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Medical-attention injuries in community Australian football: A review of 30 years of surveillance data from treatment sources

(Running head: Medical-attention injuries in community Australian football)

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ABSTRACT (250 words):

Objective: In recent reports, Australian football has outranked other team sports in the frequency of hospitalisations and emergency department (ED) presentations. Understanding the profile of these and other 'medical-attention' injuries is vital for developing preventive strategies that can reduce health costs. The objective of this review was to describe the frequency and profile of Australian football injuries presenting for medical attention.

Data sources: A systematic search was carried out to identify peer-reviewed articles and reports presenting original data about Australian football injuries from treatment sources (hospitals, EDs and health-care clinics). Data extracted included injury frequency and rate, body region, nature and mechanism of injury.

Main results: Following literature search and review, 12 publications were included. In most studies, Australian football contributed the greatest number of injuries out of any sport or recreation activity. Hospitals and EDs reported a higher proportion of upper limb than lower limb injuries while for sports medicine clinics the opposite was true. In hospitals, fractures and dislocations were most prevalent out of all injuries. In EDs and clinics, sprains/strains were most common in adults, and superficial injuries predominant in children. Most injuries resulted from contact with other players or falling.

Conclusions: The upper limb was the most commonly injured body region for Australian football presentations to hospitals and EDs. Strategies to prevent upper limb injuries could reduce associated public health costs. However, in order to understand the full extent of the injury problem in football, treatment source surveillance systems should be supplemented with other datasets including community club-based collections.

Keywords: sports injury prevention, injury frequency, community football, injury surveillance, hospital, emergency department

1 INTRODUCTION

2 Australian football is a fast moving team sport, characterised by physical contests between players,
3 kicking, handballing and running.¹ In several recent reports, Australian football has outranked other
4 team sports in the frequency of hospitalisations and emergency department (ED) presentations.²⁻⁴
5 While this is partly due to the high numbers of Australian football participants, there is also a high
6 rate of injury relative to other sports.⁴⁻⁶ As a result, there are significant public health implications
7 associated with Australian football participation.

8 In 2010, approximately 577,700 or 2.6% of Australians participated in Australian football,⁷ mostly at
9 the amateur or community level.⁸ The professional level of the sport, the Australian Football League
10 (AFL), has had a standardised injury surveillance system in operation since 1992,⁹ providing a wealth
11 of injury data which has informed changes in policy and rules to prevent injury.¹⁰ Unfortunately,
12 there are still no systematic injury monitoring systems at any other level of Australian football
13 participation.¹¹ Furthermore, a recent review of club-based injury surveys in community Australian
14 football found that previous studies are of variable quality and have used a diverse range of
15 methodologies.¹² As such, the data generated has been insufficient for informing injury prevention
16 strategies relevant to the broad base of Australian football participation and it is impossible to
17 ascertain whether rule changes designed to reduce injuries¹⁰ have had any impact on injury rates
18 beyond the elite level of the sport. Currently, hospital and ED datasets provide the only routinely-
19 collected available ongoing information about the burden of injury associated with Australian
20 football and many other sports at the broad population level.¹³

21 Over the past 15 years, there have been improvements in the coding of sports injuries in hospital
22 and ED datasets. In 1998, the majority of Australian hospitals introduced the 10th revision of the
23 Australian Modification of the World Health Organisation's (WHO) International Statistical
24 Classification of Diseases and Related Health Problems (ICD-10-AM).^{14 15} By including a specific code
25 for sports activity, the ICD-10-AM greatly improved the identification of sports injuries.¹⁴ In 2002,

codes for a full range of sports and leisure activities were introduced, allowing injuries associated with specific sports, including Australian football, to be identified.¹⁶

Undertaking a review of Australian football injury studies from hospitals, EDs and other ‘treatment sources’ is important for understanding who is seeking treatment, what kinds of injuries require treatment and the causes of such injuries. It also facilitates identification of gaps in the literature, such as any treatment sources where data are not currently available. Such a review has not been published in the peer-reviewed literature. Although injury data obtained from such treatment sources may represent only a small proportion of all injuries (i.e. those requiring medical attention),¹³ the data can be used to develop targeted preventive strategies with the potential to reduce direct health-care costs in these settings.¹⁷

The aims of this review were to describe:

1. The rates and frequencies for Australian football injury presentations to hospitals, EDs and health-care clinics; and
2. The profile of Australian football injury presentations (body region, nature and mechanisms) in these settings.

