Concussion Knowledge among United Kingdom (UK) Medical Students: A Questionnaire Survey in 2 Universities across 2 year groups

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Short Report

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Abstract

Introduction

Concussion/sports-related concussion (SRC) is a common injury and carries potential for significant acute and long term consequences. The United Kingdom (UK) government are currently developing SRC protocols for use in grass roots sport, requiring doctors to make the diagnosis and management of SRC. Medical students, as the future doctors, need to therefore be able to assess, diagnose and manage SRCs. However no previous studies have assessed UK medical students’ knowledge of SRCs.

Aims

To assess SRC knowledge among UK medical students, comparing second and fifth (final) year medical students from two Universities (QUB and Keele University), using an electronic questionnaire.

Methods

A questionnaire survey was sent to second- and fifth-year medical undergraduates at both QUB and Keele Universities in March 2022. This gave us access to a potential 500 medical students at both Universities. The questionnaire was hosted on surveymonkey.com, with consent incorporated into the survey. Ethical approval was granted through QUB Research Ethics Committee (MHLS 21_150).

Results

Twenty-seven questionnaire responses (2.7% of potential respondents) were received. All respondents were in the age group 18-34 years old, with an approximately equal sex representation, 14 (51.85%) being female. Both Universities and year groups were represented in the responses, with 5 from Keele University and 22 from QUB.

Ten (37%) people couldn’t correctly identify the definition of a SRC. Five people incorrectly identified that to make the diagnosis of a SRC, a loss of consciousness is required. In terms of the mechanism of injury for SRC, 7 felt (incorrectly) that a direct physical contact to the head was required for the diagnosis. For the management of SRC, 6 respondents felt that neuroimaging was required (1 for MRI and 5 for CT brain).

When asked about undergraduate teaching for SRC, 11 (41%) said they had never received any SRC teaching, with only 5 (18.5% of respondents) having actually seen a concussed patient. When asked to grade their SRC knowledge, from 1 (inadequate) to 10 (completely adequate), the average score was 3.7.

When asked to grade SRC as something they wanted to learn more about as part of their medical curriculum and asked to score this 1 (not at all) to 10 (very much), the average score was 8.4. When asked about their preferred learning format, 17 said lecture.

Conclusion
This is the 1st study to assess SRC knowledge in UK medical students. Although the response rate was low, students expressed a strong desire to know more about how to diagnose and manage concussions, particularly in improving their knowledge of signs and symptoms of SRC and what red flag features to be aware of. Students identified a lecture format as their preferred form of teaching. Initiating formal medical student teaching on SRC will help the UK government in their roll out of grass root SRC diagnosis and management guidelines, which should help to improve the general management of SRC injuries and their long-term sequelae.

Introduction

What is concussion?

A concussion or sports-related concussion (SRC), referred to as SRC throughout this article, “is a traumatic brain injury induced by biomechanical forces.” (1) The term SRC is sometimes used interchangeably with mild traumatic brain injury mTBI, although SRC is a subset of mTBI. (2) SRCs are common, with one study in Ontario, Canada reporting an average annual incidence of 1,153 per 100,000 residents (3), with another study reporting an annual 3.8 million mTBIs in the United States of America (4). Younger children appear to be at higher risk of developing SRCs, with a reported annual incidence of 3,600 per 100,000 in the under 5 year olds (3), with females also appearing to be at higher risk of developing SRC compared to males. (4, 5) Concussions can occur without an obvious head injury and are difficult to diagnose, with no exclusive test to make the diagnosis. (6) Concussions occur because the brain is smaller than the skull that encases it and with any whiplash-type movement (e.g. from a rugby tackle), the brain moves around inside the skull and is at risk of damage. This movement of the brain causes neurotransmitter release, seen as diffuse axonal injury (DAI) at pathology (2, 4) and the areas of the brain where this occurs, dictates the symptomatology of the SRC.

Symptoms and risks of concussion

Concussions carry potential acute and long-term consequences. Acute symptoms of concussion can be split into somatic, cognitive, mood and sleep effects. (2) Acute somatic symptoms include headache, photo-/phonophobia, dizziness, nausea and vomiting, whilst acute cognitive effects can include difficulty with concentration and issues with memory. Acute mood effects include sadness, irritability and nervousness, whilst the impacts on sleep include sleeping too much or too little and difficulty falling asleep. In addition, if another brain injury occurs before recovery from the first concussion, then the second impact syndrome can occur, which carries a high risk of mortality. (7, 8) Thus it is important for the public and health professionals involved in sport to diagnose SRCs and remove the player/athlete immediately from the field of play.

The long-term effects of SRC include physical, mood disturbances and cognitive deficits (9), termed post-concussion syndrome (10, 11), and the more concussions suffered, the higher the risk of developing these effects. Concussion is also clearly now associated with the later development of chronic traumatic
encephalopathy or CTE. CTE symptoms include motor dysfunction, cognitive impairment and/or mood disturbances and can present many years after the reported concussion(s).

