Submission No 26

INQUIRY INTO VULNERABLE ROAD USERS

Organisation: Royal Prince Alfred Hospital

Name: Dr Michael Dinh

Telephone: (02) 9515 6111

Date Received: 3/08/2010

THIS PAGE INTENTIONALLY BLANK

Royal Prince Alfred Hospital

Missenden Road, Camperdown, N. S. W. 2050, Australia.

Department of Trauma Services

Christopher Byrne: *MBBS FRACS*
Michael Dinh: *MBBS FACEM*
Jeffery Petchell: *MBBS FRACS*
Liz Leonard: *CNC*
Amanda Stack: *CNC*
Susan Roncal: *Data Manager*

August 2nd 2010

TO: Joint Standing Committee on Road Safety
Parliament House
Macquarie St, Sydney NSW 2000

Dear Sir/Madam,

Please find attached a submission made by the trauma unit at Royal Prince Alfred Hospital to the NSW Joint Commission on Road Safety inquiry into vulnerable road users.

Feel free to contact me for further details.

With warmest regards,

Michael Dinh
Staff Specialist
Emergency Department
CoDirector Trauma Services
Royal Prince Alfred Hospital
Email: dinh.mm@gmail.com
Mobile 0419 620 654(BH)

THIS PAGE INTENTIONALLY BLANK

Road incidents involving cyclists in the inner city and inner west Sydney: A review of patients admitted to an inner city major trauma centre

Authors

Michael Dinh, Emergency Physician, Co-Director of Trauma Services

Elizabeth Leonard, Clinical Nurse Consultant

Susan Roncal, Data Manager

Kendall Bein, Emergency Physician

Amanda Stack, Clinical Nurse Consultant

Danielle Wood, Registrar

Timothy Green, Director of Emergency Department

Chris Byrne, Colorectal Surgeon, Co-Director of Trauma Services

Institution

Department of Trauma Services and Emergency Department, Royal Prince Alfred Hospital, Camperdown NSW

Report prepared August 1st 2010

Correspondence

Michael Dinh, Staff Specialist Emergency Department

Royal Prince Alfred Hospital, Missenden Rd NSW 2050

Email: dinh.mm@gmail.com

Tel: 9515 6111

Conflicts of interest

None declared

Introduction

Cyclists are important users of roads in NSW. Although cycling only accounts for 0.8% of commutes to work, cycling as a means of travel has been increasing in recent years especially in the inner city where there has been a 27% increase in cycling as a form of commute since 2001[1]. At Royal Prince Alfred Hospital, an inner city major trauma centre, around 11% of all trauma related presentations requiring urgent assessment involve cyclists[2].

This brief report has been compiled to help inform policy makers regarding patterns of injury presentation and provide a profile of road accidents involving cyclists over the last two and a half years. It will be submitted to the NSW Joint Standing Committee on Road Safety inquiry into vulnerable road users with the expectation that it will assist in formulating effective injury prevention policies and legislation to protect cyclists using our roads.

The objectives of the present study are;

1. Describe the demographic and incident location profile of cyclists related trauma in the inner city and inner west Sydney
2. Demonstrate the safety benefits of helmet use

Methods

Design

This was a retrospective chart review of cyclists admitted for treatment of injuries to Royal Prince Alfred Hospital due to road traffic incidents.

Setting

Royal Prince Alfred Hospital is a Major Trauma Centre under the current NSW State Trauma Plan. The Emergency Department sees around 65 000 patients per annum of which around 4000 are injury related. The trauma service catchment area stretches from Strathfield in the west to the inner west, inner city and most of the CBD. The recent implementation of the NSW State Trauma Service Plan increased this area to include all of the CBD, eastern suburbs east to Coogee and Maroubra. It therefore covers the Local Government Areas with the highest road cyclist usage rates in NSW. All major trauma cases within this catchment area, defined by Ambulance Service of NSW trauma protocols are transported to RPAH.

Inclusion and exclusion criteria

All patients 15 years and over involved in bicycle road incidents from January 1st 2008 to June 1st 2010 and admitted to RPAH were included in this study. Patients were excluded if they were not initially seen in the emergency department, referred from other health facilities or had missing medical records.