METHODS

Search strategy

A systematic search was carried out to identify peer-reviewed articles and reports presenting original data from treatment sources (i.e. hospitals, EDs and health-care clinics) about injuries associated with Australian football. Relevant literature was identified through systematic searches of the following electronic databases: OVID MEDLINE (1946 onwards), SCOPUS (all years), SPORTDiscus (all years), EMBASE (1947 onwards), CINAHL Plus (1982 onwards), AUSPORT (1989 onwards), AusportMed (1989 onwards), Aboriginal and Torres Strait Islander Health Bibliography (ATSIhealth)

(1900 onwards), Australian Public Affairs Information Service - Health (APAIS-Health) (1978 onwards), Australian Public Affairs Information Service – Aboriginal and Torres Strait Islander Subset (APAIS-ATSIS) (1978 onwards), Australasian Medical Index (1968 - December 2009), ProQuest dissertations and theses (all years), Google (keyword search) (all years); searches of websites likely to have published reports on injuries in Australian sport, including: the New South Wales Sporting Injuries Committee (www.sportinginjuries.nsw.gov.au), University of NSW Injury Risk Management Research Centre (www.irmrc.unsw.edu.au), AIHW National Surveillance Unit (www.nisu.flinders.edu.au), Monash Injury Research Institute’s Victorian Injury Surveillance Unit (www.monash.edu.au/miri/research/research-areas/home-sport-and-leisure-safety/visu/), Queensland Injury Surveillance Unit (www.qisu.org.au); and hand searches of the reference lists from comprehensive reviews and identified studies.

The search strategy used for MEDLINE is presented in Table 1. It included a combination of controlled vocabulary (MeSH) and free text terms. All searches were based on this strategy but appropriately revised to suit each database. The terms were searched within titles, abstracts and keywords, and the search was limited to English language and human studies. The search was conducted by CFF in January 2011 and then updated by CLE in August 2012.

Inclusion/exclusion criteria

Initially the titles and/or abstracts of identified studies were reviewed. Any abstracts clearly not meeting the inclusion criteria were excluded. If unclear, the full paper was assessed, as were all studies that appeared to meet the selection criteria. Case series (retrospective or prospective), cohort studies and clinical trials were included. Editorials, opinion pieces, literature reviews, abstracts and case studies were excluded. Studies of injuries treated at hospitals, EDs or any kind of health-care clinic were included. Only studies clearly reporting injuries resulting from Australian football, rather than those resulting from football or sport in general, were included. Studies were

required to report the number of injuries and, to enable description of the injury profile in Australian football, at least one of the following variables:

1. Body region injured, e.g. thigh, knee, etc.
2. Nature of injury, e.g. sprain, fracture, etc.
3. Mechanism of injury (or how the injury was sustained), e.g. fall, etc.

The focus of this review was the broad profile of injuries in Australian football. Therefore, studies that focussed on a specific injury type (e.g. concussions or spinal cord injuries) were excluded.

Data extraction

Data were extracted independently by two of the authors (CLE and CFF) using a standardised form. Where discrepancies arose in the extracted data, the included articles received further scrutiny by the authors. Data extracted from each article included: injury frequency and rate per 100 000 participants, body region, nature of injury and mechanism of injury. Ninety-five per cent confidence intervals for frequencies were calculated using Stata® 12 (StataCorp 2011) based on reported denominator values. Where possible, the body regions were categorised according to the Australian Sports Injury Data Dictionary (ASIDD)¹⁸ and then grouped into one of four larger categories: lower limb, upper limb, head/neck and trunk. Nature of injury and injury mechanisms were also categorised according to the ASIDD. Injury mechanism was defined as the last step in a chain of events.¹⁸ For example, if a player was tackled and then injured himself by falling to the ground, it was the fall, not the tackle that was considered to be the injury mechanism.

