Postconcussion Academic Support in Children Who Attend a Primary Care Provider Follow-up Visit after Presenting to the Emergency Department

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Objective To examine whether a primary care provider (PCP) follow-up visit after emergency department evaluation of concussion improved the children's likelihood of receiving academic support.

Study design This was a prospective cohort study. Concussed children, aged 8-18 years, presenting to a regional pediatric trauma center emergency department (n = 160) were contacted 7 and 30 days after injury to gather data on PCP follow-up, symptoms, quality of life, and receipt of academic support instituted after and because of the concussion. Bivariate comparisons of demographics, concussion characteristics, quality of life, and symptoms were made between children who did and did not receive support using independent samples *t* tests, Wilcoxon rank sum tests, or χ^2 tests. ORs and 95% CIs were calculated using multivariable logistic regression with backwards elimination to test the association between attending an outpatient follow-up visit and the receipt of academic support for variables where $P < .2$ in bivariate comparisons.

Results Overall, 51.3% (n = 82) received academic support; of these, 84.2% attended a follow-up visit compared with 71.8% of 78 children who attended a follow-up visit but did not receive support ($P = .06$). Children who received support were more likely to have commercial insurance; experience a sports-related injury mechanism; have parents whose primary language was English; suffer from learning disabilities and migraines; and be non-Hispanic ($P < .05$). There was no association between attending a follow-up visit and receipt of academic support (adjusted OR 1.83; 95% CI 0.75-4.45).

Conclusions Although the majority of children received academic support postconcussion, accommodations were associated with several demographic, medical history, and injury characteristics, but not attending a PCP follow-up visit. *(J Pediatr 2019;209:168-75)*.

Concussion has become a significant public health concern, as evidenced by persistent attention from the media and scientific community. The Centers for Disease Control and Prevention estimates that 3.8 million concussions occur annually in the US. Visits to an emergency department (ED) account for approximately 640 000 concussion encounters annually by children aged 0-14 years of age in the US.[1] Despite the classification of concussion as mild traumatic brain injury (mTBI), concussions lead to a variety of cognitive, emotional, and somatic symptoms that have the potential to produce short- and long-term effects on function and overall quality of life in children.[2-6] Although parents/caregivers seek care across multiple healthcare settings for their children, EDs serve as the initial site of evaluation for a considerable proportion of patients, varying by region and healthcare system.[7-9] As greater than 85% of patients with concussions are discharged from the ED after their initial evaluation, the importance of appropriate postinjury recovery supervision including monitoring for adverse effects cannot be overemphasized.[10,11]

There is increasing awareness that concussions can adversely affect several areas of children's lives, including participation in academic activities.[12-15] Even short-term alterations in cognitive function can have developmental and emotional consequences that can potentially affect academic performance, progression, and transition to secondary or collegiate education, and even career choice.[3,10]

ED	Emergency department
HBI	Health and Behavior Inventory
mTBI	Mild traumatic brain injury
PCP	Primary care provider
PedsQL 4.0	Pediatric Quality of Life inventory
PRA	Professional research assistant
TBI	Traumatic brain injury

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The 2013 clinical report of the American Academy of Pediatrics, titled *Returning to Learning Following a Concussion*, highlighted the potential vulnerabilities of postconcussion academic functioning and emphasized the need for academic support, serving as a framework for guiding the student to a successful and safe return to learning.[12] In addition, the Fifth International Conference on Concussion in Sport Consensus Statement included guidelines recommending support for returning to learning after injury.[16] Both documents stress the importance of medical team engagement for continued surveillance of symptoms that may affect learning and overall academic performance. Primary care provider (PCP) follow-up, commonly recommended by ED providers at discharge, provides the opportunity for continued concussion recovery supervision including academic performance.[14-17]

To date, few studies have investigated compliance with ED discharge recommendations for PCP follow-up postconcussion. Even fewer have examined the relationship between PCP follow-up and the receipt of academic accommodations.[18-22] These previous studies highlight the need for children with all severity of traumatic brain injury (TBI), including concussion, to be monitored for adverse effects arising from these injuries and to ensure the receipt of necessary support and services, including those necessary for academic success. The purpose of this study was to determine whether a PCP follow-up visit after an ED evaluation of concussion improved the likelihood that children would receive academic support. We hypothesized that children who attend a PCP follow-up visit after initial ED evaluation for concussion would be more likely to receive academic support in the month following injury.