Data sources

The RPAH trauma registry provided information on all injury related admissions to RPAH including incident details, patient demographics, injury profile and patient outcomes. Data was also abstracted by trained clinical staff from medical records and ambulance sheets containing mechanisms of injury and location of injury. Incident locations were mapped to Roads and Traffic Authority Road maps to define road classifications[3].

Variables

The following variables were obtained from the data registry or abstracted from medical notes

- *Patient demographics* such as age and gender were obtained from the trauma registry
- *Incident details* such as incident address, postcode, incident time and date, evidence of intoxication, helmet use. Helmet use was abstracted from the standardised trauma assessment form indicating helmet use (yes/no) or ambulance records indicating helmet use. Intoxication use was also abstracted from the trauma assessment form as a tick box or indicated on ambulance records.
- *Mechanism of injury* These were abstracted from ambulance records, emergency department triage information and trauma assessment forms.
- *Injury profile* – injury severity score (ISS), injured regions (head, upper limb, torso and lower limb). ISS is an anatomic injury scoring system based on severity and body regions injured. Scores range from 1 to 75, with higher scores indicating more severe injury and higher probability of death. Current definitions of major injury in NSW include an ISS of 15 or more. Minor head injury was defined as concussion or simple soft tissue injury to the head whilst serious head injury was defined as any skull fracture or intracranial haemorrhage due to trauma.
- *Patient outcomes* – in hospital length of stay, deaths and intensive care admissions obtained from the trauma registry

Data analysis

Data was stored in spreadsheet format and analysed using Stata version 10.1 (Statacorp, Texas). All means and percentages were expressed with 95% confidence intervals. Where comparisons are made between categorical data, Chi square tests of significance were used and comparisons of median ISS were performed using Wilcoxon Rank Sum tests. Significance was defined as a two tailed p value <0.05. Logistic regression was used to calculate odds ratios of serious head injury without helmet use. A sample size calculation was obtained to test the hypothesis that helmet use resulted in a fourfold decrease in odds of serious head injury following a bicycle accident. Assuming a power of 0.80, a two tailed alpha of 0.05 and a ratio of helmet to no helmet use of around three to one, a sample size of around 250 patients was required.

Ethics

Approval was obtained from the Human Research Ethics Committee of the Sydney South West Area Health Service (central zone)

Results

Patient demographics

A total of 330 patients were identified. Of these 17 were subsequently found to have been referred from other health facilities and therefore excluded. Of the remaining 313 patients, the mean age was 36 years (95%CI 34-37yrs) of age and 81% were male (254/313 95%CI 77-86%). Figure 1 shows the age distribution.

