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Concussion at presentation to primary care vs. specialist: Possible implications for management (Poster)

A. Michael Luciani
Cooper Medical School of Rowan University

Concussion at Presentation to Primary Pediatric Care vs. Specialists: Possible Implications for Management

Bruce Taubman, MD; A. Michael Luciani, BS; David B. Gealt, DO; Thomas P. Drake, MD; Philip Cochetti, BS; John T Farrar, MD, MSCE, PhD

Cooper Medical School of Rowan University

Introduction

The published estimates of the annual number of pediatric concussions in the United States vary by definition [2-4]. When considering all children under 18 years of age with sports and recreational concussion, including those not seen in a health care setting, the estimate is as high as 1.1 to 1.9 million annual occurrences[2]. In a study of emergency room (ER) patients under 19 years old between 2002 and 2006, the estimate was 144,000 annual visits for pediatric concussions[3]. During the interval between 2001 and 2009, the CDC reported an average of 122,212 annual ER visits for patients diagnosed with concussions between the ages of 10–19[4]. Clearly, not all pediatric concussions are seen in ERs. For example, Arbogast reported that 81.9% of concussed patients under 17 years old entered the healthcare system through their primary care pediatric physicians (PCPP)[9]. As such, it is likely that in many locations, PCPPs see the majority of patients who seek care outside the emergency room[9-13].

A number of observational studies examining the benefit of cognitive rest (CR) have been conducted. However, these studies are all subject to confounding by indication, such that patients with different levels of symptoms receive different treatments and recover at different rates. Even advanced statistical approaches cannot consistently identify whether the differences in response are due to differences in the therapeutic approach, initial differences in the patients, or patients' ability to recover without therapy. This is complicated by the wide variability seen in concussion etiologies, symptoms and signs, and post-concussive recovery. As a result, recent guidelines and reviews provide guidance based on incomplete data and may not be applicable to the general population of concussion patients[16].

Given the lack of randomized controlled trials (RCTs) evaluating different management approaches to concussion, guidelines for management are based on clinical experience, of which the majority have been written primarily by specialists treating the concussed patient, either seen in an ER or referred to the specialist by the ER or the PCPP for ongoing care[17-21]. Therefore, an assessment of the relevance of these guidelines to the patient population seen initially by the PCPP should take into consideration any differences between the population of patients seen and followed by specialists versus those seen and followed primarily by the PCPPs, many of whom are not referred for specialty care. To explore the differences between the population of concussed pediatric patients treated by PCPPs and those seen in a specialty clinic, we collected data on the characteristics of patients seen at a sports medicine clinic and a pediatric concussion clinic in a tertiary medical center and compared those to data collected in a PCPP serving an overlapping catchment area.

Methods

Patients presenting with a concussion to the PCPP of one of the authors (BT) located in Cherry Hill, NJ, were enrolled prospectively from 12/2011 to 4/2013. Data collected were the basis for two previously published observational studies 23,24 . For comparison, two specialty clinics involved with concussion care in the Cooper University Health System, Camden, NJ agreed to participate in this study: 1) the Sports Medicine Clinic, designed to care for sports-related concussions, and 2) the Pediatric Concussion Clinic, designed to see patients with concussions sustained from non-sports activities or non-traditional sports. These specialty clinics serve patients from seven locations in southern NJ, including Cherry Hill and a similar catchment to the PCPP. All the clinic offices used the same electronic medical record system. The medical records for all patients seen in these two clinics with an ICD9 billing code for concussion between August 2015 and May 2017 were reviewed. In the PCPP and both clinics, patients were included if 11–19 years old, not in college, and sustained injuries which resulted in concussion meeting the definition of the 4th International Consensus Statement on Concussion25. Patients were excluded if they were hospitalized overnight or had abnormalities on CNS imaging. Patients were considered at rest if they were not participating in sports and had not returned to school including weekends prior to being seen. Immediate CR was defined as having at least 24 hours of CR immediately following the injury. Age, school grade and gender were collected along with time from injury to visit, and period of either immediate or subsequent CR. This study was approved by the Institutional Review Board of Cooper University Health System.