**Why is it important to educate medical students about concussion and sports-related concussion (SRC)?**

Due to the fact that SRCs are common injuries and carry a significant risk of acute and longer term morbidity and mortality, medical students should be able to diagnose a SRC and advise patients on further management, including longer term rehabilitation.

**What is already known about medical school concussion teaching?**

A scoping review of undergraduate medical teaching on the topic of concussion was recently completed. This paper highlighted that concussion research in North American medical schools was inadequate. There were, however, no papers found from outside North America assessing medical student knowledge about diagnosis and management of concussion. We therefore wanted to address this research gap by assessing concussion knowledge in United Kingdom (UK) based medical students.

**Aim**

The aim of this paper is to assess the knowledge for diagnosis and management of SRC among UK medical students, comparing second and fifth (final) year medical students from two Universities (QUB and Keele University), using an electronic questionnaire.

**Methods**

To assess the knowledge for diagnosis and management of concussion among medical students, a questionnaire survey was sent to second and fifth (final) year medical undergraduates at both QUB, Northern Ireland and Keele University, Staffordshire, England. This gave us access to a potential 500 medical students at both Universities (1,000 students in total) and was a cross-sectional survey of the medical students at both institutions. The medical students were contacted by email, providing a participation sheet and a link to the questionnaire. The questionnaire (Appendix 1) was hosted on surveymonkey.com, with consent incorporated into the survey. Responses were anonymised, with participant name and details not being obtained. The questionnaire used was a 25-item survey (Appendix 1), written by Boggild, M and Tator, C (2012)(14), developed through literature review, expert review, and pilot testing. It has subsequently been used in several research projects, including Donaworth, M.A., Grandhi, R.K. et al.(15) and Fraser, S., Wright, A. D., et al.(16) We have received permission from CH Tator to use this survey and have slightly adapted the questionnaire for a UK user.

The email invitations to Keele University were sent on 22/03/2022 and then on 25/04/2022, with the QUB students receiving an email on 07/03/2022. Ethical approval for this study was granted through QUB Faculty of Medicine, Health and Life Sciences Research Ethics Committee (Faculty REC) (Faculty reference number MHLS 21_150).
Results

Questionnaire respondents

Twenty seven questionnaire responses (approximately 2.7% of potential respondents) were received. Twenty of the respondents were in the age group 18-24 years old, with seven aged 25-34. There was an approximately equal sex representation of respondents, with 14 (51.85%) being female. Both Universities and year groups were represented in the responses, with 4 from 2nd year and 1 from 5th year at Keele University, whilst 14 were from 2nd year and 8 from 5th year at QUB. Most participants were involved in sport, with 20 having been going to the gym regularly, 15 playing football/soccer, 10 cycling and swimming, 9 athletics, 8 badminton, and 7 rugby in the past 2 years. Indeed, on average, participants were doing 5 days of sport/physical activity in the previous week prior to questionnaire completion and on average, spending at least 30 minutes per day doing these activities. Of note, 10 study participants had suffered at least one concussion, 7 whilst playing sport, whilst 17 had no personal experience of a concussion.

Questionnaire responses

Ten (37%) people could not correctly identify the definition of a concussion, with 3 people not classifying concussion as a brain injury and one respondent (incorrectly) reporting that concussions can be seen on neuro-imaging. Five people incorrectly identified that to make the diagnosis of a concussion, a loss of consciousness is required. A number of respondents also incorrectly identified signs and symptoms of concussion, with 7 reporting that a fixed dilated pupil was a sign, 5 prolonged coma, 4 hemiparesis and papilledema and 3 intention tremor. Eighteen respondents also incorrectly identified that 3 or more symptoms had to be present to make the diagnosis of concussion.

In terms of the mechanism of injury for concussion, 7 felt (incorrectly) that a direct physical contact to the head was required for the diagnosis and 2 (wrongly) felt that a concussion was caused by damage to brainstem. For the management of concussion, one respondent felt that a concussed player can return to play in the same game or practice if examined by a physician; 11 felt the standard mini mental status exam at initial assessment is an adequate cognitive test for concussion; whilst 1 respondent felt that a MRI of the brain is mandatory following a concussion, whilst 5 felt that a CT brain was mandatory.

Red flags following a concussion

When asked about some of the “red flags” that may predict the potential for more prolonged symptoms and may influence investigation and management of concussion, 11 felt a nose bleed and 2 being hit on the left side of the head were “red flags”.

