



Original research

Australian netball injuries in 2016: An overview of insurance data

Corey Joseph^{a,*}, Geraldine Naughton^b, Alanna Antcliff^c^a Monash Health, Australia^b Macquarie University, Australia^c Netball Australia, Australia

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ABSTRACT

Objectives: The objective of this study is to profile the netball-specific sporting injuries from in a national community-level insurance claim database.

Design: An audit of insurance injury claims.

Methods: An electronic dataset containing successful injury insurance claim data from the 2016 netball season was retrospectively coded. Data were de-identified and coded to meet the Orchard Sports Injury Classification System. Descriptive data reported included age, injury date, activity type, anatomical injury location, nature of injury, weather conditions, indoor/outdoor surface, quarter injury occurred, and open text for injury description.

Results: The dataset contained 1239 claims that were approved for payment by the insurance company. The overall incidence rate was 2.936 successful injury claims per 1000 participants. The average age of players with claims was 34 years. The majority of successful claims came from players aged 22 to 29 years (n = 328; 27%) and 30–39 years (n = 279; 23%) age groups. Of the successful claims for injury, most occurred during matches (n = 1116; 92%), and were for injuries to the knee (n = 509; 42%) and ankle (n = 356; 29%) and for sprains/ligament damage (n = 687; 57%) or fractures (n = 182; 15%).

Conclusions: Netball injuries profiled by an injury insurance dataset of successful claims mostly occurred to the knee and ankle. Sprains and ligament damage were the most common type of injury. This study strengthens the evidence for national injury prevention policies and strategies. Findings from the current study could be used in future to expand into mechanisms of injury, and injury diagnoses.

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Practical implications

- These findings provide a profile of injuries that occur in community-level netball, which there is a scarcity of information.
- This study provides objective data and evidence to inform national injury prevention policies and strategies.
- These results provide justification for detailed reporting of injury mechanism that, in turn, will further support injury prevention efforts.

1. Introduction

Netball is a non-contact sport played predominantly in Commonwealth based nations that is enjoyed by people of all ages. In Australia, netball is played by more than 410,000 people and is the highest participated in team sport for females.¹ Although netball

is a non-contact sport, injuries are reported across a range of participation levels of netball.^{2–4} Current injury data are limited by a piecemeal perspective from isolated domains and data sources such as, hospitals and emergency departments⁴, first aid rooms², or national championships.³

An inherent limitation seen in sports injury epidemiology is that the type of data captured is generally proportional to the level of severity of the injury.⁵ For example, in the state of Victoria, Australia, data on all injuries are routinely collected in hospitals and emergency departments, which in turn are used to provide a perspective of sports injuries.^{6–8} Hospitals and emergency departments comprise the settings where the most severe injuries, such as fractures, are presented yet, it is likely that injured players will not present to hospital emergency departments for a variety of reasons. As a result, the potentially less severe injuries that do not get captured in the hospital setting cause a gap in the dataset available to profile these injuries. Therefore, capturing data that includes those injuries that are less severe and occur more regularly is critical to a more comprehensive understanding the burden of injuries in netball players.

* Corresponding author.

E-mail address: corey.w.joseph@gmail.com (C. Joseph).

Injury insurance claim databases provide an existing infrastructure with the potential to collect rich routine, systematic, and robust data that is otherwise difficult to acquire through research investigations. These databases are generally large in sample size and longitudinal in nature. Sports insurance claims provide the ability to monitor and detail injuries that are not captured in hospital settings.^{9,10} However, challenges remain in capturing nation-wide sports injury data given the requirement of a national cooperative and collaborative network. Interestingly, countries such as Sweden, Switzerland and New Zealand have successfully used these datasets to most precisely quantify the national burden of sports injuries.^{11,14,15} Australia lacks a national sports injury surveillance system or insurance scheme. Nevertheless all netball players who are registered with a competitive club nation-wide are covered by insurance for injuries that they may incur. This investment in a sport-specific insurance scheme therefore, provides a valuable platform to collect and survey injuries that occur at the community level.