Methods

This prospective, longitudinal, 30-day observational cohort study recruited children aged 8 through 18 years who sustained a concussion and presented to a regional pediatric trauma center ED for evaluation between July 23, 2015, and February 22, 2017. Informed written consent was obtained from a parent/legal guardian. None of the children in this study received any clinical procedures related to participation. The supporting institutional review board approved this study.

Participants

Children with concussions sustained within the previous 48 hours and a parent/legal guardian were considered for inclusion. Concussion was diagnosed if participants met the American Congress of Rehabilitation Medicine definition: a traumatically induced physiologic disruption of brain function with the presence of any of the following: witnessed loss of consciousness; independent report of post-traumatic amnesia; any alteration in mental state (confusion, disorientation, slowed thinking, etc); Glasgow Coma Scale score of no less than 13; or at least 2 of 8 symptoms typical of concussion that were not present before injury and are not attributable to another cause.[20,23,24] Children were excluded if they had multisystem trauma or open head injury; injuries that were the result of suspected physical abuse; a known central nervous system disorder (eg, intracranial tumor or instrumentation, previous brain surgery, seizure disorder, intracranial infection); developmental delay; bleeding disorder or chronic pain syndrome; outside neuroimaging demonstrating intracranial hemorrhage; or a parent/legal guardian who was not present during the ED visit.

Patients identified on the ED electronic track board presenting with complaints of head injury or concussion symptoms were screened for enrollment 16 hours/day, 7 days/week by professional research assistants (PRAs), trained by the study principal investigator. PRAs obtained consent and administered all study procedures. All parent participants received identical standardized ED after-care instructions, available in both English and Spanish, that included recommendations for PCP follow-up within 2-3 days of the ED visit and indications for specialist referral (**Appendix**; available at www.jpeds.com). Parent participants were contacted by telephone 7 and 30 days after injury to complete study procedures, including gathering data related to PCP follow-up, persistent symptoms, effects on quality of life, and the main outcome: receipt of academic support that was instituted after and because of the concussion injury. For Spanish-speaking participants, a live or telephonic Spanish interpreter or a hospital-certified bilingual provider was used for review of discharge instructions in addition to the phone follow-up. Participants were considered lost to follow-up after 3 failed attempts at contact. Children whose parent did not complete the 30-day follow-up phone call or who were on school vacation at the time of follow-up were excluded from analysis.

Measurements

The primary outcome was the receipt of any form of academic support from the child's school specifically related to the concussion, as reported by the parent/legal guardian at the 30-day follow-up phone call. Parents/legal guardians also were asked when the academic supports were enacted relative to the PCP follow-up visit (before or after) in addition to specific PCP recommendations. Types of recommendations included (1) notification of teacher/school personnel that the child had experienced a concussion, (2) shortened school days, (3) school attendance restriction, (4) additional time to complete assignments (in-class and homework), (5) fewer or shorter assignments, (6) postponement/elimination of tests, and (7) more breaks during the day. Finally, parents were asked about the method of communication between the PCP and school. Options included (1) PCP called the school, (2) PCP sent written recommendations to the school, (3) PCP gave parents/guardians verbal instructions to give to the school, and (4) PCP gave parents/guardians written instructions to give to the school. The primary exposure of

Table I. Demographic, medical history, and injury characteristics for those who received academic support within 30 days of ED visit vs those who did not

