

Adherence to Return to Play Protocols in Children Presenting with Concussion

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Abstract

Introduction

There is a paucity of documentation on parental and child adherence to return to play (RTP) protocols in the context of Ireland. Failure to adhere to guidelines can lead to a prolongation of symptoms; the risk of recurrent injury with the associated complications and a repeat presentation to the Emergency Department (ED). Our aim was to assess and evaluate parental adherence to RTP protocols in children who sustained head injury during a sporting event.

Methods

Parents or guardians of children were contacted by telephone and asked to complete an online survey in relation to the initial head injury.

Results

Fifty-seven responses were recorded. 80.7% of patients were removed from the field of play at the time of head injury. Of those attending the ED, 53 patients (93%) were advised on RTP protocols at discharge. Nine patients (15.79%) were assessed by a physician prior to returning to play.

Conclusion

Whilst there is a strong awareness of management of concussion on the sporting field itself, there is a paucity of understanding and implementation in the post injury phase, particularly RTP. In addition, and in contrast with international guidelines, most children were not medically cleared appropriately before returning to play.

Introduction

Engagement in sporting activities is essential for the growth and well-being of children, with documented benefits to general health, fitness and social development¹. With active participation in sports comes the risk of injury. In particular, children frequently present to the Emergency Department (ED) with head injury following engagement in sports. 65% of all sports-related head injuries presenting to ED's in the United States are in children between the ages of 5 and 18 years². In Ireland, in adolescence, boys represent 70% of head injury presentations, half with sport related injury, with 40% from rugby³.

The management of concussion has evolved to focus on programs incorporating cognitive rest, physical rest, neurocognitive testing and the utilisation of return to play guidelines. Concussion management and return to play protocols are modelled on adult return to play (RTP) protocols, recommended by the Concussion in Sport Group (CISG) 2012 Consensus Statement⁴. However, there are no such protocols or guidelines specific to paediatrics. There therefore remains significant confusion and variability among athletes, parents and coaches as to the gold standard of management in children⁵.

Irish sporting bodies, including the Gaelic Athletic Association (GAA), the Football Association of Ireland (FAI) and the Irish Rugby Football Union (IRFU) advise graduated return to play (RTP) through a guideline-based system. Both the GAA and IRFU advise set timeframes for RTP; including a specific duration of time, in addition to monitoring symptoms with a step-up or step-down approach which is based on an individual's response to each stage of the programme. The FAI too, recommend a stepwise approach to RTP, although they do not provide guidance on a definitive timeline. In all cases, a medical assessment is recommended prior to the child re-engaging in full-contact sporting activity

There is a paucity of documentation on parental and child adherence to RTP protocols in the context of Ireland. Failure to adhere to guidelines can lead to a prolongation of symptoms; the risk of recurrent injury with the associated complications and a repeat presentation to the ED. Post-concussive physiological changes have been shown to increase the brain's vulnerability to further injury, especially in cases where a second concussive injury is sustained within days of the first. This phenomenon can lead to severe and permanent deficits⁶. Internationally, adherence to RTP guidelines is poor^{7 8 9}.

We aim to assess and evaluate parental adherence to RTP protocols in children who sustained head injury during a sporting event.

We sought to ascertain adherence to the return to play protocols and concussion management in relation to on field head injury management, administration of RTP advice upon discharge from the emergency department, duration of concussion symptoms, if a medical assessment was conducted prior to going back to play and time to return to play from concussive event. We sought to assess the factors influencing early RTP and the effects of early RTP on the patient.

Methods

All children between the ages of 8 and 16 years, who presented to the ED with a head injury and concussive symptoms, sustained in an organised sports event were included, and all those who had presented to the ED, who met these inclusion criteria, between June and December 2019, were retrospectively identified via the electronic patient records system in the Emergency Department.

Parents or guardians of children were contacted by telephone and asked to complete an online survey in relation to the initial head injury. Informed consent was obtained prior to commencing the survey. Participants were contacted a second time as a reminder to complete the survey. The survey of ten questions, focused specifically on the event surrounding the head injury and the patient journey from the time of injury to RTP.

Ethical guidance was sought and granted from the hospital ethics committee.

This was a single-centre study conducted in a tertiary level paediatric hospital. Children's Health Ireland (CHI) at Temple Street. CHI at Temple Street has an annual ED attendance of approximately 49,700 patients.