As a result, the objective of this study is to profile injuries present in a community-level national register of successful netball injury insurance claims. The specific aim was to detail information relating to the type and anatomical location of claims that were present in the data.

2. Methods

The Netball Australia National Risk Protection Accident Insurance Program provides cover for non-medicare item medical expenses as well as Loss of Income cover for any Netball Australia registered player or person. Medicare is a publically funded national universal healthcare system in Australia. All players who register to play in an organised competition governed by Netball Australia must pay a registration fee, which subsequently, qualifies them as a member of the injury insurance policy. Any player or member of a registered community netball club is eligible to engage the insurance cover. Individuals are covered by the policy when they are “engaged in officially sanctioned activities involving: time of operation of cover playing in club, representative, state or national matches, training routines arranged by the club, league, association or federation, travelling directly to or from the above activities and residence or place of employment or club premises, staying away from home during a tour for the purposes of participating in representative matches, an administrative capacity or organised social and fund raising activities.” For the purpose of this study data extraction was limited to claims for injuries that occurred during playing or training, and no other contexts such as travelling, injuries while staffing the canteen, etc.

An injury was defined by the insurance company as a “bodily injury resulting from accident, which is not an illness and which is not of a repetitive nature and which occurs during the period of insurance, and within twelve (12) months of the injury, results solely and independently of any other cause in the events covered under this Policy, and includes any condition resulting from exposure to the elements as a result of injury”.

Players or members were required to complete one standardised claim form per claim outlining the injury, or injuries if multiple, and details surrounding it. If a claim contained multiple injuries, only the first injury reported in the claim was coded as this was generally the primary injury. An association/club official was required to verify that the incident took place, and an attending physician or physiotherapist was required to complete a report regarding the details of the injury. The form was then submitted to the insurance company for review and data was transcribed into an electronic database in which the details were stored.

Data were retrospectively coded from an electronic database in Microsoft Excel 2013 (Microsoft, Washington, U.S.). Data regarding injury insurance claims were de-identified and contained information about age, injury date, activity type (match or training), anatomical injury location, nature of injury, weather conditions, indoor/outdoor surface, quarter injury occurred, and open text for injury description. Data relating to the anatomical location of injury and type of injury were extracted and coded by one author to meet the Orchard Sports Injury Classification System (OSICS-10).¹⁶ Two independent authors, from differing backgrounds, coded 10% of the dataset and agreement was assessed.¹⁷ Coding agreement was assessed and presented as percentage of agreement.¹⁷

Total netball participation figures (n=413,800 participants) were used from the most recent Participation in Sport and Physical Recreation report.¹ The total netball participation figure includes all players who are formally registered to a club that is governed by the national sporting body, Netball Australia. Annual injury rate was calculated by dividing the number of injuries by the total number of participants (number of injuries/number of participants). This was then multiplied by 1000 to estimate incidence rate per 1000 participants. The 95% confidence intervals of the claim rate were calculated as: (claim proportion \pm (1.96* standard error)). Standard error = $\sqrt{\text{claim proportion} * ((1 - \text{claim proportion}) / \text{total number of claims})}$. Claim rate was calculated by multiplying claim proportion multiplied by 1000 to report it as per 1000 claims.

Body region and injury type were reported as a total count and as a proportion of all injuries. It was not possible to determine if these injuries were subsequent injuries. To meet National Health and Medical Research Committee guidelines, any data cell totals that were less than 5 was represented as an asterisk (*) to ensure privacy and anonymity. Age was categorised to align with national figures¹ and previous work,¹⁸ and presented accordingly.

Ethics approval was granted for this project by the Human Research Ethics Committee of the Australian Catholic University (2016-36N).

3. Results

Over the period from the 1/1/2016 until the 31/12/2016, the database contained 1239 injury claims that were approved for payment by the insurance company. Of these records, 24 were excluded from this study as they did not involve players, or did not occur during matches or training. No records were excluded based on incomplete data. As a result, the final total of successful injury claims included in this study was 1215.