Participant characteristic	Received academic support (n = 82)	Did not receive academic support (n = 78)	*P* value*
Age, y, mean (SD)	12.7 (2.6)	12.1 (2.7)	.14
Sex, n (%)			
Female	31 (37.8)	26 (33.3)	.56
Male	51 (62.2)	52 (66.7)	
Race, n (%)			
Black	10 (12.2)	17 (21.8)	.26
Other	7 (8.5)	7 (9.0)	
White	65 (79.3)	54 (69.2)	
Ethnicity, n (%)			
Hispanic or Latino/a	25 (30.5)	43 (55.1)	**.002**
Not Hispanic or Latino/a	57 (69.5)	35 (44.9)	
Child primary language, n (%)			
English	77 (93.9)	66 (84.6)	.07
Spanish	5 (6.1)	12 (15.4)	
Parent primary language, n (%)			
English	72 (87.8)	57 (73.1)	**.02**
Spanish	10 (12.2)	21 (26.9)	
Parent highest education, n (%)			
College graduate or greater	38 (46.3)	30 (38.5)	.40
Some college	17 (20.7)	15 (19.2)	
High school graduate/GED	14 (17.1)	12 (15.4)	
Less than high school	13 (15.9)	21 (26.9)	
Insurance coverage for child, n (%)			
Commercial	38 (48.1)	22 (29.7)	**.02**
Public	43 (51.9)	56 (70.3)	
History of migraine, n (%)			
Yes	16 (19.5)	6 (7.7)	**.03**
No	66 (80.5)	72 (92.3)	
Mental health diagnosis, n (%)			
Yes	6 (8.5)	5 (6.9)	.72
No	65 (91.5)	68 (93.1)	
History of learning disability, n (%)			
Yes	12 (14.6)	2 (2.6)	**.01**
No	70 (85.4)	76 (97.4)	
Previous mTBI, n (%)			
Yes	18 (22.0)	16 (20.5)	.82
No	64 (78.1)	18 (79.5)	
Number of previous mTBIs, median (IQR)†	2 (1-3)	1 (1-2)	.06
Months since last mTBI, median (IQR)†	23 (10-34)	11 (4-26)	.17
Mechanism of injury, n (%)			
Sport	46 (56.1)	28 (35.9)	**.01**
Nonsport‡	36 (43.9)	50 (64.1)	
HBI,§ median (IQR)			
Baseline	16 (10-26)	16 (6-23)	.30
ED visit	25 (18-33)	25 (15-33)	.35
Loss of consciousness, n (%)			
Yes	19 (23.2)	19 (24.4)	.86
No	63 (76.8)	59 (75.6)	
Post-traumatic amnesia, n (%)			
Yes	38 (46.3)	35 (44.9)	.85
No	44 (53.7)	43 (55.1)	
Disorientation, n (%)			
Yes	46 (56.1)	34 (43.6)	.11
No	36 (43.9)	44 (56.4)	
GCS score <15, n (%)			
Yes	4 (4.9)	6 (7.7)	.56
No	78 (95.1)	72 (92.3)	
Abnormal CT findings, n (%)¶			
Yes	4 (20.0)	4 (22.2)	.99
No	16 (80.0)	14 (77.8)	
Acknowledged receipt of mTBI ACIs, n (%)			
Yes	76 (92.7)	71 (91.0)	
No	6 (7.3)	7 (9.0)	

ACI, after-care instruction; *CT*, computed tomography; *GCS*, Glasgow Coma Scale; *GED*, general equivalency diploma.
*Bold indicates significance at alpha < 0.05.
†Refers only to children who have sustained a previous mTBI.
‡HBI (Graded Concussion Symptom Inventory); baseline HBI completed by parent at initial ED visit.
§Nonsport mechanisms include falls/slips/trips, motor vehicle crashes, assaults, and other.
¶Includes only children who had a CT scan.

interest was attending a PCP follow-up visit within 30 days of the original ED visit.

Additional variables of interest included demographics, concussion injury characteristics, medical history, persistent postconcussive symptoms, and reported quality of life. Postconcussive symptoms were assessed using the Health and Behavior Inventory (HBI)[25] and quality of life was measured using the Pediatric Quality of Life Inventory 4.0 (PedsQL 4.0).[26] HBI baseline data were collected at ED evaluation by parent report and HBI postinjury data were collected from the child at ED evaluation as well as the 7- and 30-day follow-up calls. The PedsQL 4.0 was administered at the 30-day follow-up call and was completed by the child.

Analysis and Statistical Procedures

Statistical analyses were conducted with SAS Version 9.4 (SAS Institute Inc, Cary, North Carolina).[27] Bivariate comparisons of demographic factors, concussion characteristics, child quality of life, and concussion symptom severity were made between children who received academic support and those who did not using independent samples *t* tests, Wilcoxon rank sum tests, or χ^2 tests (or Fisher exact) depending on the distribution of the covariate. ORs and 95% CIs also were calculated using logistic regression for categorical covariates. Statistical significance was set at $\alpha < 0.05$. Multivariable logistic regression with backwards elimination was used to test the association between attending an outpatient follow-up visit (yes vs no) and the receipt of academic support (yes vs no). Variables that had bivariate associations with academic support (*P* values .10) were entered into the model and retained if they remained associated with the outcome at $P < .20$. Age and sex were chosen a priori for inclusion in the adjusted model based on past study results showing that female and younger aged patients commonly report a greater number and greater severity of symptoms and their potential to affect the receipt of academic support.[27-33] Results were considered significant if the 95% CI for each aOR did not contain 1.00.