Results

Ninety-eight patients fulfilled the inclusion criteria and were included. Only one parent declined to participate. Each participant was contacted twice to ensure completion of the survey. Fifty-seven completed survey responses were recorded, with 40 surveys uncompleted. Only completed surveys were included in the study.

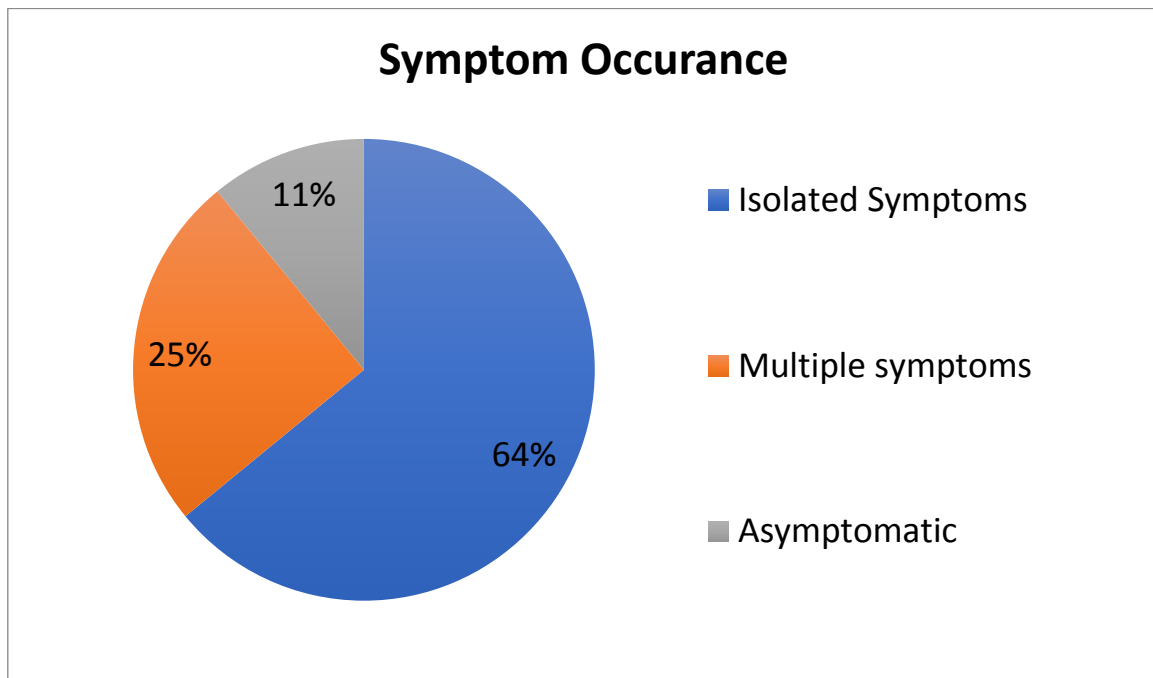
The sports in which patients were involved at the time of head injury were: gaelic football (42.1%, $n=24$), rugby (29.8%, $n=17$), soccer (10.5%, $n=6$) and hurling (7%, $n=4$). Other sports included horse-riding, baseball, hockey and basketball.

80.7% of patients were removed from the field of play at the time of head injury. Most children reported isolated symptoms at the time of injury, with headache the most frequently reported symptom (47%, $n=27$). Table 1 details all reported symptoms.

Table 1: Reported symptoms among patients

Reported symptoms	<i>N</i>
Headache	27 (47%)
Nausea	15 (26%)
Vomiting	6 (10%)
Irritability	4 (7%)
Dizziness	23 (40%)
Poor concentration	7 (12%)
Asymptomatic	4 (7%)
Other	9 (15%)

Figure 1: Symptom morphology amongst respondents



Of those attending the ED, $n=53$ (93%) were advised on RTP protocols at discharge. However, of those, $n=6$ (11.3%) children returned to play prior to the recommended RTP advice. $n=7$ (13.2%) reported returning to play sooner than advised due to external pressure from their team-mates or coach. Most ($n=48$, 84.2%) children returned to play without a medical assessment. Ten (17.5%) participants experienced persistent symptoms following their head injury; and of those $n=5$ (50%) reported intermittent headaches and $n=3$ (30%) experienced dizziness.