Coding agreement between the two independent coders met acceptable levels and suggested agreement. The current study reported a 95% agreement on the first digit of the OSICS code, and an 88% agreement on the second OSICS code if there was agreement on the first code. Previous work has indicated acceptable agreement of 95% for OSICS digit 1 and 86% for OSICS digit 2.¹⁷

The overall injury incidence rate based on successful claims 2.936 injuries per 1000 participants. The age of those participants showed that the age of the most prevalent successful claimee was 34 ± 17 years (mean \pm standard deviation).

The majority of successful injury claims were for injuries to the knee (n=509; 42%) and ankle (n=356; 29%) and for sprains/ligament damage (n=687; 57%) or fractures (n=182; 15%) (Table 1).

An analysis of injuries over quarters showed a tendency for more injuries in the second quarter, although counts were similar in all quarters. Other claims were dominated by environmental conditions such as fine weather conditions, on an outdoor court, an asphalt/concrete surface, and whilst the playing surface was wet (Table 2). The majority of successful claims came from the

Table 1
Summary of the anatomical location and type of injuries that led to a successful claim.

Anatomical location	n	%	Claim rate per 1000 claims (95% CI)
Knee	509	42	418.93 (391.19–446.67)
Ankle	356	29	293.00 (267.41–318.60)
Wrist	132	11	108.64 (91.14–126.14)
Lower leg	67	6	55.14 (42.31–67.98)
Shoulder	31	3	25.51 (16.64–34.38)
Foot	30	2	24.69 (15.97–33.42)
Head	25	2	20.58 (12.59–28.56)
Elbow	14	1	11.52 (5.52–17.52)
Lumbar spine	14	1	11.52 (5.52–17.52)
Upper arm	8	1	6.58 (2.04–11.13)
Thigh	7	1	5.76 (1.51–10.02)
Hip and groin	6	0	4.94 (1.00–8.88)
Unknown	6	0	4.94 (1.00–8.88)
Chest	a	a	a
Neck	a	a	a
Pelvis/buttock	a	a	a
Injury type			
Sprain/ligament injury	687	57	565.43 (537.56–593.31)
Fracture	182	15	149.79 (129.72–169.86)
Tendon	77	6	63.37 (49.67–77.07)
Muscle	74	6	60.91 (47.46–74.35)
Dislocation	61	5	50.21 (37.93–62.48)
Disc/chondral/osteochondral injury	42	3	34.57 (24.30–44.84)
Unknown	34	3	27.98 (18.71–37.26)
Organ damage (i.e. tooth, eye, ear)	17	1	13.99 (7.39–20.60)
Pain/injury not specified	17	1	13.99 (7.39–20.60)
Bruising/haematoma	10	1	8.23 (3.15–13.31)
Instability	a	a	a
Neurological (i.e. concussion)	a	a	a
Stress fracture	a	a	a
Synovitis	a	a	a
Whiplash	a	a	a

^a Denotes count less than 5.

25 to 34 years ($n=358$; 30%) and 18 to 24 ($n=306$; 25%) age groups (Table 2). The majority of injuries occurred during matches ($n=1116$; 92%).

4. Discussion

To the authors' knowledge, this is the first study to report the profile of nation-wide community-level netball injuries based on data from successful insurance claims in Australia. From this dataset, the majority of successful injury claims were for injuries to the knee and ankle, and for sprains/ligament damage or fractures. The majority of successful injury claims were for injuries that occurred in the second quarter of play, under fine weather conditions, on an outdoor court, an asphalt/concrete surface, and whilst the playing surface was wet.

An overall injury incidence rate based on successful claims of 2.9 injuries per 1000 participants is reported in this study. Previous research reporting netball injuries from insurance claims has reported incidence rate of 9 injuries per 1000 players,¹⁰ which is higher than the rate reported here. It is possible that the discrepancies are related to differing data collection methodologies, with previous research having reported injury data for one state whereas this study reports figures nationally. Reporting data from one state may over or under represent figures depending on the number of participants. It is also possible that awareness of the insurance scheme by players was different between studies and therefore, more players placing a claim for their injury may explain the larger incidence rate. There is also the potential for the scope of injuries able to be claimed under the policy became limited. Therefore, changes in claim criteria may have resulted in less successful claims for injuries than previously reported.

