



SPORTS PERFORMANCE
RESEARCH INSTITUTE, NEW ZEALAND
AN INSTITUTE OF AUT UNIVERSITY

KNOWLEDGE and ATTITUDES (KA) SURVEYS ON CONCUSSION IN SPORTS: DOCTOR SEPTEMBER 2017 SURVEY

REPORT #4 TO ACCIDENT COMPENSATION CORPORATION (ACC)

BY DUNCAN REID, CAROLINE STUART, MARK FULCHER, PATRIA HUME, ALICE THEADOM, CHRIS WHATMAN, SIMON WALTERS

14th February 2018

Acknowledgement

Thanks to Rachel Smith and Ethan Smith, Year 4 Physiotherapy students, for assisting with the data collection and analysis.

Citation:

Reid, D., Stuart, C., Fulcher, M., Hume, P.A., Theadom, A., Whatman, C., & Walters, S.R. (2018). *Knowledge and attitudes (KA) surveys on concussion in sport: Doctors September 2017 Survey. Report #4 to Accident Compensation Corporation.* SPRINZ, Auckland University of Technology. 15 pages.

OVERVIEW

This report is the fourth in a series presenting baseline Knowledge and Attitudes (KA) around concussion in sport. The first report (Reid et al., 2017) focused on referees' knowledge, whilst this fourth report focuses on General Practitioners (GP) and Urgent Care Physicians (UCP) and is termed the "*Doctors September 2017 Survey*".

The 'Sports Concussion in New Zealand ACC National Guideline' was released in 2014. The KA studies aim to assess current knowledge and attitudes of GP and UCPs towards concussion in sport following release of the guideline.

The results from the *Doctors September 2017 Survey* suggest that most GPs and UCPs in this survey have good knowledge of sports related concussion but are lacking confidence in the overall management, particularly with regards to timeframes to return to sports. There is also limited use of the SCAT-3 or 5 tool and most are unaware of the Consensus Statement on Concussion in Sport. Further education around management, return to sport decision making and the use of the SCAT tool is warranted.

RECOMMENDATIONS

- Greater education around the use of the SCAT tool for doctors.
- Greater education around overall management of sport-related concussion for doctors.
- Greater education regarding return to play decision-making and graduated return protocols for doctors.
- GP CME Conferences and Best Practice publications are likely the most effective way to disseminate knowledge on concussion identification and treatment and management for doctors.
- Consider funding the SCAT assessment as a procedure so practices are fairly remunerated and able to resource the time necessary for a thorough assessment of sport-related concussion.

INTRODUCTION

The aims of the KA concussion research programme are to undertake surveys of secondary school students, coaches, parents, referees, and primary care providers (GPs and Urgent Care Physicians [UCPs]) to understand their current knowledge and attitudes towards the management of concussion. This report overviews the findings from GPs and UCPs who assess patients presenting with sports related concussion

The key outcomes of this review are:

- **A comprehensive overview of the KA of sports related concussion in GPs and UCPs after the implementation of the ACC Sports Concussion Guidelines.**
- **Recommendations of the key areas where improvements can be made to improve KA of concussion.**

Sport related concussion is a significant problem in New Zealand sporting populations (Theadom et al., 2014). It has been estimated that 21% of all traumatic brain injuries (TBI) are sustained in the sports arena each year at a cost to ACC of \$76 million from 2009-2013 (ACC National Guideline 2016). Rugby, cycling and equestrian activities have been identified as the most common cause of mild-TBI/concussion in sports (Theadom et al., 2014).

Assessment and management of concussion is an evolving field and recommendations have changed following each of the five International Consensus Conferences on Concussion in Sport with the most recent consensus statement released in 2017 following the Conference in Berlin in 2016 (Echemendia et al 2017). The Sport Concussion Assessment Tool (SCAT) was developed during the 2004 meeting in Prague to serve as an educational tool and to assist medical providers in evaluating sports-related concussion and has been updated with each subsequent meeting with the most recent edition, the SCAT5, published in 2017 (Echemendia et al, 2017).