Table 2: Time from ED presentation to next game

<1 week	N=1 (1.75%)
1-2 weeks	N=8 (14.03%)
2-4 weeks	N=30 (52.63%)
1-2 months	N= 9 (15.79%)
>2 months	N= 7 (12.28%)
Unknown	N=2 (3.5%)

Thirty-two (56.14 %) participants reported no effect on their performance following RTP. Of those remaining, 25 (47.2%) experienced some degree of negative impact on their performance, involving dizziness, headache and fatigue.

In all, two (3.5%) participants took one week to return to their normal level of play, 13 patients (22.8 %) took 2 to 4 weeks and 10 (17.5%) took more than 4 weeks until they felt they had returned to their normal level of performance.

In terms of individual sports breakdown and length of time until return to play, children participating in rugby; 62.5% returned within 2-4 weeks, with 25% within 1-2 months. A further 12.5 % returned after 2 months.

With regard to children participating in GAA; 3.4% returned within one week, 17.24% returned within 2 weeks and 34.48% returned to play between 2-4 weeks post concussion event. 13.79% of children returned after 2 months.

Children who presented following a soccer match, 25% returned between 1-2 weeks, 37.5% between 2-4 weeks and a similar 37.5% returned within 1-2 months

Duration of symptoms were noted to be greater than 1 week in 22.81% of respondents with the majority (47.37) reporting symptom resolution at 3 days.

Only 9 patients (15.79%) of all participants were assessed by a physician prior to returning to play. All patients reporting external pressures to return to sports did not undergo a medical assessment.

Discussion

Return to play protocols are a fundamental component of concussion management, particularly in a paediatric population where a significantly more conservative approach is recommended^{9 10}.

There is emerging research in the field of adolescent and paediatric concussion¹¹, however there are few studies concerning the adherence to return to play protocols and their effect on concussion management in the paediatric population. Protocols for children are different than those for adults and should be used accordingly. Current recommendations for an immediate period of cognitive and physical rest for 1–2 days while initiating a gradual RTP protocol align with the best available evidence. Of the literature available, a systematic review noted that increased adherence to protocols predicted successful return to sport without symptom exacerbation. The evidence suggests that protocols with short rest periods and graduated physical and cognitive activity may best facilitate successful RTP while enhancing the patient's experience during recovery¹².

An Australian study in 2015 conducted on children with sports related head injury noted a 72% compliance with Return to play protocols. The authors expressed concern that 17.6% of patients studied returned to play with symptoms or did not follow appropriate remedial action following symptom onset during the RTP process. Potential causes for poor compliance were identified as; poor parental understanding, lack of medical supervision during the step-wise programme and the difficulty of using a process primarily designed for adult athletes in a non-professional paediatric sports setting¹³.

With 47.2% of participants in this study reporting negative effects of concussion on performance upon return to sport, the potential causes identified in the study above may also be applicable to Ireland.

The 2016 Consensus statement on concussion in sport—the 5th international conference on concussion in sport¹⁴ held in Berlin, noted that the management of sports related concussion in children requires special paradigms suitable for the developing child. It was recommended that child and adolescent guidelines refer to individuals 18 years or less.

Child-specific paradigms for sports related concussion (SRC) should apply to children aged 5–12 years, and adolescent-specific paradigms should apply to those aged 13–18 years. No studies have addressed whether sports related concussion signs and symptoms differ from adults. The expected duration of symptoms in children is up to 4 weeks.

The overall increased awareness of concussion and its management by those involved in team sports is reflected in our results, with most (80.7%) patients presenting following a head injury having been removed from the field of play at the time of injury. What is concerning is that most children, 84.2%, returning to play were not reviewed by a medical professional prior to doing so. With no established concussion clinic or indeed, a pathway that would facilitate medical input; patients, their parents and coaches are left to interpret guidelines whilst experiencing continued pressure to RTP. A concussion clinic could provide the ideal means to assess and review patients who are experiencing persistent symptoms.