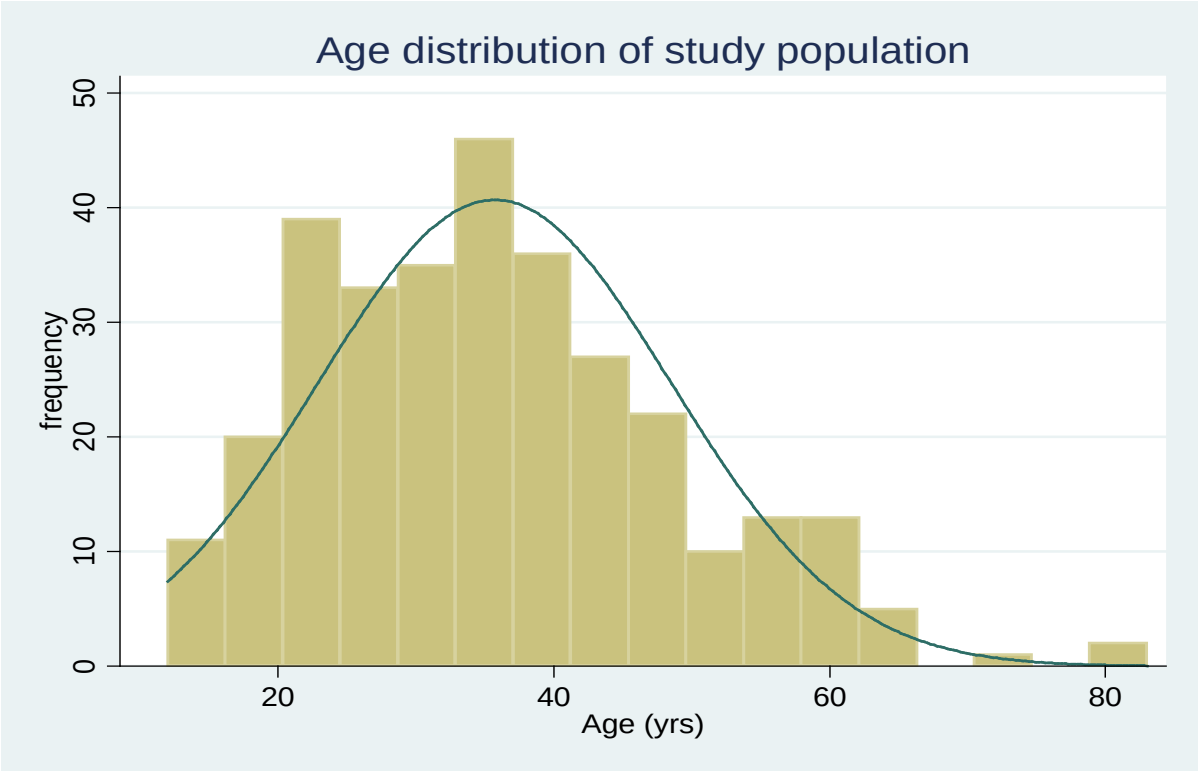

Figure 1 – Age distribution

Incident details

Mechanism of injury

Around half of all incidents involved falls off a bicycle without involving a collision with another vehicle. A further one third involved collisions with cars and only 4% involved collisions with stationary car doors opening. The data is summarised in Figure 2.