A survey of 93 GPs and Emergency Doctors (EDs) by Stoller et al. (2014) identified that GPs and EDs in Canada had limited usage and awareness of consensus statements on sports related concussion. There was very poor usage of the Sport Concussion Assessment tool (SCAT) with 86% of EDs and 54% of GPs reporting having never used the tool. There was also mixed use of cognitive rest in the management of concussion with only 49% of GPs and 57% of EDs recommending this. Overall, this study demonstrated a significant lack of understanding of the management of sports related concussion (Stoller et al, 2014).

In 2014 The Accident Compensation Corporation (ACC, 2014) released a guideline on the management of sports concussion. Whilst there are studies that have explored GPs and other Primary Care and Specialist Doctors knowledge and understanding of sport related concussion overseas (Stoller et al, 2014; Carson et al, 2016; Pleacher, 2006; Lebrun, 2013), we are not aware of any studies in the New Zealand medical population.

Purpose

The purpose of the *Doctors September 2017 Survey* was to assess the current state of knowledge and attitudes around concussion guidelines and management for Primary Care providers (GPs and UCPs) in 2017 and to understand if there is need for an intervention to address any gaps in knowledge.

METHODOLOGY

Data collection process

General Practitioners and Urgent Care Physicians were invited to participate in the study. It is important to note that urgent care and emergency doctors are not equivalent in New Zealand – they are separate specialties with different training schemes. Urgent Care Physicians operate in the community as primary care doctors whilst emergency doctors operate in hospital emergency departments as secondary care.

The methodology used to ascertain the Knowledge and Attitudes (KA) of GPs and UCPs used a cross-sectional questionnaire design. The 21-item multi-choice questionnaire was based on the validated questionnaire used in previous studies by Stoller et al. (2014).

The sample of GPs and UCPs was drawn from the Goodfellow Unit at the University of Auckland and the Royal New Zealand College of Urgent Care (RNZCUC). The Goodfellow Unit provides Continuing Medical Education (CME) to GPs and UCPs across New Zealand. An invitation to take part in the survey was sent to those registered with the Goodfellow Unit or the RNZCUC via their email database as part of their regular newsletters and CME invitations over an eight-week period. Undertaking the survey was voluntary, all information gathered was anonymous and a Survey Monkey tool was used to facilitate the responses.

183 potential participants read the Goodfellow Unit invitation and 402 doctors on the RNZCUC mailing list were emailed and invited to attend, making a total number invited of 585. 133 responded with a response rate of 23%.

Ethical approval was provided by AUTEK Application # **16/187**. The ACC Ethics Committee also approved the study.

Data analysis

All data were analysed descriptively via SPSS. Means and standard deviations and 95% confidence intervals are reported as appropriate for the data gained.

RESULTS

Demographics

The majority of participants are GPs (50%) or GP registrars (13%) with UCPs making up a further 25% (Table 1). There were responses from clinicians in every region of New Zealand. The largest number of participants practice in Auckland (40%) followed by Wellington (12%), Canterbury (11%) and Waikato (10%) and 81% have an urban practice. Participants had been practicing clinically for an average of 19 years (SD: 10.7) since graduation with a range of 2 to 46 years. A small percentage (10%) had undertaken post-graduate study.