RESULTS

Overview of search results

The search results are presented in Figure 1. A total of 21 full-text articles were reviewed, nine of which were subsequently excluded. Five of these excluded articles only provided information on injury frequencies or rates without providing any additional details,¹⁹⁻²³ one article reported duplicated data from another included study,²⁴ one did not separate Australian football injuries from other sporting injuries,²⁵ one reported data from player self-report rather than from the treatment source²⁶ and one article reported the data from an included thesis in abridged form.^{27 28} Of the 12 remaining articles (Table 2), four reported hospitalisations only,^{3-5 29} six reported ED presentations only,³⁰⁻³⁵ one reported both hospitalisations and ED presentations² and one reported visits to sports medicine clinics.²⁸ All included studies were case series studies and all but two studies^{30 31} were from the grey literature (nine reports^{2-5 29 32-35} and one thesis²⁸). The majority of publications reported data from ongoing general routine injury surveillance systems, including the Victorian Admitted Episodes Dataset (VAED)^{2 4} and the Victorian Emergency Minimum Dataset (VEMD)² (and previously the Victorian Injury Surveillance System (VISS)^{32 33}), the National Hospital Morbidity Database,^{3 5 30} the New South Wales (NSW) Inpatient Statistics Collection²⁹ and the Queensland Injury Surveillance Unit (QISU).^{34 35} Only three studies limited reporting to specific age ranges: for adults aged 15 years and over^{4 33} and for children aged under 15 years.³² The methodologies of all included studies are described in Table 2.

Included injuries

In all hospitalisation studies (n=5),^{2-5 29} Australian football injuries were specifically identified by searching for those injuries with an ICD-10-AM activity code of Australian football (U50.00) associated with an external cause of morbidity. In the most recent VAED report,⁴ cases coded as 'Unspecified football' (U50.09) were included with Australian football cases based on the safe assumption that, within Victoria, soccer or rugby would not be referred to as 'football'. For the ED

studies (n=7),^{2 30-35} injury presentations were extracted from the relevant dataset and then Australian football injuries specifically identified by searching for the term 'Australian football' (and related terms) in the narrative text descriptions of the injury event. In the sports medicine clinic study, all initial presentations to doctors, physiotherapists, podiatry and massage with Australian football as the activity at the time of injury were reported.²⁸

Time periods for reporting

The dates of publication, depicted in Figure 2, showed a clear pattern of reporting. All seven ED studies were published before 2002 and all five hospital admissions studies were published after 2002. In general, the reporting timeframes for each study were relatively short, with the majority of studies (n= 9) reporting data over a one to two-year time period.^{2 3 5 28 29 32-35} However, the most recent VAED report also included a trend analysis covering 2002-3 to 2012-3.⁴ One study reported data over five years.³⁰

Injury rates/frequencies

Reported injury rates and frequencies are presented in Table 2. In all but the NSW study,²⁹ Australian football was responsible for the highest percentage of hospitalisations out of all reported sport or recreational activity. For example, in Victoria, Australian football was responsible for 50% of all hospitalisations resulting from 16 of the most popular sports.⁴ Across Australia, this value was lower at 9%^{3 5} of all sport or recreation hospitalisations but was still the highest of any sport. For studies reporting ED presentations, Australian football injuries were again more frequent in the Victorian studies^{2 32 33} than those from states with fewer Australian football participants (e.g. Queensland).^{34 35} In Victoria, Australian football was responsible for the highest percentage of sport-related ED presentations (22²-36%³³). In Queensland, the proportion of ED presentations for Australian football was much lower (4% of all sports injury presentations). In this state, rugby codes were responsible

for a far greater proportion of ED presentations.³⁵ Nationwide, values ranged from 11% of all sports/recreation injury ED presentations for children (second only to cycling)³⁰ and 22% in adults (highest out of all sports/recreation activities).³⁰ In the sports medicine clinic study, Australian football was responsible for 29% of all treated injuries, the highest proportion of any sport.²⁸