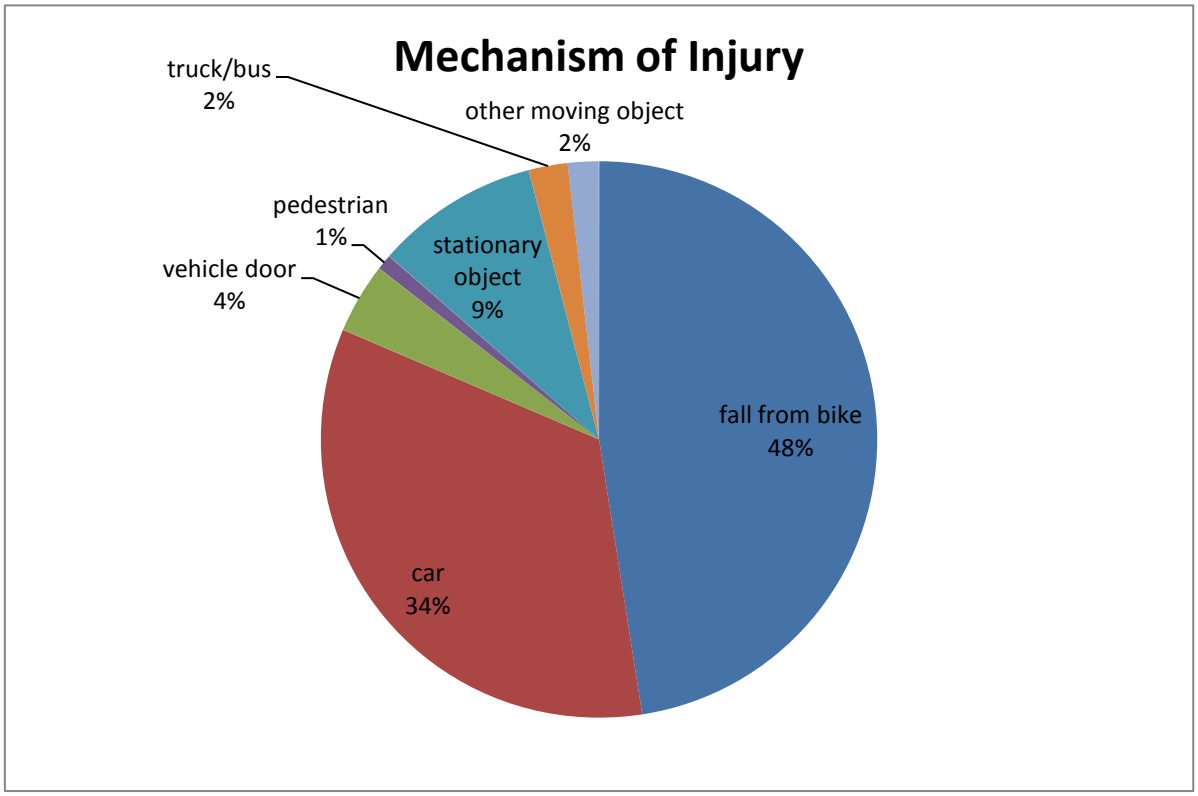

Figure 2 – Mechanisms of injury. Falls from bike indicate no direct collision with another vehicle or object. Collisions involving vehicles or objects are indicated

Incident locations and time

Postcodes of incident locations were available from 308 patient records. The mean distance from CDB for cyclist road incidents was 4.7km (95%CI 4.2-5.0km). Seventy two percent of all incidents occurred within 5km of CBD (218/304 95%CI 66-76%). The most common incident postcodes lay within 5 km of Sydney CBD with the notable exception of postcode 2046 (Five Dock and Abbotsford).

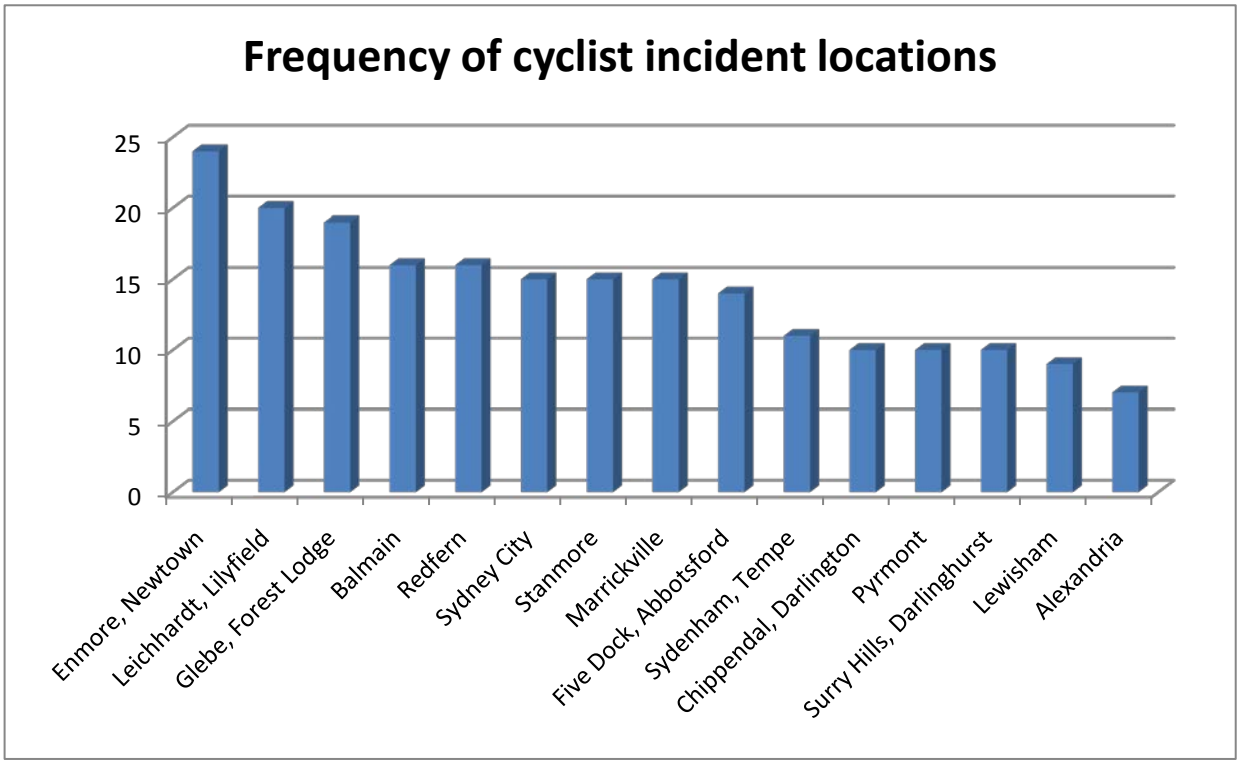

Figure 3 – Most common location of cyclist road incidents by suburb (postcode). See appendix for full list of incidents by postcode

