475) of the concordant cases. The majority of football-related concussions within the discordant group occurred to athletes who identified as Black or African American (n = 125 of 142, 88.0%). The disproportionate incidence of football-related concussions among Black or African American athletes in the discordant group may warrant further investigation. Specifically, a refined approach in future research to comprehensively assess the complex interplay among sport culture, collision sport type, and AT and athlete sociodemographic variables may be indicated.

Clinical Considerations

The delivery of person-centered health care is rooted in the development of a trusting relationship between the patient and their health care provider. Our null findings related to concussion recovery milestones may show that perhaps ATs are able to build strong relationships with athletes and provide them with quality care regardless of racial and ethnic similarities and differences. Redinger et al previously found that approximately 60% of collegiate athletes reported strongly agreeing that their ATs provided culturally competent care and were respectful of their preferences during health care delivery.[46] Additionally, authors of a qualitative study found that collegiate athletes perceived ATs to portray empathy through patient advocacy, communication, approachability, access, and competence.[47] One facilitator for relationship building in the collegiate sport setting may simply be the consistent presence of ATs, which creates the opportunity to have a high volume of interactions with their patient populations. These interactions come in all forms (eg, professional, personal) and occur within a variety of different environments (eg, on the field, in the clinic, during travel). Due to this, ATs are well positioned to form a trusting bond and an open line of communication with their patients before an injury or illness occurs that may serve to help overcome the racial and ethnic prejudices that are more readily found in other areas of health care. Indeed, prior research highlights the importance of training health care providers to engage in high-quality communication when navigating discordant patient-provider pairings by focusing on improving patient-centered care, partnership building, and shared contributions toward health-related goal settings.[9] Perhaps cultural sensitivity and humility of the health care provider matter more for recovery rather than racial and ethnic concordance in this space. This sentiment is

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echoed by the inclusion of athletic training educational standards focused on cultivating professional skills related to cultural competency, humility, respect, compassion, and empathy, which are needed in order to provide high-quality care regardless of patient race and ethnicity, among other factors.[48]

Limitations

Data in this study were derived from medical records of athletes from geographically diverse NCAA institutions within the United States. Although the overarching goal of LIMBIC MATARS is to investigate brain health among collegiate athletes, this novel secondary analysis provides an important inquiry about racial and ethnic identities as social determinants of health. Due to the retrospective medical chart review study design of this investigation, we observed a lack of standardization of assessment tools as well as approaches to concussion diagnosis, management, and documentation approaches among participating institutions. The benefit of this study design was that the data captured are an authentic representation of concussion management clinical practices at the included institutions, but ultimately this resulted in lower methodologic internal validity among sites. Furthermore, the distribution of racial and ethnic identities for collegiate athletes included in this study was similar to that of the population of NCAA athletes between 2015 and 2019.[18] However, we were limited in our ability to collect detailed information on the individual ATs providing care at these institutions. Each athlete included within the dataset had a unique participant code, but this approach was not used for each AT working at each site. Therefore, we were unable to determine how many individual ATs provided care to the 694 included concussion cases. Based upon the information available to us, the total number of ATs who may have managed these concussion cases ranged from 105 to 114 individuals annually (Supplemental Table). Additionally, the frequency of concussion cases was not equally distributed among the 9 LIMBIC MATARS sites, and the total number of included concussion cases per institution ranged from 11 to 241 (Supplemental Table). When considering these factors together, the findings within our sample regarding patient-provider racial and ethnic concordance and discordance should not be generalized to represent the larger NCAA athlete and collegiate AT populations at this time, nor do they reflect the reality of other sport populations (eg, youth, high school, professional).

Future Research

Future research efforts should include stakeholders and partnerships among colleges and universities with large populations of diverse racial and ethnic identities, including those that were not substantially represented in the present study (ie, American Indian or Alaska Native, Asian, Hispanic or Latino, Native Hawaiian or other Pacific Islander). Additionally, these further inquiries should allow participants to select from a wider variety of racial and ethnic identities, including the selection of multiple identifiers. Further, qualitative and mixed-methods approaches are encouraged to better grasp the factors associated with racial and ethnic concordance and discordance that may contribute to more or less favorable clinical outcomes. Given that this study focused solely on race and ethnicity, future researchers should build upon this work by capturing a much larger sample of concussion cases from more institutions and investigate how multiple types of social identities (eg, gender, age, socioeconomic status) and environmental factors intersect to affect injury recognition and diagnosis, recovery timelines, and the patient-provider relationship. In addition, subsequent explorations of patient-provider racial and ethnic concordance and discordance in sports medicine should consider additional characteristics of the treating AT (eg, gender, age, level of experience) and interpersonal factors that may affect care and injury/illness outcomes.

CONCLUSIONS

Our study lays a foundation for future investigations regarding the role of patient-provider racial and ethnic concordance and discordance in sports medicine. There is a historical lack of diversity within the athletic training profession, which could relate to our findings that 95% of the included concussion cases were cared for by White ATs, and all of the concordant dyads were White athletes paired with White ATs. We did not observe meaningful differences in concussion clinical diagnosis and recovery milestones between the concordant and discordant groups. However, it should be noted that our study did not capture additional person-centered care elements (eg, satisfaction, comfortability, trust, communication) that may be affected by patient-provider racial and ethnic concordance and discordance and significantly influence a patient's concussion experience and future care-seeking intentions. Progressing forward, we must learn and unpack the intricacies of race, ethnicity, and other social determinants of health both immediately within the athletic training profession and with regard to the delivery of patient care as we continue striving and advocating for health care equity within sports medicine.

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SUPPLEMENTAL MATERIAL

Supplemental Table. Frequency of Athletic Trainers, Athletes, and Included Concussion Cases per Year by Site.
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