Results

Table 1: Patient and Concussion Incident Demographic Data - primary care versus combined specialty clinic

	N	Pediatric Primary Care n	Mean or %	95% CI	Specialty Clinic* n	Mean or %	95% CI
Age (in years)	305	101	14.3	(13.9, 14.7)	204	15.1	(14.8, 15.3)
US Grade Level (k-12)	305	101	8.9	(8.5, 9.3)	204	9.7	(9.4, 9.9)
Gender	305						
Male		61	60.4%	(50.5%, 69.5%)	116	56.9%	(49.9%, 63.5%)
Female		40	39.6%	(30.5%, 49.5%)	88	43.1%	(36.5%, 50.1%)
Sports-Related	305	66	65.3%	(55.5%, 74.0%)	146	71.6%	(65.0%, 77.4%)
Memory Loss	305	35	34.7%	(26.0%, 44.5%)	28	13.7%	(9.6%, 19.2%)
Loss of Consciousness	305	2	2.0%	(0.5%, 7.7%)	19	9.3%	(6.0%, 14.2%)
Emergency Room Visit	305	19	18.8%	(12.3%, 27.7%)	97	47.5%	(40.7%, 54.4%)
Previous Concussion	305	29	28.7%	(20.7%, 38.4%)	66	32.4%	(26.3%, 39.1%)
Attention Deficit Disorder	304	10	9.9%	(5.4%, 17.5%)	29	14.3%	(10.1%, 19.8%)
Mood Disorder	305	4	4.0%	(1.5%, 10.2%)	18	8.8%	(5.6%, 13.6%)

95%CI = 95% confidence interval;

**Note: The Specialty Clinics data is the combination of the Pediatric Concussion Clinic and Sports Medicine data*

Table 2: Referral Source, by clinic

	Total N	Pediatric Concussion Clinic N	%	95% CI	Median Days From Event	IQR	Sport Medicine Clinic N	%	95% CI	Median Days From Event	IQR
Seen in Clinic	204	101	96.2%	(90.2%, 98.6%)	13.0	[9, 18.5]	90	90.9%	(83.4%, 95.2%)	7.0	[4, 11]
Referral Source	191										
Primary Care		80	79.2%	(70%, 86%)	13.5	[8.5, 18]	54	60%	(50%, 70%)	8.5	[5, 12]
Emergency Room		14	13.9%	(8%, 22%)	11.0	[9, 14]	21	23%	(16%, 33%)	4.0	[3, 9]
Athletic Trainer		3	3.0%	(1%, 9%)	8.0	[7, 36]	9	10%	(5%, 18%)	3.0	[2, 5]
School/Other		4	4.0%	(2%, 10%)	22.5	[14.5, 25]	6	7%	(3%, 14%)	9.5	[4, 18]
		101	100%								

Table 3: Days from Injury to Presentation at Primary Care versus Specialty Clinic Stratified by Cognitive Rest Status

	N	Pediatric Primary Care n	% / Median	95% CI / [IQR]	Specialty Care n	% / Median	95% CI / [IQR]	p
Days from Initial Injury	304	101			203			
Median Days			2	IQR [1, 3]		10	IQR [5, 16]	< 0.001
Immediate Cognitive Rest	118	62	61.4%	(51.5%, 70.4%)	56	27.6%	(21.8%, 34.2%)	< 0.001
Median Days			1	IQR [1, 2]		7	IQR [3.5, 11]	< 0.001
Cog Rest at Presentation	118	62	61.4%	(51.5%, 70.4%)	56	27.5%	(29.6%, 48.5%)	< 0.001
Median Days			1	IQR [1, 2]		7	IQR [3.5, 11]	< 0.001
Not at Cog Rest at Presentation	186	39	38.6%	(29.6%, 48.5%)	147	72.4%	(66.0%, 78.3%)	
Median Days			3	IQR [2, 5]		11	IQR [7, 17]	< 0.001
Any Cognitive Rest	157	62	61.4%	(51.5%, 70.4%)	95	46.8%	(39.8%, 53.5%)	0.017
Median Days			1	IQR [1, 2]		10	IQR [5, 16]	< 0.001
No Cognitive Rest	147	39	38.6%	(29.6%, 48.5%)	108	53.2%	(46.5%, 60.2%)	
Median Days			3	IQR [2, 5]		10.5	IQR [5, 15.5]	< 0.001