Three of the five hospitalisation studies also reported injury rates relative to participation. In two of these studies, Australian football had the highest rate of hospitalisation of any other reported sport/leisure activity, with 635 hospitalisations per 100,000 participants across Australia³ and 1001 hospitalisations per 100,000 participants in Victoria.⁴ The third study reported an injury rate of 734 hospitalisations per 100,000 participants which was the highest rate of all sports and recreation activities across Australia behind only wheeled motor sports (e.g. trail-bike riding) and roller sports (e.g. skateboarding).⁵ A trend analysis conducted within the VAED, revealed a significant increase in the frequency of Australian football hospitalisations from 1693 in 2002-03 to 2098 in 2009-10.⁴ However, there was no significant change in participation-adjusted hospitalisation rates, indicating that the increase in injuries was associated with an increase in participation.⁴

Body regions

Table 3 presents body regions injured as a percentage of all cases. In the sports medicine clinic study, the lower limb was the most commonly injured body region (62% of all injuries).²⁸ In contrast, all other studies reported a predominance of upper limb injuries (36²-54%³²). In nine of the 12 hospital and ED studies, the lower limb was the second most commonly injured body region (19³⁵-33%³⁰). In studies that separated adults and children, children had a higher ratio of upper limb to lower limb injuries compared to adults (see Table 3).^{30 32 33}

Several reports provided details of specific body parts injured.^{2-5 28 31 33-35} Where reported,²⁻⁵ the head or head/face specifically were the most commonly injured body parts resulting in hospitalisation

(23⁴-26%² of all cases). Across all studies, the majority of injuries to the upper limb involved the hand, wrist and fingers (11²⁸-31%³⁴) and the shoulder (7³⁴-15%³⁵). The majority of injuries to the lower limb involved the knee (5³⁴-31%²⁸) and the ankle (5³⁴-13%³¹). Of all head/neck injuries, head injuries were most prevalent (5³³-25%⁵), followed by facial injuries (excluding the eye) (10³⁴-15%³³).

Nature of injury

Table 4 presents the nature of injuries categorised according to the ASIDD. Fractures and fracture/dislocations were the predominant type of Australian football injury leading to hospitalisation (53⁴-62%²⁹ of all injuries). There was also a high proportion of intracranial injuries (6²⁹-11%²) and sprains/strains (6²⁹-13%²). While sprains/strains were the leading nature of injuries for adults presenting to EDs (21³³-33%³⁴), in children, superficial injuries (including bruising, blisters, grazes, superficial swelling and inflammation) were most prevalent (30³⁰-31%³²). Sprains (34%) were the most common type of injury presenting to sports medicine clinics.²⁸

Nature of injury by body region

A selection of studies also reported the nature of injury in association with the specific body region injured. In the 2002 VAED report², the most prevalent Australian football injuries were hand and finger fractures/dislocations (14%). In the 2007 report of Australia-wide hospitalisations³, fractures of the lower end of radius (8%) were predominant. In New South Wales hospitals²⁹ and in the most recent VAED report⁴ the most prevalent Australian football injuries were wrist and hand fractures (15% and 17% respectively). For ED presentations at one Victorian hospital,³¹ ankle ligament damage (10%) was most common. In the 2002 VEMD report,² hand and finger fractures/dislocations (13%) were the most frequent injuries. Finally, in the sports medicine clinic study²⁸ the most common individual diagnosis was a medial collateral ligament injury of the knee (7%).