Table 1: Types of physicians surveyed (n= 133)

Type of Physician	Frequency (%)
General Practitioner (GP)	67 (50.4)
GP Registrar	18 (13.5)
Urgent Care Physician (Fellow)	21 (15.8)
Urgent Care Trainee (Registrar)	12 (9.0)
Emergency Physician (Fellow)	2 (1.5)
Other	13 (9.8)
Total	133 (100)

Table 2: Location of primary practice (n= 133)

Location	Frequency (%)
Northland	2 (1.5)
Auckland	53 (39.8)
Waikato	13 (9.8)
Bay of Plenty	5 (3.8)
Taranaki	2 (1.5)
Hawkes Bay	5 (3.8)
Manawatu	4 (3.0)
Wairarapa	1 (.8)
Wellington	16 (12.0)
Nelson/Buller	3 (2.3)
West Coast	2 (1.5)

Canterbury	15 (11.3)
Otago	6 (4.5)
Other	6 (4.5)
Total	133 (100)

Estimated number of sport-related concussion patients assessed in the past two years

The number of sports related concussion patients these medical practitioners see per year is outlined in Table 3. Approximately half of those surveyed assessed ten or more sport related concussions in the past two years

Table 3. Estimated number of sport-related concussion patients assessed in the past two years

Number of estimated concussion patients	Frequency (%)
0	5 (3.8)
1-2	16 (12)
3-5	24 (18)
6-9	24 (18)
10-20	32 (24.1)
More than 20	32 (24.1)
Total	133 (100)

Usefulness of information sources from the past two years

The usefulness of information sources is outlined in Table 4. Of the information sources identified, Best Practice (Bpac^{nz} Ltd) articles/website and GP conference/CME presentations were considered the most useful with 76.3% and 68.8% of participants finding them useful, respectively.

Sports medicine journal articles, within which the International Concussion Consensus statement and related publications are published, were only considered useful by 23.5% with 67.2% never or rarely having used this source of information. The ACC "Sport Smart" website was found useful by 55% whilst 33% never used this source.

Table 4: Usefulness of information sources from the past two years

Information Source Frequency (%)	Very useful	Fairly useful	Not very useful	Not at all useful	Not applicable (never or rarely used)
GP journal articles	10 (8.3)	39 (32.2)	39 (32.2)	6 (5.0)	27 (22.3)
Emergency medicine journal articles	7 (5.9)	27 (22.7)	12 (10.1)	1 (0.8)	72 (60.5)
Sports medicine journal articles	9 (7.6)	19 (16.0)	8 (6.7)	3 (2.5)	80 (67.2)
Best Practice (BPAC) articles/website	39 (32.0)	54 (44.3)	15 (12.3)	4 (3.3)	10 (8.20)
ACC "Sport Smart" website contents	23 (19.3)	42 (35.3)	13 (10.9)	2 (1.7)	39 (32.8)
GP Conference and CME presentations	41 (33.6)	43 (35.2)	12 (9.8)	5 (4.1)	21 (17.2)
Urgent Care Conference and CME presentations	18 (15.5)	19 (16.4)	5 (4.3)	1 (0.9)	73 (62.9)
Emergency Medicine Conference and CME presentations	11 (9.2)	7 (5.9)	11 (9.2)	2 (1.7)	88 (73.9)
Sports Medicine Conference and CME presentations	9 (7.6)	8 (6.7)	8 (6.7)	3 (2.5)	91 (76.5)
Consultants letters	13 (10.9)	32 (26.9)	23 (19.3)	17 (14.3)	34 (28.6)
Hospital rounds or CME	5 (4.2)	9 (7.6)	6 (5.0)	6 (5.0)	93 (78.2)
Mixed media (newspaper, websites, television shows or magazine articles)	1 (0.8)	29 (24.4)	34 (28.6)	19 (16.0)	36 (30.3)

Consensus Statement on Concussion in Sport

Of those surveyed, 56% stated they had no knowledge of the Consensus Statement on Concussion in Sport. However, 37% of those surveyed found the Consensus Statement useful for the management of patients who present with sport related concussion symptoms.

Knowledge and use of the SCAT-5 or SCAT-3

Most participants (87.7%) had heard of the SCAT tool. There is no clear consensus around the ease of use of the SCAT tool. While 41% agree or strongly agree with its ease of use another 59% are either neutral or disagree (Table 5). A third rarely or never use SCAT. 14% always use SCAT. Of those who utilize the SCAT tool, 57% would prefer to have it integrated into their patient management software (Table 6). A number of participants commented that time pressures and limitations in funding were barriers to concussion assessment and management.