Table II. Comparisons between PCP follow-up visit between those who received academic support within 30 days of ED visit and those who did not

Characteristic of PCP follow-up	Received academic support (n = 82)	Did not receive academic support (n = 78)	*P* value*
Attended a follow-up PCP visit by 30 days of initial ED visit, n (%)			
Yes	69 (84.2)	56 (71.8)	.06
No	13 (16.9)	22 (28.2)	
If yes, how many days since initial visit did follow-up PCP visit occur?			
Median (IQR)	5 (3-7)	7 (3-9)	.24
Range	1-30	1-25	
Were academic supports put in place before or after PCP visit? n (%)			
Before	37 (53.6)	N/A	N/A
After	32 (46.4)	N/A	
Days of school missed, median (IQR)	2 (1-4)	1 (0-2)	**<.001**

CI = confidence interval, injury; *ED* = emergency department; *IQR* = interquartile range; *N/A*, not available; *OR* = odds ratio; *PCP* = primary care provider.
*Bold indicates significance at alpha < 0.05.

Results

PRAs screened 1313 children for eligibility during the study period; 619 (47.1%) met inclusion criteria and 335 (54.1% of those eligible) were approached for participation. Due to presentation of some patients outside PRA coverage hours, not all eligible patients were approached for enrollment. Of the 224 subjects enrolled in the study, 160 (71.4%) of their parents completed the 30-day follow-up phone call and responded to questions specific to the primary outcome measure. Those not completing the 30-day follow-up phone call did not differ from those who did in terms of age, sex, race, ethnicity, injury characteristics, or type of insurance. However, the children of those who completed the 30-day follow-up phone call were more likely to have a sports-related concussion mechanism (46.3% vs 27.4%, $P = .01$).

Of the 160 participants, 82 (51.3%) reported receiving some form of academic support. Table I summarizes the demographic, medical history, and injury characteristics of the participants relative to whether they reported receipt of academic support. A greater proportion of children with a history of migraines, learning disability, sports-related concussion, and commercial insurance and whose parents' primary language was English received academic support ($P < .05$). HBI score at baseline or ED visit, history of previous mTBI, loss of consciousness, post-traumatic amnesia, disorientation, Glasgow Coma Scale score <15, and abnormal findings on computed tomography did not differ significantly relative to receipt of academic support.

With respect to the primary hypothesis, attending a PCP follow-up visit was not significantly associated with receiving academic support (OR 2.09; 95% CI 0.97-4.51; $P = .06$). The only variable of interest that was significantly associated with a PCP follow-up visit was "days of school missed" (OR 2.98; 95% CI 1.48-5.97). Table II summarizes comparisons of those who did and did not receive academic support within 30 days of ED visit with respect to PCP visit. Notably, 53.6% of participants receiving academic support reported that the PCP visit occurred after academic support was enacted. Because it is not possible for the PCP to have influenced receipt of academic support in this subset of participants, we explored reassigning these patients to the same category as having had no PCP visit. After we recalculated the OR for receipt of academic support relative to attending a PCP visit, the OR remained insignificant (OR 1.12; 95% CI 0.51-2.49).

At the 30-day phone call, 40.2% of parents whose child received academic support indicated that their child's PCP had notified the school regarding their child's concussion compared with 10.3% of those who did not receive academic support ($P < .001$). Of the participants who attended a follow-up visit (n = 125), 45 (36.0%) parent participants indicated that their PCP communicated recommendations for academic support by 1 or more methods. However, only 34 reported receipt of support. Of those who received academic support, 24 parents (70.6%) reported they received written instructions from the PCP to give to the school, 6 (17.7%) reported the PCP gave them verbal instructions to give to the school, 4 (11.8%) reported the PCP sent written instructions to the school, and no parents reported the PCP contacted the school directly. Of those who did not receive support (n = 11), 6 parents (54.6%) reported they received written instructions from the PCP to give to the school, 2 (18.2%) reported the PCP gave them verbal instructions to give to the school, 3 (27.3%) reported the PCP sent written instructions to the school, and no parents reported the PCP contacted the school directly.