Mechanism of injury

Table 5 presents the reported mechanisms of injury for Australian football injuries. All hospitalisation and clinic studies reported injury mechanisms but only four of the seven ED studies did so. The most common mechanism of injury was being 'struck or hit by contact with other object, person or animal'.^{2-5 28 35} Across all studies, between 29²⁹ and 73%² of injuries resulted from contact; usually this contact was with another player. A fall was the second most common mechanism of injury, accounting for 14²⁸-44%²⁹ of all injuries. For NSW hospitalisations, falling was the most common mechanism of injury but it should be noted that the majority of these falls were actually due to a collision with, or pushing by, another person.²⁹ In the two VISS reports, it was not clear whether contact or falls were the predominant mechanism.^{32 33} Falls were not included as a separate injury mechanism but instead described as "hitting against an object, surface or person"³³ or "hitting against victim moving".²⁴

Mechanism of injury by body region

A subset of studies also provided injury mechanisms for specific body regions.^{2 29 33} Amongst upper limb injuries treated in Victorian and NSW hospitals, falling was the leading cause of injury (32²-73%²⁹ of all upper limb injuries). The NSW study specified that 82% of these falls were due to collision with, or pushing by, another person.²⁹ Amongst cases presenting to Victorian EDs, the most common mechanism for upper limb injuries was a collision with a person or object (65%).² In all three reports, falls were the predominant injury mechanism for lower limb injuries (22²-69%²⁹). In NSW hospitals, head injuries were mainly the result of falling due to collision with, or pushing by, another person (33%).²⁹ While in Victorian hospitals and EDs, the majority of head/face/neck injuries resulted from hit/struck/crush incidents (72%) and collisions (87%), respectively.²

DISCUSSION

The aim of this review was to report the frequency, rate and profile of Australian football injuries treated in hospitals, EDs and health-care clinics. Understanding the profile of these ‘medical-attention’ injuries is vital for informing preventive strategies that could reduce Australian football-related health-care expenditure. This review confirms that, in Australia, Australian football is a sport with a high frequency and rate of injury compared to other sports, and provides support for prioritisation of preventive initiatives aimed at reducing Australian football-related hospital admissions and ED presentations for upper limb injuries and their primary mechanisms of falling and collisions.

In nine out of 12 included studies, Australian football contributed the greatest number of injuries out of any sport or active recreation activity. Only the three studies from NSW²⁹ and Queensland^{32 33} reported higher injury frequencies in other sports, such as rugby league. In part, this can be attributed to the greater popularity of rugby codes in these two states.³⁶ However, in most of the studies that adjusted for participation counts, the rate of injury was still highest for Australian football.^{3 4} Other organised sports such as soccer and netball have greater numbers of participants but far fewer ED presentations and hospitalisations than Australian football.^{5 7 30}

Amongst Australian football injuries treated in hospitals and EDs, injuries to the upper limb were the most common reason for presentation. This finding contrasts with that of a recent review of injuries in community Australian football clubs.¹² The authors reported injury data from studies using field-based injury monitoring methods and therefore encapsulated a wider spectrum of injuries from mild to severe. In their review, the lower limb was found to be the most commonly injured body region with injuries to the knee, ankle and thigh (e.g. hamstrings, quadriceps) predominant. It also found that while injuries to the lower limb mainly consisted of sprains, strains and superficial injuries, injuries to the upper limb were more likely to consist of fractures, sprains and strains. This may explain our finding of upper limb injuries being more common in hospital and ED datasets as

fractures are more likely to require the urgent attention available at hospitals. In fact, the most common specific injury diagnoses in hospital and ED datasets were fractures to the wrist, hand and fingers.