Table 5: Ease of using the SCAT tool

Ease of using the SCAT tool	Frequency (%)
Strongly Agree	11 (10.6)
Agree	32 (30.8)
Neutral	30 (28.8)
Disagree	27 (26.0)
Strongly disagree	4 (3.8)
Total	104 (100)

Table 6. Preferred method of applying the SCAT tool

Preferred method of applying the SCAT tool	Frequency (%)
Patient management software	61 (57.5)
Paper form	19 (17.9)
Web/online platform	13 (12.3)
An app or digital platform	8 (7.5)
Other	5 (4.7)
Total	106 (100)

Use of tools in diagnosing sports-related concussion

The use of tools for diagnosing sports related concussion are outlined in Table 7.

Table 7: Use of tools in diagnosing sports-related concussion

Use of tools in diagnosing sports-related concussion	Always	Usually	Some of the time	Rarely	Never
History and physical exam	115 (96.6)	4 (3.4)	0 (0)	0 (0)	0 (0)
SCAT	21 (17.6)	34 (28.6)	24 (20.2)	15 (12.6)	25 (21.0)
Computer based neuropsychological evaluation	1 (.8)	3 (2.5)	1 (.8)	17 (14.3)	97 (81.5)
Balance testing	29 (24.4)	26 (21.8)	15 (12.6)	9 (7.6)	40 (33.6)
Diagnostic imaging	2 (1.7)	1 (.8)	26 (21.8)	40 (33.6)	50 (42.0)

History and physical exam

100% of the participants indicated they usually or always use the patients' history and a physical exam when assessing for sports-related concussion.

Computer based neuropsychological evaluation

The majority of participants (81.5%) do not use a computer-based evaluation when assessing a patient for sport related concussion.

Diagnostic imaging

75% of the participants rarely or never use diagnostic imaging when assessing for sport related concussion.

Knowledge attitudes and beliefs around sport related concussion

The next section presents the responses to questions relating to knowledge and beliefs around sports related concussion. The majority of participants (90%) agreed that once concussed a patient should not return to play for 3 weeks and that sports-related concussion can lead to long term brain damage. Over 80% of those surveyed believe a player should seek assessment from a doctor on the day the injury occurs, and all participants agreed that a player who has been concussed should not return to sport the day the concussion occurred. The majority of participants (94.8%) believe that once a player has been concussed they should follow a return to play protocol prior to returning to sport.

Table 8. Knowledge attitudes and beliefs around sport related concussion

Knowledge attitudes and beliefs around sport related concussion	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
To sustain a concussion a Pt must have a blow to the head	4 (3.4)	16 (13.7)	12 (10.3)	53 (45.3)	32 (27.4)
All concussion Pts lose consciousness	1 (.9)	0 (0)	1 (.9)	43 (36.8)	72 (61.5)
Pts who are concussed should not play for 3 weeks	39 (33.3)	55 (47.0)	7 (6.0)	11 (9.4)	5 (4.3)
After 3 weeks a Pt can return to normal sporting activities	5 (4.3)	43 (36.8)	28 (23.9)	28 (23.9)	13 (11.1)
Sport-related concussions causes long term brain damage	64 (55.2)	44 (37.9)	6 (5.2)	0 (0)	2 (1.7)
A concussed Pt may not have any symptoms or signs at the time of assessment	41 (35.0)	64 (54.7)	8 (6.8)	4 (3.4)	0 (0)
A player should seek an assessment from a doctor on the day of injury	38 (32.5)	61 (52.1)	11 (9.4)	7 (6.0)	0 (0)

A player who has been concussed should not return to sport the day of injury	98 (83.8)	19 (16.2)	0 (0)	0 (0)	0 (0)
A player who has been concussed should follow a gradual return to play protocol	72 (61.5)	39 (33.3)	5 (4.3)	1 (.9)	0 (0)

Confidence in managing patient with sport-related concussion

Table 9 outlines the responses to participants confidence to manage sports related concussion. Just over half of participants surveyed are confident in managing a patient with sport related concussion.