For those who received academic support (n = 34), parents reported that the communication from the PCP included 1 or more of the following recommendations: request to notify school personnel (n = 33; 97.1%), additional time to complete assignments (n = 27; 79.4%), more frequent breaks (n = 22; 64.7%), taking days off (n = 17; 50.0%), postponing/eliminating tests (n = 17; 50.0%), fewer or shorter assignments (n = 15; 44.1%), and shorter school days (n = 14; 41.2%). Of the participants who did not receive support (n = 11), specific PCP recommendations included request to notify school personnel (n = 8; 72.7%),

Table III. Differences in child health outcomes between those who received academic support within 30 days post ED visit and those who did not

Child health outcome	Received academic support (n = 82)	Did not receive academic support (n = 78)	*P* value*
HBI,† median (IQR)			
7 days post-ED	23 (14-34)	17 (7-27)	**.01**
30 days post-ED	12 (6-28)	15 (5-24)	.75
PedsQL 4.0 score, median (IQR)			
Total	87 (67-97)	84 (72-99)	.91
Physical	90.6 (71.9-100)	89 (78.1-100)	.68
Emotional	90 (65-100)	82.5 (60-100)	.28
Social	95 (75-100)	90 (80-100)	.59
School	80 (60-95)	80 (60-92.5)	.70

*Bold indicates significance at alpha < 0.05.
†HBI (Graded Concussion Symptom Inventory): 20 responses were missing for HBI at 7 days post-ED visit (5 who received support, 15 who did receive support).

taking days off (n = 4; 36.4%), and more time to complete assignments, more frequents breaks, postponing/eliminating tests, fewer or shorter assignments, and shorter school days (n = 2 for each; 18.1%).

Participants receiving academic support had a significantly greater symptom burden at 7 days than those not receiving support (median HBI score = 23 vs 17, respectively; $P < .01$), but this difference did not persist at 30 days. No differences were noted in reported quality of life between those who received academic support and those who did not on the PedsQL 4.0 physical, emotional, social, and school subscales or on the total score (Table III).

In bivariate analysis, we identified 10 variables for further investigation in multivariable analysis in which $P < .1$: ethnicity, primary language of child, primary language of parent, insurance type, migraine history, learning disability, number of previous mTBIs, PCP follow-up visit, mechanism of injury, and the 7-day HBI score. There were missing values for the 7-day HBI scores for 20 (12.5%) participants, so this variable was not included in the multivariable analysis. There were also strong correlations between parent primary language, child primary language, and ethnicity, suggesting collinearity among these demographic factors. aORs were calculated including all 3 variables and then using backwards selection with a retention criterion of $P < .20$. The more parsimonious model had better fit, and both child language, caregiver language, and number of previous mTBIs were eliminated via the backwards selection process ($P > .20$).

After we adjusted for age, sex, ethnicity, learning disabilities, insurance type, and mechanism of injury, there was no significant association between attending a follow-up visit and receipt of academic support (aOR 1.83; 95% CI 0.75-4.45). Variables that were independently associated with receiving academic support included a sports-related concussion (OR 2.92; 95% CI 1.39-6.13), a history of a learning disability (OR 7.05; 95% CI 1.38-35.96), and Hispanic vs non-Hispanic ethnicity (OR 0.43; 95% CI 0.20-0.96; Table IV).

Examination of the most frequently reported reasons for PCP follow-up, comparing those who received academic support and those who did not respectively, revealed similar responses in both groups: (1) to make sure the child is healing properly (70.4%, 60.3%) and (2) to make sure nothing was missed (18.5%, 24.4%). Proportions choosing "to make sure it is ok for the child to return to school, sports, or work" were 6.2% and 11.5%, respectively.

