Quality Improvement in Concussion Care: Influence of Guideline-Based Education

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Objective To evaluate the potential impact of a concussion management education program on community-practicing pediatricians.

Study design We prospectively surveyed 210 pediatricians before and 18 months after participation in an evidence-based, concussion education program. Pediatricians were part of a network of 38 clinically integrated practices in metro-Atlanta. Participation was mandatory for at least 1 pediatrician in each practice. We assessed pediatricians' self-reported concussion knowledge, use of guidelines, and comfort level, as well as self-reported referral patterns for computed tomography (CT) and/or emergency department (ED) evaluation of children who sustained concussion.

Results Based on responses from 120 pediatricians participating in the 2 surveys and intervention (response rate, 57.1%), the program had significant positive effects from pre- to postintervention on knowledge of concussions (–0.26 to 0.56 on –3 to +1 scale; $P < .001$), guideline use (0.73-.06 on 0-6 scale; $P < .01$), and comfort level in managing concussions (3.76-4.16 on 1-5 scale; $P < .01$). Posteducation, pediatricians were significantly less likely to self-report referral for CT (1.64-1.07; $P < .001$) and CT/ED (4.73-3.97; $P < .01$), but not ED referral alone (3.07-3.09; $P =$ ns).

Conclusions Adoption of a multifaceted, evidence-based, education program translated into a positive modification of self-reported practice behavior for youth concussion case management. Given the surging demand for community-based youth concussion care, this program can serve as a model for improving the quality of pediatric concussion management. *(J Pediatr 2017;184:26-31).*

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There is increasing awareness that concussions are not always benign, and inappropriate management initially can lead to a protracted recovery or poor, long-term outcomes.[1,2] An evolving understanding of the pathophysiologic mechanisms involved in traumatic brain injury in children and adolescents has also led to refinements in the clinical approach to the diagnosis and management of concussions in contemporary practice.[3-10]

Increased caseload, stemming in part from state-mandated concussion management legislation,[11,12] necessitates that community-practicing pediatricians play a central role in concussion management. However, several recent studies suggest that pediatric care providers are uneasy about managing children with concussions.[13,14] Many potential reasons have been cited for this discomfort, including a lack of familiarity with concussion practice management guidelines[15-17] and inadequate exposure to concussions and sports-related injury topics during residency training and continuing education.[17,18]

Across medical specialties, barriers to adoption and implementation of clinical practice guidelines include lack of familiarity or agreement with, difficulty in accessing or understanding, and lack of peer support for guidelines.[19-21] Yet, clinical practice guidelines are considered useful tools for improving the quality and efficiency of care, as they serve as a vehicle for translating new research into routine practice.[22,23] Despite evidence showing that guideline adherence across conditions is associated with better clinical outcomes and lower cost,[24-26] adherence to guidelines remains variable.[23]

Low adherence may be due to methods used to distribute clinical practice guidelines.[22,27] Targeted provider education is suggested as a potential means to improve adoption of guidelines in general[21,27] and to improve concussion management by pediatric providers specifically.[13-16] Evidence shows that multifaceted, educational strategies, including those strategies that emphasize the practicality of the guidelines and require active involvement of the participant will most influence practice.[19,21,22,27]

CHOA	Children's Healthcare of Atlanta
CT	Computed tomography
ED	Emergency department
KHF	Kids Health First Pediatric Alliance

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Given this gap in knowledge and application of pediatric concussion management guidelines, the present study assessed the efficacy of an evidence-based, education program with decision support tools on quality improvement in the management of concussion among community pediatricians. Quality improvement was measured through greater reliance on clinical care guidelines, more targeted patient referral for computed tomography (CT) and emergency department (ED) assessment, as well as improved self-reported confidence of the practicing clinicians.

Methods

Through formation of a community-wide, multidisciplinary Quality Assurance Council, pediatricians from Children's Healthcare of Atlanta (CHOA), a tertiary children's facility, and Kids Health First Pediatric Alliance (KHF) worked together to launch a comprehensive concussion education and management program for the primary care pediatric setting.