Table 9: Confidence in managing patient with sport-related concussion

Confidence in managing patient with sport-related concussion	Frequency (%)
Strongly agree	10 (8.5)
Agree	56 (47.9)
Neutral	32 (27.4)
Disagree	16 (13.7)
Strongly disagree	3 (2.6)
Total	117 (100)

Use of treatment and strategies to manage SRC (sport-related concussion)

Table 10 outlines the types of treatment and strategies used to manage SRC. The most commonly agreed upon strategies for the management of sport related concussion is cognitive and physical rest at a level below which provokes the patient's symptoms. Analgesics and NSAIDs were fairly frequently utilised with 79% always or usually prescribing analgesia and 34% NSAIDs. Of the participants, 93% stated that when treating concussion, they rarely or never use opioids such as codeine, tramadol, and morphine. There was a low utilisation of allied health practitioners with 36% and 62% respectively stating they rarely or never referred to physiotherapy and neurovascular or vestibular rehabilitation.

Table 10: Use of treatment and strategies to manage SRC (sport-related concussion)

Use of treatment and strategies to manage SRC (sport-related concussion)	Always	Usually	Some of the time	Rarely	Never
Analgesics	30 (25.6)	62 (53.0)	22 (18.8)	3 (2.6)	0 (0)
NSAIDs	12 (10.3)	27 (23.3)	47 (40.5)	25 (21.6)	5 (4.3)
Opioids	0 (0)	0 (0)	8 (6.8)	56 (47.9)	53 (45.3)
Muscle relaxants	0 (0)	2 (1.7)	10 (8.6)	46 (39.7)	58 (50)
Antidepressants	1 (.9)	0 (0)	12 (10.3)	41 (35)	63 (53.8)
Neuropathic pain medication	1 (.9)	1 (.9)	29 (25.0)	41 (35.3)	44 (37.9)
Sedatives	0 (0)	0 (0)	2 (1.7)	27 (23.3)	87 (75)
Sleep aids and sleep hygiene	9 (7.7)	34 (29.1)	39 (33.3)	18 (15.4)	17 (14.5)
Cognitive/absolute rest	21 (18.1)	28 (24.1)	36 (31.0)	18 (15.5)	13 (11.2)
Cognitive/relative rest. Below symptom provocation	48 (41.0)	42 (35.9)	22 (18.8)	1 (.9)	4 (3.4)
Physical/absolute	10 (8.7)	19 (16.5)	35 (30.4)	39 (33.9)	12 (10.4)
Physical/relative rest. Below symptom provocation	40 (34.5)	56 (48.3)	17 (14.7)	0 (0)	3 (2.6)
Time off work or school	14 (12.1)	53 (45.7)	43 (37.1)	6 (5.2)	0 (0)
Physiotherapy	6 (5.1)	20 (17.1)	49 (41.9)	27 (23.1)	15 (12.8)
Chiropractic, massage or other manual therapy	0 (0)	3 (2.6)	18 (15.5)	46 (39.7)	49 (42.2)
Neurovascular or vestibular rehabilitation	1 (.9)	8 (6.8)	35 (29.9)	29 (24.8)	44 (37.6)

Time from initial visit to patient review

Table 11 indicates the time from initial visit to follow up review. Seventy four percent of participants agree a patient should be reviewed within 7-10 days following their initial visit.

Table 11. Time from initial visit to patient review

Time from initial visit to patient review	N (%)
As required (not improving or worsening)	24 (20.5)

Within 7-10 days	74 (63.2)
3 weeks	5 (4.3)
Never	1 (.9)
Other	13 (11.1)
Total	117 (100)

Who does the follow up and how often.