Discussion

Contrary to our hypothesis, our study did not find that PCP follow-up visit after initial ED evaluation of a concussion increased the likelihood that children received academic support. However, non-Hispanic ethnicity, parents' primary language as English, sports injury mechanism, and a previous history of learning disabilities were significantly associated with receiving academic support. The lack of association between attending a PCP follow-up visit and receiving academic support contrasts previous findings that outpatient follow-up after ED evaluation was associated with receiving academic accommodations for a concussion injury.[20] However the previous study did not examine the timing of PCP follow-up visit, as it compared with receipt of academic support. In this study, the majority of those receiving academic support had support in place before their follow-up PCP visit. Although contrary to our hypothesis, this finding is a positive one for children's postinjury support, suggesting other systems are in place to assess the needs of children returning to the classroom after a concussion. Although our study did not assess the processes that led to receiving academic support before the PCP

Table IV. aORs* and 95% CIs for receiving academic support vs not receiving support

Variable	OR (95% CI)
Attended a follow-up PCP visit (yes vs no)	1.83 (0.75-4.45)
Child sex (male vs female)	0.75 (0.35-1.60)
Child age (years, continuous)	1.01 (0.89-1.15)
Child ethnicity (Hispanic vs not Hispanic)	**0.43 (0.20-0.96)**
Injury mechanism (sport vs other)	**2.92 (1.39-6.13)**
Child history of migraine (yes vs no)	3.23 (1.00-10.41)
Child history of learning disability (yes vs no)	**7.05 (1.38-35.96)**
Insurance type (private vs public)	1.71 (0.77-3.82)

*Each variable is adjusted for all other variables listed in table. Bold indicates significance at alpha < 0.05.

follow-up visit, potential sources include school nurses, teachers, athletic trainers, or administrative staff, highlighting the important role of team-based concussion care.[12,13,34]

In addition, the high proportion of parents acknowledging receipt of mTBI after-care instructions may have led to parent and/or student self-advocacy for support academic support. There also exists the possibility that some parents could have consulted a PCP by telephone or electronic means, as a substitute for a PCP visit, and received academic support from that interaction. Our study did not collect those data. Finally, a related publication using this same dataset examined the primary reason for not attending a PCP visit post-ED follow-up and found the most common reason cited was that parents did not think their child needed an appointment (36.6%).[35] This parental opinion could contribute to our findings in that parents were able to navigate their child's postconcussion needs without the need for an appointment.

Meaningful shortcomings have been identified in the care of children with TBI following acute care encounters in the ED or inpatient setting. A previous study found more than 60% of a sample of patients (that included those with mTBI/concussion) received no additional services following discharge from an acute care admission.[18] Another study reported that 35.2% of head-injured participants reported at least 1 unmet need, 51.5% had unrecognized needs, and 47% reported at least 1 barrier to receiving support 1 year after TBI.[19] A more recent study examining rehabilitation needs of hospitalized children with TBI noted that children with TBI have persistent dysfunction with unmet needs across multiple domains, including academic services.[21] Finally, a multicenter cohort study using data on 831 patients with mTBI presenting to the ED of US level I trauma centers found 44% reported seeing a physician or other medical practitioner within 3 months after injury. Among patients with 3 or more moderate-to-severe postconcussive symptoms, 52% reported having seen a practitioner within 3 months following the injury. That study found a large proportion of patients with mTBI do not receive follow-up care after injury even when they experience ongoing postconcussive symptoms.[22]

As attention has focused on these shortcomings, it is possible that schools are becoming more proactive at providing support for children with mTBI. Although participants in the present study who received support at school reported a significantly greater symptom burden at 7 days, by 30 days HBI scores were similar to those who had not received support and comparable with preinjury baseline. It is possible that the greater symptom burden at 7 days may have prompted parents to request academic support or alerted school staff that the child may require modification of their work load. The provision of support for those with greater symptom scores at 7 days also may have contributed to the lack of variability in symptom scores at the 30-day measure. However, no differences were noted in any area of the PedsQL 4.0, including the school domain, between those who received academic support and those who did not. Finally, those who received academic support missed more days of school. Perhaps the greater number of missed school days prompted parents to request support and/or served as an indicator to school staff that the patient needed specific intervention. For example, missing more school days is likely associated with missing more class, necessitating support to complete overdue work. Together, these findings suggest that previously identified inadequacies in ongoing care of children with mTBI are being addressed by schools and families to mitigate the impact of the injury in this population at risk for further challenges Randomized trials comparing specific academic interventions will be necessary to clarify the role of school support.