To inform priorities for the development of preventive strategies for Australian football injuries, it is important to first identify common injury types and their injury mechanisms. Considering the predominance of upper limb fractures caused by Australian football, developing strategies to prevent these injuries could reduce public health-care expenditure. Upper limb injuries were most consistently caused by falling,² a collision² or falling due to a collision or push.²⁹ Strategies to reduce upper limb injuries might include preventing excessive contact in community football matches through increased umpiring vigilance or rule modification. Other injury prevention strategies might include training skills in the safe use of contact and the ability to withstand contact.³⁷ There is also evidence that landing skills training programmes can improve landing and falling skills and significantly reduce injury in junior Australian footballers.³⁸

While the treatment source data reviewed here can provide useful information about the most serious injuries in football, they do not capture all Australian football-related injuries. It has been reported that up to three quarters of individuals who experience a sports injury will not seek treatment, despite the fact that many of these injuries may be considered ‘significant’ in terms of the disruption caused to daily life and activity participation.³⁹ Others will only receive first aid treatment from sports trainers or other health professionals at the scene of the injury.^{25 40} Of those injuries that do receive treatment in a health-care setting, 44% will reportedly be treated in physiotherapy or general practice clinics and only 9% will require treatment in hospitals and EDs.⁴¹

Incomplete case capture led to further limitations in the reported data. While the capture rate of injuries was reportedly very high in the sports medicine clinic study (93%),²⁸ in the hospital and ED datasets the capture rate was much lower.^{2 4 16} One-third of NSW hospitalisations¹⁶ and up to two-thirds of Victorian hospital injury case records^{2 4} had missing or unspecified activity codes, precluding

1 attribution of the injury to a particular sport. Attempts to improve the consistency of activity coding
2 in hospital and ED datasets may help to provide more complete injury data in future studies.

3 Another major challenge in interpreting the data from this compilation, and translating it to clearly
4 actionable injury prevention priorities, is the fact that most studies used largely uninformative
5 categories to describe key injuries (e.g. strains/sprains combined) or factors associated with injury
6 causation (e.g. “overexertion” and “overuse”). Most routine health sector data is constrained by the
7 coding and classification scheme used in the ICD⁴² and therefore, it is recommended that sports
8 injury epidemiologists and other musculoskeletal experts seek involvement in committees that make
9 decisions about ICD code modifications. Interestingly, all five hospital admissions studies were
10 published after 2002 which is the year that the full range of activity codes were added to the ICD-10.
11 This demonstrates the importance of having useful and relevant coding and classification schemes
12 for injury surveillance and strengthens the argument for the ICD to continue to include specific
13 activity codes for all sports.

14 A further limitation of the reported data was the lack of detail about the level of play at which an
15 injury was sustained.¹³ For example, the reported injuries may have occurred in any context, ranging
16 from backyard play to elite levels of the game. Furthermore, in studies reporting injury rates,
17 participation figures were obtained from the Exercise, Recreation and Sport Survey (ERASS).³⁻⁵ This
18 survey includes all levels of play, including leisure, and does not take into account the frequency or
19 intensity of play.⁴³ Therefore, injury rates must be interpreted with caution considering the broad
20 spectrum contained within both numerator and denominator values.

21 There were several gaps in the literature identified by this review. The majority of studies did not
22 cross-tabulate different injury variables when reporting injury frequencies. In order to support injury
23 prevention efforts, it is recommended that this level of detail be provided in future studies. For
24 example, knowing the most common injury mechanisms for different body regions and diagnoses

would help inform the design of more specific injury prevention strategies, as well as improve our understanding of the overall burden of injury related to specific sports.

Another gap in the literature is the absence of recent health-care clinic and ED publications on Australian football injuries, with all of these studies having been published prior to 2002. Considering the fact that a higher proportion of sports injuries will receive treatment in clinics and EDs than those requiring hospitalisation, there is a continued need for reporting from these sources.^{41 44} This is also likely to be the case in many countries other than Australia. Another limitation was that neither ED nor clinic reports provided injury rates by participation thereby preventing comparisons of injury rates across sports. Finally, it is recommended that future reports from hospital and ED datasets be translated for publication in peer-reviewed journals so as to disseminate the evidence to a wider audience and to ensure that any limitations in the dataset are addressed adequately.