Long term consequences of concussion

For the long term consequences of repetitive concussive injury, 14 felt that there was an increased risk of haemorrhagic stroke and 4 felt there was an increased risk of schizophrenia.
Previous undergraduate concussion teaching

When asked about undergraduate teaching for concussion, 11 (41%) said they had never received any concussion teaching. Other respondents reported that they had received concussion teaching, 8 by lecture and 1 during their clinical placement in A&E, during a Special Study Module (SSM), clinical teaching during a brain injury clinic and finally, one when working in a rugby club. Only 5 (18.5% of respondents) had actually seen a concussed patient, with only 2 (7.4%) students having seen a patient with post-concussive syndrome. When asked to grade their concussion knowledge, from 1 (inadequate) to 10 (completely adequate), the average score was 3.7.

Future medical school concussion teaching

When asked to grade concussion as something they wanted to learn more about as part of their medical curriculum and asked to score this 1 (not at all) to 10 (very much), the average score was 8.4. When asked about their preferred learning format, 17 said lecture, 7 seminar and 3 a workshop. Meanwhile, for resources the medical students are most likely to use to find out further information about concussion, 15 said Google, five PubMed, four using a relevant textbook, two Up-to-date (which can be found https://www.wolterskluwer.com/en-gb/solutions/uptodate) and one would use National Institute for Health and Care Excellence (NICE) Clinical Knowledge Summary (CKS) guidelines.

Challenges facing doctors when diagnosing and managing concussion

When asked about the challenges, if any, facing physicians when diagnosing and managing a concussion, free text comments could be grouped into six subthemes:

1) Uncertainty

- Uncertainty around diagnosis.
- Wide variety of possible symptoms. Delayed presentation.
- It is difficult to diagnose and distinguish from other neurological conditions, E.g. A fixed dilated pupil could suggest a bleed in the brain, tinnitus, dizziness and vertigo could suggest an otopathy.
- Defining the severity confidently.
- Difficulty in getting an accurate history.
- They can be so varied in severity and recovery.
- Symptoms are vague, so recognition of the concussion (is difficult). Ability to rule out other, potentially more serious causes of symptoms.
- Doing this survey made me realise how little I know as a second year about concussions. Given how common they are I feel it would be useful to make them a more core part of the curriculum to give us a good foundation when it comes to placements.
- No definitive diagnosis - symptoms can be vague and non specific. If sustained in sport a lot of the time concussions may not be diagnosed or taken seriously leading to sportspeople continuing to
play.

- Variety of symptoms experienced.
- Not witnessing concussion event. Unable to get clear history from patient. Blurred diagnostic lines.
- Heterogeneous presentation and patient can appear well
- Often a desire to return to sport or pressure if in a professional sport setting. Also signs and symptoms can be delayed and not initially evident.
- Dealing with patients post impact and not being present at the time of injury. Mixed history and inconsistent pre-hospital management from other healthcare professionals particularly in sports such as rugby.

2) **SRC is not a serious injury**

- Lack of attendance at EDs or GPs as may be perceived as not serious.
- Patient co-operation, they may think it is just a minor injury.
- Recognising and acknowledging the seriousness of concussion.

3) **People participating in sport not wanting to be labelled with the ‘sick role’**

- People don’t like to go to hospital, especially those who want to play sport.

4) **Don’t want to be told not to play sport**

- Most people know if they get diagnosed they can’t play for a period of time.

5) **Missing a more ‘serious’ head injury**

- Worry about missing a more serious injury vs over investigating.
- Recognising red flags.
- Knowing whether to scan or not.
- Complications/ differential diagnosis.

6) **Insufficient concussion teaching during medical school**

- I do not recall receiving any formal teaching on concussion during my undergraduate studies.
- Not having enough experience in diagnosing concussion.
- Inadequate knowledge (of concussion).

**Discussion**

**Summary of key findings**
This is the 1st study to assess concussion or sports-related concussion (SRC) knowledge in UK medical students. There were 27 responses (2.7% of potential respondents) to an emailed questionnaire to assess the medical students knowledge of diagnosis and management of SRC. All questionnaire responses were in the age range 18-34 years old, with an approximate equal split between females (14) and males (13). Both Universities and year groups were represented in the responses. Most questionnaire respondents were involved in sport themselves and 10 (37%) had experienced a concussion. Ten respondents (37%) could not correctly identify the definition of concussion from a list and the respondents were not confident in identifying symptoms of concussion, with 5 (18.5%) incorrectly reporting that a loss of consciousness was required to make the diagnosis of concussion and 7 (25.9%) incorrectly requiring a head injury to make the diagnosis. Eleven students (41% of respondents) had no teaching on concussion, with 81.5% of students having never seen a concussed patient during their clinical placements and only 2 (7%) having seen patients with post-concussive syndrome. Indeed, they self-rated their concussion knowledge as poor, being graded on average as 3.7 on a 10 point scale. Knowledge of long term consequences following concussions, particularly repeated concussions, could also be improved, with 14 (52%) and 4 (15%) students incorrectly identifying an increased risk of haemorrhagic stroke and schizophrenia, respectively, post-concussion. Medical students were however interested in receiving concussion teaching during their medical school curriculum, scoring this on average 8.4 on a 10 point scale of interest, with most (17 or 63%) requesting a lecture format for this teaching.