Discussion

- Patients presenting to a PCPP are seen sooner after their injury compared to specialists (median 2 days vs. 10 days).
- Specialists typically see patients referred an ER or PCPP, likely because of persistent symptoms.
- More PCPP patients vs. specialty clinics had immediate cognitive rest after injury (61.4% vs. 27.9% in the specialty clinic
- There are limited RCTs studying the relationship between CR and return to school performance to guide management
- Older recommendations and guidelines believed it to be best for patients to remain under cognitive rest until symptom free, however, this has recently changed to state patients may return to school on accommodations (18-20,25,27-33)
- If these recent guidelines were made by specialists and this study proves that specialists see different patients than PCPPs, then do these new guidelines still apply to patients seen by PCPPs?
- The average patient seen by the PCPP recovers at 11 days (23-24), and this study found that the average patient doesn't see a specialist until 10 days post-injury
- Limitations:
- The way we defined "rest" and "immediate cognitive rest" was by missing school was often uncertain from retrospective chart review in the specialty clinic patients
- PCPP patient data was collected prospectively, while specialty clinic patients were collected retrospectively. This data was collected over different time periods
- It is possible that the patient populations in this study do not represent those of the general population

Conclusions

- Specialists and PCPPs see different types of pediatric concussion patients who present at different time periods after their initial injury
- Perhaps the guidelines written by specialists do not apply to the patients primarily managed by their PCPP
- More RCTs are needed to properly identify the differences between these two patient populations, and how to best return those managed by PCPPs to academics and athletics

References

1. de Kruijk JR, Leffers P, Meerhoff S, Rutten J, Twijnstra A. Effectiveness of bed rest after mild traumatic brain injury: a randomised trial of no versus six days of bed rest. J Neurol Neurosurg Psychiatry 2002;73:167-72.

2. Bryan MA, Rowhani-Rahbar A, Comstock RD, Rivara F. Sports- and Recreation-Related Concussions in US Youth. Pediatrics 2016;138.

3.Meehan WP, 3rd, Mannix R. Pediatric concussions in United States emergency departments in the years 2002 to 2006. J Pediatr 2010;157:889-93.

4.Centers for Disease C, Prevention. Nonfatal traumatic brain injuries related to sports and recreation activities among persons aged </=19 years--United States, 2001-2009. MMWR Morb Mortal Wkly Rep 2011;60:1337-42.

5.Maerlender A, Rieman W, Lichtenstein J, Condiracci C. Programmed Physical Exertion in Recovery From Sports-Related Concussion: A Randomized Pilot Study. Dev Neuropsychol 2015;40:273-8.

9.Arbogast KB, McGinley AD, Master CL, Grady MF, Robinson RL, Zonfrillo MR. Cognitive rest and school-based recommendations following pediatric concussion: the need for primary care support tools. Clin Pediatr (Phila) 2013;52:397-402.

10.Reijsner A, Popoli DM, Burns TG, et al. The Central Role of Community-Practicing Pediatricians in Contemporary Concussion Care: A Case Study of Children's Healthcare of Atlanta's Concussion Program. Clin Pediatr (Phila) 2015;54:1031-7.

11.Kaye AJ, Gallagher R, Callahan JM, Nance ML. Mild traumatic brain injury in the pediatric population: the role of the pediatrician in routine follow-up. J Trauma 2010;68:1396-400.

12.Zonfrillo MR, Master CL, Grady MF, Winston FK, Callahan JM, Arbogast KB. Pediatric providers' self-reported knowledge, practices, and attitudes about concussion. Pediatrics 2012;130:1120-5.

13.Carl RL, Kinsella SB. Pediatricians' knowledge of current sports concussion legislation and guidelines and comfort with sports concussion management: a cross-sectional study. Clin Pediatr (Phila) 2014;53:689-97.

17.Harmon KG, Drezner JA, Gammons M, et al. American Medical Society for Sports Medicine position statement: concussion in sport. Br J Sports Med 2013;47:15-26.

18.Giza CC, Kutcher JS, Ashwal S, et al. Summary of evidence-based guideline update: evaluation and management of concussion in sports: report of the Guideline Development Subcommittee of the American Academy of Neurology. Neurology 2013;80:2250-7,.

21.Lumba-Brown A, Yeates KO, Sarmiento K, et al. Centers for Disease Control and Prevention Guideline on the Diagnosis and Management of Mild Traumatic Brain Injury Among Children. JAMA Pediatr 2018;172:e182853.

26.Moser RS, Schatz P, Glenn M, Kollias KE, Iverson GL. Examining prescribed rest as treatment for adolescents who are slow to recover from concussion. Brain Inj 2015;29:58-63.

30.McCrory P, Meeuwisse W, Dvorak J, et al. Consensus statement on concussion in sport-the 5(th) international conference on concussion in sport held in Berlin, October 2016. Br J Sports Med 2017;51:838-47\

33.Halstead ME, Walter KD, Moffatt K. Sport-Related Concussion in Children and Adolescents. Pediatrics 2018;142.