Other netball injury rates from non-insurance data have been reported as 139 injuries per 1000 players,³ 52 injuries per 1000 players,¹⁹ 304 injuries per 1000 players²⁰ and 17 injuries per

1000 participations.²¹ Again, variances in incidence rates could be contributed to the differing methodologies of each study. Comparisons in injury rates are difficult given the different populations, data collection methodologies and injury definitions. For example, injury data has been collected over 3 days of a representative championship,³ or over several months of community level participation.²¹ The differing duration of data collection periods and the breadth of competition levels studied may contribute to the differing injury rate figures. It is also possible that competitions conducted over a series of days may result in higher injury rates due to limited recovery time between games, where two games per day are common, compared with one game per week in domestic and or community competitions.²²

Furthermore, injury definitions also vary vastly between studies; making injury rate comparisons difficult.²³ It is possible that definitions are more or less sensitive to registering a player as being injured which then provides a profile that is larger or smaller than a study using a different definition.

Other reasons for this study reporting lower injury rates than previous work may be due to the nature of insurance data and that it is likely to capture claims for more severe injuries¹⁰ that impose a larger burden on the player. As a result, it is possible that insurance datasets that profile sports injuries underrepresent the real burden of injuries given they generally do not provide a complete profile of injuries that are less severe in nature, or contain information about injuries that did not require treatment, or financial cost.

Other sporting codes have reported injury figures from insurance datasets.^{14,24} Soccer injuries in Sweden had an incidence rate of 16 injuries per 1000 participants.²⁴ This rate is higher than in this study and in addition to differing definitions and conditions of data capture, could be explained by the differing nature of the sports.

Ankle and knee are consistently the most frequently injured body parts in netball.^{2,20,21} The proportions of knee injuries presented in this study (42%) was lower than some previous work²

Table 2

Summary of weather, quarter injury occurred, court location, activity type, surface type, and surface condition for injuries that led to a successful claim.

Variable	n	%
Weather		
Fine	1153	94.98
Showers	27	2.22
Dry	9	0.74
Extreme cold	6	0.49
Raining	15	1.24
Extreme heat	^a	^a
Quarter		
1st quarter	288	23.72
2nd quarter	294	24.22
3rd quarter	282	23.23
4th quarter	245	20.18
Not applicable	104	8.57
Court location		
Outdoor	831	68.45
Indoor	382	31.47
Activity type		
Game	1116	91.93
Training	96	7.91
Unknown	^a	^a
Surface type		
Concrete/asphalt	787	64.83
Timber	350	28.83
Synthetic	62	5.11
Other	14	1.15
Surface condition		
Wet	1145	94.32
Dry	9	0.74
Other	59	4.86
Age (years)		
5–9	3	0.25
10–14	59	4.88
15–17	155	12.81
18–24	306	25.29
25–34	358	29.59
35–44	233	19.26
45–54	81	6.69
55–64	14	1.16
65+	1	0.08

^a Denotes count less than.

but also higher than others.^{3,20,22} The high rate reported here is likely related to the cost and severity of knee injuries, and therefore, players are more likely to seek compensation through an insurance claim. Sports-related knee injuries in Australia have been reported as high with hospitalised sports-related injuries indicating that knee injuries are the most common, particularly in netball, and particularly for females.¹⁸ The proportions of ankle injuries presented in this study (29%) were similar^{20,21} or lower than previously reported,^{2,19,22} but also higher than previously reported.³ Hospitalised sports-related injuries in Australia have reported the ankle being in the top five most common however, these injuries are mainly related to soccer and rugby.¹⁸