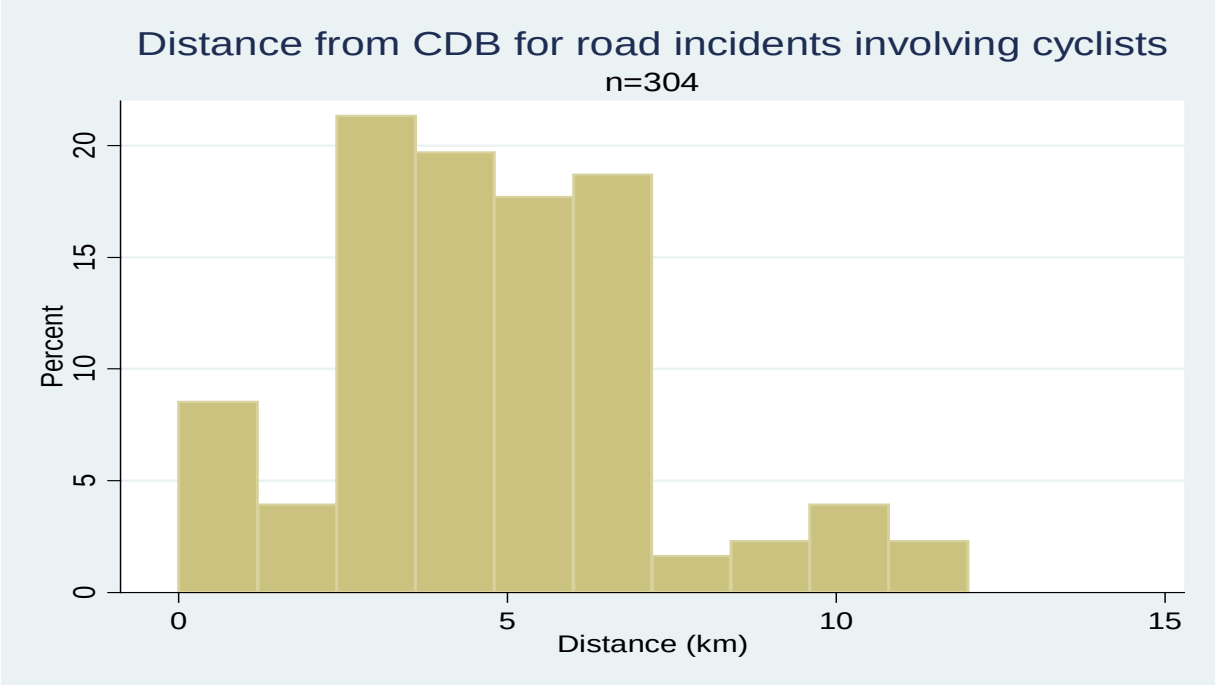

Figure 4 – Distribution of distances from CDB of incidents

Of the 138 patient files with incident address location details available, 76/138 (55%, 95%CI 47-63%) occurred on existing state or regional roads.