Table 12 outlines the responses as to who they recommend the patient seek for follow-up. 32.8% usually or always refer the patient to the ACC Concussion Service and 79.3% reported using this service at least some of the time. Most patients continue to be cared for by the original assessing doctor (39.7%) or are referred back to their GP for ongoing care (48.2%). Some participants voiced difficulty with accessing concussion services through the ACC pathway in their region.

Table 12. Who does the follow up and how often.

Who does the follow up and how often.	Always	Usually	Some of the time	Rarely	Never
I do the follow up myself	7 (6.0)	39 (33.6)	40 (34.5)	14 (12.1)	16 (13.8)
Refer back to their GP	24 (21.8)	29 (26.4)	34 (30.9)	12 (10.9)	11 (10.0)
Refer to Sport and Exercise Physician	0 (0)	5 (4.3)	36 (31.3)	34 (29.6)	40 (34.8)
Refer to ACC Concussion Service	10 (8.6)	28 (24.1)	54 (46.6)	17 (14.7)	7 (6.0)
Refer to a Neurosurgeon or Neurologist	0 (0)	0 (0)	21 (18.4)	56 (49.1)	37 (32.5)

Confidence in advising return to sport following concussion

Table 13 outlines the responses to participants confidence to give advice in return to sport. There is a variance in participants confidence in advising on a return to sport with 46% agreeing that they feel confident in advising patients, another 54% are either neutral or disagree in their confidence to do so.

Table 13. Confidence in advising return to sport following concussion

Confidence in advising return to sport following concussion	Frequency (%)
Strongly agree	8 (6.8)
Agree	46 (39.3)
Neutral	38 (32.5)
Disagree	24 (20.5)
Strongly disagree	1 (.9)
Total	117 (100)

DISCUSSION

The results from the *GP 2017 Survey* suggest that GPs and UCPs are knowledgeable regarding the overall management of sports related concussion. The majority of participants (90%) agreed that once concussed a patient should not return to play for 3 weeks and that sports-related concussion can lead to long term brain damage. The majority also believe a player should seek assessment from a doctor on the day the injury occurs, and all participants agree that a player who has been concussed should not return to sport the day the concussion occurred and that once a player has been concussed they should follow a return to play protocol prior to returning to sport. These results are encouraging and consistent with the guidelines particularly as GPs and UCPs are ideally placed within the community to assess and manage sports related concussion and determine when a player is able to return to sport.

There are however some significant gaps in current knowledge and management. Whilst most participants (87.7%) had heard of the SCAT-5 or SCAT-3 tool there is no clear consensus around the ease of use of the SCAT tool. While 41% agree or strongly agree with its ease of use another 59% are either neutral or disagree and 21% indicate they never use the SCAT. Whilst this is an improvement when compared with the Canadian study by Stoller et al., in which 54% of Family Physicians never used the SCAT, further improvement could still be made. Given this is a validated tool to assess sports related concussion and recommended by the guidelines, further work is needed to integrate this tool into common practice. Of the doctors surveyed, 57% would prefer the tool be integrated into their patient management software which may improve utilisation. Consideration of additional funding to allow adequate length of consultation for a full history and SCAT assessment may also assist in uptake of use of the guidelines.

Of greater concern is the low response to the confidence to manage sports related concussion, with only half of the participants stating they are confident. An even smaller percentage (46%) feel confident in managing the return to sport process. These two significant gaps are opportunities for further education.