There is good evidence to suggest that many sports injuries are preventable. However, successful injury prevention strategies are reliant on good quality epidemiological data to inform their development. While the treatment source data reviewed here are useful for providing information about medical-attention injuries in Australian football, these sources do not capture the full extent of the injury problem in Australian football. Other injuries may be just as significant to participants in terms of their impact on activity, employment and quality of life. Supplementing treatment source datasets with other routine injury surveillance systems such as community club-based datasets could provide a more comprehensive understanding of how best to prevent injuries in all sports.

CONCLUSIONS

Currently, there is no systematic injury surveillance specifically designed for the broad base of Australian football participation. Therefore, ongoing reporting from routine treatment source datasets is needed to provide a valuable source of epidemiological data and inform prevention

1 strategies. It is reasonable to assume that a similar situation currently exists in many sports around
2 the world, as well as in Australian football, where the broad base of participation is at the
3 community, rather than elite, level.

4 The findings of this review suggest a number of immediate priorities, including a need to address the
5 high frequency of upper limb injuries and their primary mechanisms of falling and collisions. Several
6 limitations were also identified in the reporting of treatment source data that warrant improvement
7 to maximise the potential to inform preventive strategies for Australian football and other sports
8 more generally. These include a need to improve the consistency of activity coding in hospital and
9 ED datasets, to report injury diagnoses and mechanisms in greater detail and to increase reporting
10 on injuries treated at EDs, health-care clinics and in other community settings.

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Figure 1. Flow diagram presenting search results

Figure 2. Timeline presenting dates of publication for hospitalisation, ED and clinic studies

Figure 1. Flow diagram presenting search results

Figure 2. Timeline presenting dates of publication for hospitalisation, ED and clinic studies

Table 1. Search strategy

1. (Australia\$ adj3 Football\$)
2. Australian rules
3. Australian Football League
4. 1 or 2 or 3
5. death
6. musculoskeletal disease
7. exp "wounds and injuries"/
8. 5 or 6 or 7
9. hospital\$
10. emergenc\$
11. medic\$
12. clinic
13. admit\$
14. admission\$
15. 9 or 10 or 11 or 12 or 13 or 14
16. 4 and 8 and 15

*Participation values only available for those 15 years and over; †Children <15 years; ‡Adults ≥15 years; § denominator values not given (95% confidence intervals could not be calculated); **Shaded %** indicates this was the highest proportion out of all included activities; cells left blank where categories not reported.

Table 3. Broad body regions injured in community Australian football (numbers are % of total cases)

	Hospital admissions					Emergency department presentations								Clinic visits
	Cassell and Clapperton, 2002 ²	Flood and Harrison, 2006 ⁵ *	Henley, 2007 ³ *	Finch et al., 2007 ²⁹	Cassell et al., 2012 ⁴	Quinn, 1983 ³¹	Routley and Ozanne-Smith, 1991 ³² †	Routley and Valuri, 1993 ³³ ‡	Finch, 1998 ³⁰ †	Finch, 1998 ³⁰ ‡	Hockey and Miles, 1998 ³⁴	Hockey and Knowles, 2000 ³⁵	Cassell and Clapperton, 2002 ²	Gabbe, 1999 ²⁸
Total cases (n)	1947	3944	4280	902	6275	771	825	1517	5948	10122	41	334	8863	1868
Upper limb	36%	(1)	(1)	42%	43%	37%	54%	41%	53%	38%	38%	42%	43%	24%
Lower limb	28%	(2)	(2)	29%	23%	28%	23%	27%	23%	33%	10%	19%	23%	62%
Head/neck	26%	(3)	(2)	24%	25%	25%	15%	20%	17%	20%	12%	17%	24%	8%
Trunk	8%	(4)	(4)	5%	8%	10%	7%	7%	5%	7%			7%	8%

*These reports did not give the actual percentages in each category. The numbers here represent the decreasing rank order presented in that report; †Children <15 years; ‡Adults ≥15 years

Shaded % represents the highest proportion out of all body regions for that study; cells left blank where categories not reported.