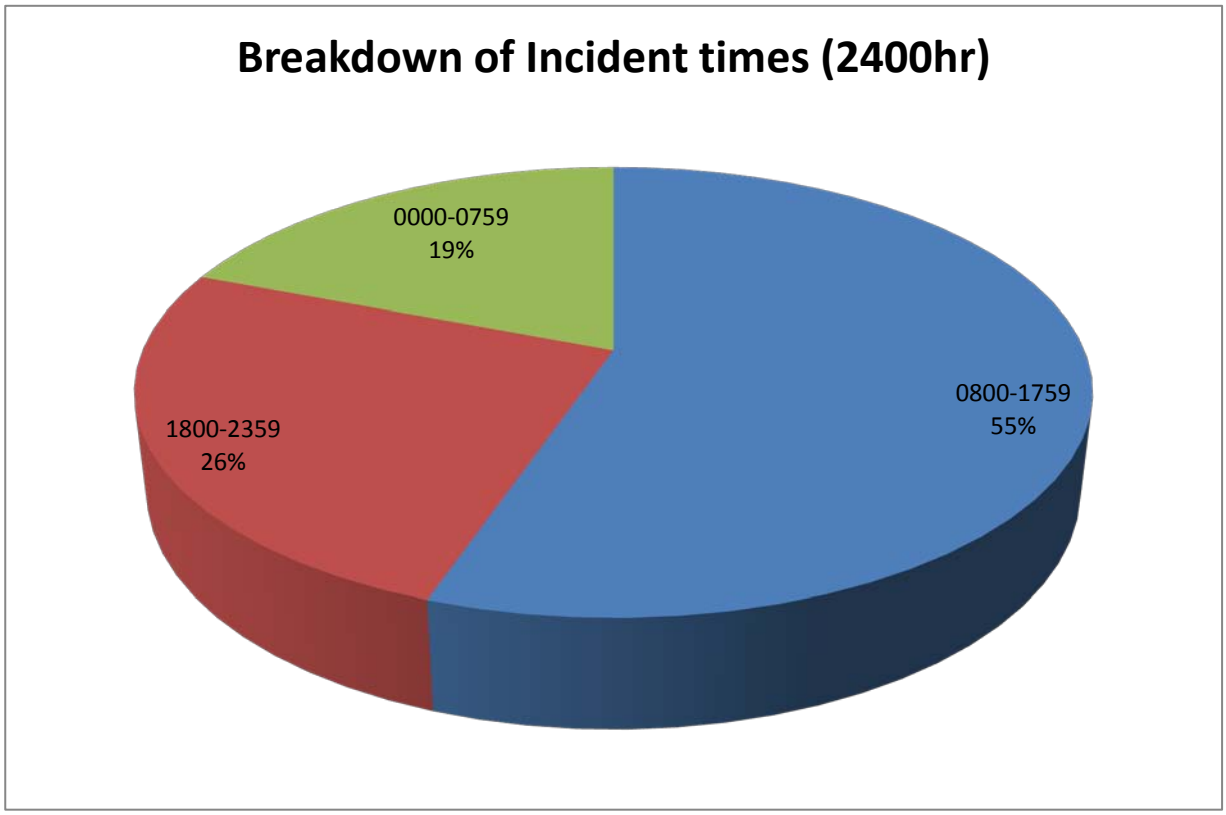

Figure 5 – Incident times

Most incidents occurred during business hours (0800-1759) with 55% falling within this time interval (173/313 95%CI 50-61%). Only 15% of incidents occurred during Monday to Friday peak hours (0700-0900 and 1700-1900) (47/313 95%CI 11-19%).

Information on helmet use was available in 287 records. Of these 241 (84% 95%CI79-88%) wore a helmet at the time of incident. Around 3% of patients had documented evidence of alcohol intoxication at the time of incident, recorded by ambulance or emergency medical staff.

Injury profile

The median injury severity score (ISS) was 4 with an interquartile range of 1 to 5. The distribution of ISS is shown in Figure 6. Only 15/313 patients (5% 95%CI 3-8%) had an ISS greater than 15 indicating major trauma.