Despite these encouraging results, this study identified concerning disparities between those who did and did not receive academic support. Children with commercial insurance, learning disabilities, parents whose primary language is English, non-Hispanic ethnicity, and sports-related injury mechanism were more likely to receive academic support. Regarding the relationship between learning disabilities and receipt of academic support, previous pediatric studies have shown that this population is at risk for more severe and more prolonged postconcussive symptoms.[36,37] Because these students may already be receiving some form of academic support for an existing learning disability, it is likely that these participants were more likely to receive academic support postconcussion because they were already being more closely attended by educators. Although we explicitly asked parents whether the child was receiving any support related to the concussion, the parent may not have drawn a distinction between academic support for a concussion vs general support for the pre-existing disability. In addition, parents of children with learning disabilities are likely more familiar and comfortable with the process for requesting support. Alternatively, teachers of children with learning disabilities may be more astutely aware of changes in postinjury performance and the need for additional support.

Hispanic children were significantly less likely to receive academic support than their non-Hispanic counterparts. This suggests these children may face additional barriers to obtaining academic accommodations. There is a potential that parent/family concussion care expectations may differ by race and ethnicity. However, a recent study did not find racial or ethnic differences when examining postconcussion care management in the ED setting.[38] In addition, language barriers may present a challenge for these families as they interact with schools and subsequent providers. A recent study summarized this concern as it relates to school-based resources for high school students from Spanish-speaking families.[39] Only one-quarter of school district Web sites examined contained any concussion information in Spanish; none of these Web sites offered a mirrored Spanish-language translation. These findings suggest that non–English-speaking parents may be inadequately informed about concussion because translation of concussion educational

materials is absent, incomplete, or hard to access.[39] Although a detailed discussion of this finding is beyond the scope of this study, further research is needed to identify opportunities for this population to secure the same resources as their non-Hispanic counterparts.

Finally, children sustaining sport-related concussion were more likely to receive academic accommodations. As sport-related concussion has received widespread media attention over the past decade, this finding could represent increased awareness in parents of pediatric athletes that has not yet expanded to include parents of children sustaining concussion from other mechanisms. Both acute care providers and PCPs should be aware that, regardless of mechanism, all children with concussion are at risk for persistent problems that may require academic support.

This investigation is not without limitations. This study enrolled children evaluated in a single pediatric ED. However, the challenges in obtaining academic support are unlikely to be unique to this population. As this urban ED patient population is largely publicly insured, there may be barriers to primary care access that influence PCP follow-up for children,[37] limiting the generalizability of this study's findings. However, when examining the role type of insurance may play in overall follow-up, a related publication using this same dataset found no association.[35] In addition, the study design included a follow-up phone call at 7 days to inquire about PCP visits, thus prompting the parent/caregiver to schedule a PCP follow-up when they may not have done so otherwise. It is reasonable to point out that increased PCP attendance would have been expected to bias our results toward finding an association between follow-up and school support, which was not the case. Symptom inventories were only assessed at 7 and 30 days' follow-up and quality of life measure at 30 days. Therefore, it is difficult to ascertain differences in the trajectory of these measures between those who received support and those who did not. However, it is encouraging that among the group who did receive support, we noted a significantly greater symptom burden at 7 days that did not persist at 30 days, providing indirect evidence of a benefit in this subset of patients. In addition, parents may have contacted PCP by telephone or electronic means and received academic support from this interaction. Our study did not directly assess this possible PCP interaction. Our study also had a moderately sized sample, and the possibility of type II error precluding our finding a difference in PCP use is possible. Finally, the primary outcome, and other variables, was self-reported by parents/legal guardians and not verified by medical or school record. Recall and/or social desirability response may have influenced our findings. Despite these limitations, this study provides pediatric clinicians with novel information useful in guiding care for postconcussed children, particularly with respect to barriers related to ethnicity and language, mechanism of injury, and insurance status.

In conclusion, among a pediatric ED cohort of children with concussion, there was no association between attending a PCP follow-up visit and receipt of academic support. Children who did not receive academic support were more likely to have parents/legal guardians who were of Hispanic ethnicity, to have sustained their injury per a nonsport mechanism, and to have public insurance. Our findings should prompt PCPs to consider these potential risk factors when customizing academic support for children postconcussion. ■

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