The most common injury types in this study were sprains/ligament damage (57%), or fractures (15%). These figures are similar to previous netball research.^{10,21,22} The nature of the movement patterns performed in netball was postulated to be a result of the high proportion of joint injuries, such as sprains/ligament damage.^{26,27} Rapid accelerations, sudden and explosive changes of direction, jumping and landing are all movement characteristics associated with netball^{26,27} with landings the most common mechanism for injury, particularly to the knee and ankle joints.^{2,21,25} The smaller proportion of fractures, compared with sprains/ligament damage reported here is likely to be related to the severity of such an injury and the observation that fractures are more likely to present in hospital emergency departments in

the public healthcare system.⁴ Further, because fractures can be diagnosed and managed in the public healthcare system, there is no out-of-pocket cost for immediate treatment and therefore, players may not apply for compensation through the insurance scheme.

There is mixed evidence underlying age and injury rates in netballers.^{3,10} Previous studies have reported that 65% of injuries occur at U/17 level, 13% at U/19, 12% at U/23, and 10% in open age.³ Other studies have reported that the 30–40 year age group is where most injuries occur, with one injury for every 40 players.¹⁰ Open age players have also been reported to sustain more injuries than U/21 and U/16.²⁵ The current study showed that the most injuries resulting in insurance claims occurred to players aged between 18–44 years, with the majority occurring between 25–34 years. It is possible that open age players were more willing to participate with an injury than underage players and therefore, reported more injuries given they were present and still competing when compared with “the duty of care” from adults who are responsible for younger players. Indeed, well managed younger players may have been unavailable due to their injury and hence, not captured in data collection.²⁵ It has also been theorised that those players who have more experience or are older are likely to receive more injuries.^{25,28}

Overall, the majority of claims for injury were on a concrete/asphalt surface. The majority of claims were while the surface condition was wet. While the link between external injury risk factors such as playing surface condition and injury may be interesting, it was not the focus of this paper. Future research should further examine this relationship and make comment on the implications for practice for reducing injury risk.

The data presented in this study are not without bias and limitations. The information provided in these insurance claims relating to injury epidemiology may not represent a complete record of injuries that occurred in community-level netball. It is possible that less severe injuries would not have been captured in this database because individuals would not have placed a claim for one, or that participants were not aware of the insurance scheme. It is also possible that injuries were treated in the public health system which is funded by the national government under the Medicare scheme, and therefore, the figures in this study underrepresent the overall injury profile. Also, not every injury claim application is successful, based on the strict terms and conditions of the insurance policy, and as a result it is possible the figures in this study are an underestimate of injuries that occur during community netball. It is also possible that players were still able to play and/or train whilst injured, and therefore, non-time loss injuries were not captured. Overuse injuries are examples of injuries that can still allow players to continue physical activity. Subsequent injuries are an important part of the injury picture as they can provide information on incomplete or inadequate rehabilitation from the initial injury. This dataset does not provide the capability to capture these recurrent or subsequent injuries. This database was also limited in being able to capture multiple injuries that occur as a result of a single mechanism (i.e. a fall resulting in a fractured arm and dislocated thumb), which may therefore, also underestimate injury rates. Moreover, the possibility of errors in details that were extracted from the hard copy form to the electronic database, or forms contained incomplete or missing data is acknowledged. It should also be acknowledged that herein is a profile of injuries over one year. As a result, the dataset is limited by this time frame and further strength would be added to such a dataset if it can be reported over a larger time span.

5. Conclusion

This study profiled community-level netball injuries contained in a national insurance dataset of successful claims. Injuries mostly

occurred to the knee and ankle and were mostly sprains and ligament damage or fractures. The majority of successful injury claims were for injuries in the second quarter of play, under fine weather conditions, on an outdoor court, an asphalt/concrete surface, and whilst the playing surface was wet.

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Ethics approval

Ethics approval was granted for this project by the Human Research Ethics Committee of the Australian Catholic University (2016-36N).

This manuscript has not been published anywhere else. Nor is it currently under review anywhere else.

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