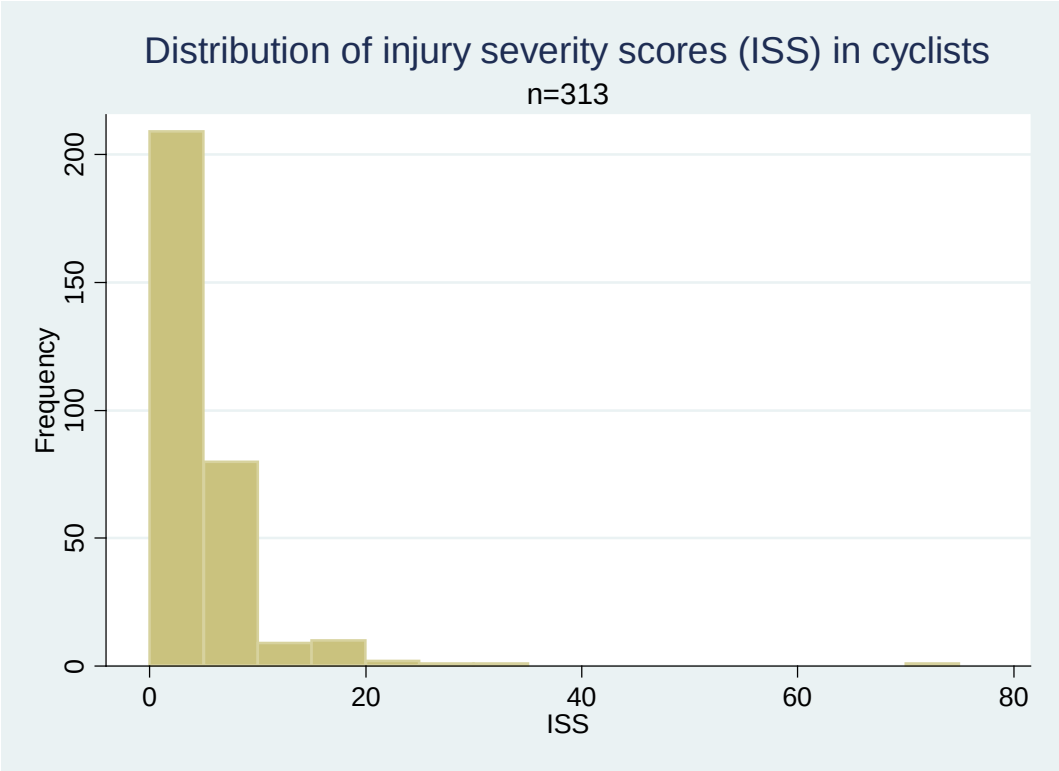

Figure 6 – Injury severity scores

The most common body regions injured were upper limb and head (see table 1). Sixteen patients (5% 95%CI 3-8%) sustained serious head injuries such as skull fractures or intracranial bleeding.

Body Region Injured	(%) injured	95%CI
Upper limb	153 (49%)	43-54
Lower limb	64 (20%)	16-25
Head (closed head injury, skull fracture and intracranial bleeds)	79 (25%)	21-30
Torso (chest, abdomen)	25 (8%)	5-12
Vertebra	11 (4%)	2-6
Facial	53 (17%)	13-21

Table 1 – Body regions injured in cyclists (n=313)

Of the 287 patients with available information, helmet use was associated with lower rates of head injury, intracranial and facial injury (see table 2).

	Helmet N=241	95%CI	No helmet N=46	95%CI	Significance
Males (%)	196 (81%)	76-86	39 (85%)	71-92	P=0.60
Mean LOS (days)	2.1	1.7-2.6	2.4	1.8-3.1	P=0.61
All head injury (%)	49 (21%)	16-26	23 (50%)	36-64	P<0.001
Serious head injury (%)	8 (3%)	2-6	6 (13%)	6-36	P=0.005
Facial injury	37 (15%)	11-20	13 (28%)	17-42	P=0.03

Table 2 – Univariate analysis of helmet use

There appeared to be no association or relationship between the severity of injury and time of day, type of road or mechanism of injury. There was only a weak positive relationship between age and injury severity (Pearson correlation coefficient of 0.07, see appendix two).

After adjusting for age, the odds of serious head injury if not wearing a helmet were four times higher compared to those who wore a helmet (OR 4.1 95%CI 1.3-12.6 p=0.01 PseudoR2 = 0.06) using a logistic regression model. The mean ISS was also higher in those who did not wear a helmet (ISS 4.0 95%CI 3.5-4.5 vs. ISS 7.0 95%CI 3.6-10.3 p<0.01).