**Concussion teaching for medical students should be mandatory?**

This current study supports the findings from a recent scoping review on concussion education in medical students showing that most students are not receiving any concussion teaching and training. (13) However, SRC is a common injury and all graduating medical students need to feel confident in its assessment, diagnosis and management, in-keeping with the General Medical Council's (GMC's) guidance for medical school teaching, Promoting Excellence.(17) Indeed the Department of Digital, Culture, Sport and Media (DCMS) for the UK government, will be releasing grassroots concussion diagnosis and management guidelines.(18) As part of this guidance, doctors will be asked to confirm the diagnosis and initiate appropriate management for concussed athletes. Thus, medical students need to be taught on SRC assessment, diagnosis and management, both acute and longer term.

Additionally, cases of concussion can present to doctors working in a variety of fields, including General Practice, Emergency Medicine and General Medicine including Neurology, Paediatrics and Sports Medicine.(15, 19) Indeed Ropper and Gorson report that “almost all physicians are called on at some time to provide care at the scene or to treat the sequelae of concussion”.(20) Additionally, this questionnaire study has shown that medical students are keen to receive teaching on concussion and this could be incorporated into their formal teaching sessions in a number of medical specialities, including the emergency department, trauma and orthopaedics, neurology, sports medicine and primary care/family medicine.

**How should concussion teaching be delivered?**
The students noted a preference for lecture-based concussion teaching. However, Provvidenza and Johnston undertook a qualitative literature review of concussion education in 2009, with the intention of identifying the most effective means of concussion teaching for healthcare professionals. Their results indicated that didactic lectures and educational literature had little impact on changing physicians’ performance but that interactive educational sessions were effective in helping physicians apply current knowledge, as was educational outreach events (visits by educators). Thus, the concussion teaching could be delivered via case-based or problem-based learning approaches and clinical rotations, supported via lecture-based or small group teaching.

**Limitations**

There was a poor response rate to the questionnaire (2.7% of potential total respondents) and we were asking participants to recall certain facts, e.g. did they receive concussion teaching, thus increasing the risk of recall bias. Additionally, most questionnaire respondents were involved in sport and 10 (37%) had experienced a concussion themselves, thus the responses may have been biased in favour of positive concussion knowledge. Thus, this research questionnaire needs repeated in medical students from across the UK and Europe to assess current levels of concussion knowledge and whether this aspect of medical school teaching needs incorporated into the curriculum.

**Conclusion**

Concussion is a common and complex condition that all graduating medical students need to be familiar with in terms of its assessment, diagnosis, and management. This is the 1st study to assess concussion or sports-related concussion (SRC) knowledge in UK medical students and should be replicated in other geographical areas. Although the response rate was low, students expressed a strong desire to know about how to diagnose and manage concussions, helping to address the ‘diagnostic uncertainty’ of SRC, particularly to improve their knowledge of signs and symptoms of SRC and what red flag features to be aware of. Students identified a lecture format as their preferred form of teaching, and this could be supported by clinical placements and case-based discussions. Initiating formal medical student teaching on concussion will help the UK government in their roll out of grass root concussion diagnosis and management guidelines, which will help to improve the general management of concussion injuries and their long-term sequelae.

**Strengths And Limitations**

- First study to assess concussion/sports-related concussion (SRC) knowledge in UK based medical students.
- Medical students in the UK get limited SRC teaching currently but are keen to receive further training in this area, particularly via lecture formats.
- There was a poor response rate to the questionnaire (2.7% of potential total respondents) but this study is a positive first step in understanding SRC knowledge within UK medical students.
• Most questionnaire respondents were involved in sport and 10 (37%) had experienced a concussion themselves, thus the responses may have been biased in favour of positive concussion knowledge.

• This research questionnaire needs repeated in medical students from across the UK and Europe to assess current levels of concussion knowledge and whether this aspect of medical school teaching needs incorporated into the curriculum.

Declarations

Competing interests - nil

Acknowledgements – We would like to acknowledge the medical schools and students who participated in the research study.

Funding, grant and award info – nil

Ethical approval information – Ethical approval for this study was granted through QUB Faculty of Medicine, Health and Life Sciences Research Ethics Committee (Faculty REC)(Faculty reference number MHLS 21_150).

Data sharing statement – all data is freely available within the publication.

Patient involvement: no.

Consent to participate

This research study is fully anonymised. Please ensure you have read the patient participation information sheet before proceeding.

Please tick the box below if you give consent to participate in this study. By ticking this box, you are consenting to participate in this study.

References


Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SuppfileAppendix1.docx