NB. When the % do not add up to 100% for a given study, the remainder can be ascribed to a general "other" category

Table 4. Nature of injury in community Australian football (numbers are % of total injuries)

	Hospital admissions					Emergency department presentations								Clinic visits
	Cassell and Clapperton, 2002 ²	Flood and Harrison, 2006 ⁵ *	Henley, 2007 ³ *	Finch et al., 2007 ²⁹	Cassell et al., 2012 ⁴	Quinn, 1983 ³¹	Routley and Ozanne-Smith, 1991 ³² †	Routley and Valuri, 1993 ³³ ‡	Finch, 1998 ³⁰ †	Finch, 1998 ³⁰ ‡	Hockey and Miles, 1998 ³⁴	Hockey and Knowles, 2000 ³⁵	Cassell and Clapperton, 2002 ²	Gabbe, 1999 ²⁸
Superficial		(9)	(8)	2%	2%	21% (haematoma only)	31%	26%	30%	26%		10%		22%
Open wound		(8)	(9)	2%	2%	9%	5%	7%	6%	9%		9%		3%
Fracture		(1) (56%)	(1) (54%)	62%	53%	32%	30%	30%	29%	23%	31%	28%	26%	13%
Dislocation	60%	(3)	(2)	8%		6%	2%	8%			7%			8% (dislocations/subluxations) 4% (meniscus tears)
Sprain or strain	13%	(4)	(5)	6%		20%	24%	21%	24%	30%	33%	31%	30%	34% (sprains) 14% (sprains)
Injury to nerve (inc. spinal cord injury)		(10) (1%)	(10) (1%)											
Injury to muscle or tendon		(7)	(7)	3%	3%									3% (tendon pathologies)
Injury to internal organ		(6)	(6)	2%	4%	3%								
Intracranial injury (inc. concussion)	11%	(2) (10%)	(3) (9%)	6%	7%	6%	6%	4%			7%	7%	5%	
Other specified nature of injury		(5)	(4)	10%		3%	2%	4%	11%	13%				
Injury of unspecified nature					8%									

*These reports did not give the actual percentages in each category. The numbers here represent the decreasing rank order presented in that report; †Children <15 years; ‡Adults ≥15 years
Shaded % represents the highest proportion out of all injury types for that study; cells left blank where categories not reported.

Table 5. Mechanism of injury in community Australian football (numbers are % of total injuries)

	Hospital admissions					Emergency department presentations				Clinic visits
	Cassell and Clapperton, 2002 ²	Flood and Harrison, 2006 ⁵ *	Henley, 2007 ³ *	Finch et al., 2007 ²⁹	Cassell et al., 2012 ⁴	Routley and Ozanne-Smith, 1991 ³² †	Routley and Valuri, 1993 ³³ ‡	Hockey and Knowles, 2000 ³⁵	Cassell and Clapperton, 2002 ²	Gabbe, 1999 ²⁸
Fall	24%	(2)	(2)	44% (fall due to collision/pushing =34.8%)	22%	85%	81%	32%	24%	14%
Struck, hit by contact with other object, person or animal	42%	(1) (33% contact with person)	(1) (34% contact with person)	29%	45%			58%	73%	54%
Crushing, piercing, abrading						2%				
Gradual or chronic over-exertion of body or part of body										16%
Acute over-exertion of body or part of body	(4) 5%					12%	17%			6% (Twist, rotation, change of direction)
Other and unspecified mechanism of injury	(3) (3) 23% 32%					1%	2%	5%	12%	

*These reports did not give the actual percentages in each category. The numbers here represent the decreasing rank order presented in that report; †Children <15 years; ‡Adults ≥15 years
Shaded % represents the highest proportion out of all injury mechanisms; cells left blank where categories not reported.