With respect to the sources of knowledge Best Practice articles/websites and GP conference/CME presentations were considered the most useful. The ACC SportSmart website was found useful by 55%. 56% of those surveyed stated they had no knowledge of the Consensus Statement on Concussion in Sport

Most participants are using appropriate management strategies for patients with concussion and recognise the benefits of cognitive rest. The most commonly agreed upon strategy for the management of sport related concussion was cognitive and physical rest at a level below which provokes the patients' symptoms indicating an understanding of the shift toward relative rest rather than absolute rest. The ability to use cognitive rest appropriately indicates a better knowledge of the condition than seen in the survey by Stoller et al. (2014), where only 49% of Family Physicians advised cognitive rest. However, the inclusion of cervical and vestibular rehabilitation in SRC management (supported in a recent systematic review) (Schneider et al 2017) was somewhat low perhaps indicating a lack of awareness of its benefits. Appropriately, 93% of those surveyed state that when treating concussion, they rarely or never use opioids such as codeine, tramadol, and morphine. Analgesics and NSAIDs were more frequently utilised with 79% always or usually prescribing analgesia and 34% NSAIDs.

CONCLUSIONS

Most GPs and UCPs in this survey understand the key medical management of sports related concussion but are lacking confidence in the overall management, particularly related to when to return to sports. There is also limited use of the SCAT-3 or SCAT-5 tool and limited awareness of the International Consensus Statement or ACC guidelines on concussion. Further education around management, return to sport decision-making and the use of the SCAT tool is warranted. Education attempts will likely be most effective if presented at GP conferences or through Best Practice (Bpac^{nz} Ltd) publications.

RECOMMENDATIONS

- Greater education around the use of the SCAT tool.
- Greater education around overall management of sport-related concussion.
- Greater education regarding return to play decision-making and graduated return protocols.
- GP CME Conferences and Best Practice publications will likely be the most effective way to disseminate concussion knowledge.
- Consider funding the SCAT assessment as a procedure so practices are fairly remunerated and able to resource the time necessary for a thorough assessment.

REFERENCES

Carson, J. D., Rendely, A., Garell, A., et al. (2016). Are Canadian clinicians providing consistent sport-related concussion management advice?. *Canadian family physician*, 62(6), 494-500.

Echemendia, R. J., Meeuwisse, W., McCrory, P., et al. (2017). The Sport Concussion Assessment Tool 5th Edition (SCAT5): Background and rationale. *Br J Sports Med*.51,848-850.

Lebrun, C. M., Mrazik, M., Prasad, A. S., Tjarks, B. J., Dorman, J. C., Bergeron, M. F., ... & Valentine, V. D. (2013). Sport concussion knowledge base, clinical practises and needs for continuing medical education: a survey of family physicians and cross-border comparison. *Br J Sports Med*, 47(1), 54-59.

Pickup, K., Starkey, N., & Theadom, A. (2015). *What do secondary school rugby players think about concussion?* Unpublished Master's Thesis, University of Waikato.

- Pleacher, M. D., & Dexter, W. W. (2006). Concussion management by primary care providers. *British journal of sports medicine*, 40(1), e2-e2.
- Reid, D., Hume, P.A., Theadom, A., Whatman, C., & Walters, S. (2017). *Knowledge and attitudes (KA) surveys on concussion in sport. Referees Survey 2017 Report Number 1 to Accident Compensation Corporation*. SPRINZ, Auckland University of Technology.
- Sport Concussion in New Zealand: *ACC National Guidelines. Accident Compensation Corporation 2015*
www.acc.co.nz.
- Schneider KJ, Leddy JJ, Guskiewicz KM, et al Rest and treatment/rehabilitation following sport-related concussion: a systematic review Br J Sports Med Published Online First: 24 March 2017. doi: 10.1136/bjsports-2016-097475
- Stoller, J., Carson, J., Garel, A., Libfeld, P., Snow, C., Law, M., & Fremont, P. (2014). Do Family Physicians, emergency department physicians and paediatricians give consistent sports related concussion advice? *Canadian Family Physician*, 60, 548-52
- Theadom, A., Starkey, N., Dowell, T. et al. (2014). Sports-related brain injury in the general population: An epidemiological study. *Journal of Science and Medicine in Sport*, 17(1), 591–596. doi:10.1016/j.jsams.2014.02.001