There is international consensus on the importance of medical assessment post-concussion and prior to re- engaging in sports following head injury. This affords not only the opportunity to assess the clinical status of a player prior to their return to the game, but the time to identify areas for modification in order to optimise players' protective behaviour and provide education on concussion to players. Particular emphasis is placed on the paediatric population and the importance of children being completely symptom-free prior to RTP. It is strongly recommended that RTP, and its potential impact, should be discussed with both player and parents.

This review highlights an untouched area in Irish paediatric trauma and exposes a gap in how healthcare is provided to patients presenting with concussion. It supports the need for players, parents and those involved in organised sport for children to adhere to RTP guidelines. This needs to be continually stressed both to patients and parents and should be overseen by a medical professional experienced in dealing with concussion. Symptoms of concussion usually persist for more than 4 days in many patients: this should be reflected in RTP programmes.

The study is limited in its scope due to the data being obtained in a single centre. Methods were potentially exposed to recall bias. A relatively low number of respondents limits the generalisability and reliability of the results.

Declaration of Conflicts of Interest:

The authors have no conflicts of interest to declare.

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References:

1. Eime RM, Young JA, Harvey JT, Charity MJ, Payne WR. A systematic review of the psychological and social benefits of participation in sport for children and adolescents: informing development of a conceptual model of health through sport. *Int J Behav Nutr Phys Act.* 2013 Aug 15; 10:98.
2. Centers for Disease Control and 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 Oct 7;60(39):1337-42.
3. E. Ryan, T. Bolger, M.J. Barrett, C. Blackburn, I. Okafor, R. McNamara et al. Paediatric Head Injury and Traumatic Brain Injury. *Ir Med J;* 2020 Jun 11;113(6):94.
4. McCrory P, Meeuwisse WH, Aubry M, et al. Consensus statement on concussion in sport: the 4th International Conference on Concussion in Sport held in Zurich, November 2012. *British Journal of Sports Medicine* 2013; 47:250-258.
5. May KH, Marshall DL, Burns TG, Popoli DM, Polikandriotis JA. Pediatric sports specific return to play guidelines following concussion. *Int J Sports Phys Ther.* 2014 Apr;9(2):242-55.
6. Shrey D, Griesbach G, Giza C. The Pathophysiology of Concussions in Youth. *Physical medicine and rehabilitation clinics of North America.* 2011 Aug 22. 577-602
7. Yard, Ellen & Dawn, Rachel. Compliance with return to play guidelines following concussion in US high school athletes, 2005-2008. *Brain injury: [BI]* 2009. 23. 888-98.
8. Hollis SJ, Stevenson MR, McIntosh AS, Shores EA, Collins MW, Taylor CB. Incidence, Risk, and Protective Factors of Mild Traumatic Brain Injury in a Cohort of Australian Nonprofessional Male Rugby Players. *The American Journal of Sports Medicine.* 2009;37(12):2328-2333
9. Sye Gal, Sullivan SJ, McCrory P. High school rugby players' understanding of concussion and return to play guidelines. *British Journal of Sports Medicine* 2006; 40:1003-1005
10. Patricios J, Ardern C, Hislop M, Aubry M, Bloomfield P, Broderick C et al. Implementation of the 2017 Berlin Concussion in Sport Group Consensus Statement in contact and collision sports: A joint position statement from 11 national and international sports organisations. *British Journal of Sports Medicine.* 52. *bjsports-2018.* 10.1136
11. Kurowski B, Hugentobler J, Quatman-Yates C, Taylor J, Gubanich P, Altaye M et al. Aerobic Exercise for Adolescents With Prolonged Symptoms After Mild Traumatic Brain Injury: An Exploratory Randomized Clinical Trial. *The Journal of head trauma rehabilitation.* 2016. 32. 10.1097
12. DeMatteo C, Bednar ED, Randall S, et al. Effectiveness of return to activity and return to school protocols for children post-concussion: a systematic review. *BMJ Open Sport & Exercise Medicine* 2020.6.667
13. Haran H, Bressan S, Oakley E, Davis G, Anderson V, Babl F. On-field management and return-to-play in sports-related concussion in children: Are children managed appropriately? *Journal of Science and Medicine in Sport.*2015. 19. 10.1016
14. McCrory P, Meeuwisse W, Dvorak J, et al. Consensus statement on concussion in sport—the 5th international conference on concussion in sport held in Berlin, October 2016. *British Journal of Sports Medicine* 2017;51: 838-847