Participation in the concussion program was mandatory for all 38 of the KHF practices, representing 210 pediatricians across the metro-Atlanta area.

The KHF Board of Directors required that at least 1 provider from each practice participate in the educational intervention and share the information with their peers at their practice location. In addition, a minimum of 1 provider from each practice was required to take the survey at each data collection point. There was no incentive for participation, and consent was implied through participation in the survey. The study protocol was identified as exempt from review by the CHOA institutional review board.

Practice Survey

Practice administrators and lead physicians from all 38 KHF pediatric practices were emailed an electronic survey and asked to identify the frequency of patients who present with a concussion to their primary care pediatric setting. *International Classification of Diseases, Ninth Revision* codes for concussion, head injury, and postconcussion syndrome (850.0, 850.1, 850.11, 850.12, 850.0, 854.0x, 959.01, and 310.2) were used to calculate a baseline of network-wide concussion visits in 2011. Results were presented to KHF Independent Practice Association for correlation.

Provider Survey

All 210 pediatricians were emailed an electronic survey on April 30, 2012, before initiation of the educational program along with a follow-up survey 18 months later on October 31, 2013. Participants were asked questions pertaining to their comfort level diagnosing and managing concussions, as well as use of guidelines. In the scenario of a patient with a suspected concussion, participants were asked how they would manage a variety of symptoms in terms of observation in the office, referral for CT scans, referral to ED, or both. Additional questions asked about imaging choices, postconcussion neuropsychological testing, return to play/school/sports, and perceived barriers to specialist referral for concussion care. No feedback was given to providers regarding survey results.

Educational Intervention

Concussion Provider Toolkit. All 210 Kids Health First providers were emailed a direct link to download the CHOA concussion toolkit on May 21, 2012. Development of the evidence- and consensus-based concussion program and clinical decision-making toolkit were based on 6 concussion-management guidelines and previously documented.[28] The toolkit provided evidence-based guidelines on how to manage adolescent and youth concussions, including guidelines for CT and ED referral, when it is safe to send home from pediatrician's office, general return-to-play and return-to-learning guidelines, as well as sports-specific return-to-play guidelines and how to evaluate potential concussion at the sideline. At least 1 provider from each practice was required to download the toolkit with the intention that the provider would share the material with their peers and implement the toolkit in practice.

Educational Webcast. On May 21, 2012, all 210 Kids Health First pediatricians were emailed a direct link to launch a concussion education webcast on pediatric concussion management, including referral and return-to-play guidelines. Participation provided 0.5 AMA PRA category 1 credits. Again, the KHF Board of Directors required at least 1 provider from each practice to complete the educational webcast with the intention that the provider would share the information learned with their colleagues.

Although the requirement was for 1 provider to download both the toolkit and the webcast, all providers were strongly encouraged to participate. Compliance for all requirements was met and tracked by the network.

Coding Update. As part of the educational program, all KHF practices were supplied with a concussion coding update to assure that concussions were coded correctly in the pediatric practices.

Data Analyses

Statistical analysis was performed using ANOVA tests. Number of guidelines used (question number 4) ranged from 0, indicating no use of guidelines, to 6, indicating 6 various published sets of criteria guidelines being used. Knowledge of concussion (question number 9) was scored as 1 point for correct responses, −1 point for incorrect responses, and 0 for neutral responses (neither correct nor incorrect), with scores ranging from 1, indicating a perfect score, to −3, indicating all incorrect responses. To assess the impact the toolkit had on pediatricians' likelihood of referring patients to the ED or for a CT scan, another series of ANOVA tests were conducted. The aggregate number of referrals across various symptom presentations (question number 8) was analyzed in both the pre- and postsurveys. Comfort level (question number 2) was coded from 1-5, with 1 being "very uncomfortable" and 5 being "very comfortable" at managing concussions.