Patient outcomes

The mean length of stay in hospital was 2.4 days (95%CI 1.9-2.8days). Nine patients required intensive care treatment (3% 95%CI 2-5%). There was only one death in this study sample (In hospital mortality 0.3%). The patient was a 30 year old man who apparently fell off his bicycle striking a concrete bollard around midnight.

Discussion

The main findings of this study were that most cyclists admitted to RPAH due to injuries were males typically in their late thirties and early forties. Over half occurred during business hours but only 15% occurred during peak hours. Most injuries occurred within 5km of the CBD. Most admissions were for minor injuries with relatively short lengths of stay in hospital with only 3% requiring intensive care. The most commonly injured body regions were upper limb, lower limb and head injuries. The study confirmed the utility of helmet use

in preventing serious head injury after cycling accidents. This was the only factor in this study to influence the severity of injury.

With the introduction of an Inner Sydney Regional Bicycle Network, it would be of further interest to know if accidents occurred on designated cycle-ways. Evidence suggests rates of cyclist injuries are lowest in countries where people ride regularly[4].

There are several limitations to this study. As cycling use and ownership within the catchment area is not known, an incidence rate of cycling injuries cannot be estimated. In addition, data on incident address was missing in 56% of cases, severely limiting any conclusions regarding road types from this data. In general, incident addresses are noted on ambulance sheets, however if the patient self presents to the emergency department, this information is not routinely collected. Better trauma information collection systems are required for more accurate surveillance of injury locations.

During the study period, the NSW Trauma Plan was implemented, increasing the catchment area of RPAH trauma services to include most of the eastern suburbs and CBD. This will improve the ability of a single trauma centre covering these areas to monitor injuries sustained by cyclists and therefore the effectiveness of any injury prevention strategy. This will require ongoing support and commitment from the Department of Health to the State Trauma Plan implemented on March 1st 2010.

References

1. Lehmann R, Lee D, Reid I, et al. Cycling in NSW. What the data tells us. Parsons Brinkerhoff Australia Pty Ltd 2008 Sydney

2. Davis T, Dinh M, Roncal S. Et al. Prospective evaluation of a two tiered trauma activation protocol in an Australian major trauma referral hospital. Injury 2010 41(5): 435-552

3. NSW Roads and Traffic Authority. Information paper and maps URL: http://www.rta.nsw.gov.au/doingbusinesswithus/downloads/rcr/rcr_info-paper.html Accessed July 2010 Last updated Sept 2007

4. British Medical Association. *Cycling Towards Health and Safety*. 1992, Oxford University Press

5. NSW Department of Health. Selected specialty and statewide services plan number six. NSW Trauma Services plan. December 2009

Appendix one

Incident locations by postcode in order of descending frequency

ipost	Freq.	Percent	Cum.
2042	24	7.79	7.79
2040	20	6.49	14.29
2037	19	6.17	20.45
2016	16	5.19	25.65
2041	16	5.19	30.84
2000	15	4.87	35.71
2048	15	4.87	40.58
2204	15	4.87	45.45
2046	14	4.55	50.00
2044	11	3.57	53.57
2008	10	3.25	56.82
2009	10	3.25	60.06
2010	10	3.25	63.31
2050	10	3.25	66.56
2049	9	2.92	69.48
2015	7	2.27	71.75
2017	7	2.27	74.03
2047	7	2.27	76.30
2203	7	2.27	78.57
2043	6	1.95	80.52
2038	5	1.62	82.14
2131	5	1.62	83.77
2039	4	1.30	85.06
2132	4	1.30	86.36
2193	4	1.30	87.66
2035	3	0.97	88.64
2045	3	0.97	89.61
2130	3	0.97	90.58
2137	3	0.97	91.56
2007	2	0.65	92.21
2018	2	0.65	92.86
2020	2	0.65	93.51
2138	2	0.65	94.16
2192	2	0.65	94.81
2011	1	0.32	95.13
2025	1	0.32	95.45
2026	1	0.32	95.78
2033	1	0.32	96.10
2034	1	0.32	96.43
2133	1	0.32	96.75
2134	1	0.32	97.08
2135	1	0.32	97.40
2136	1	0.32	97.73
2139	1	0.32	98.05
2140	1	0.32	98.38
2191	1	0.32	98.70
2205	1	0.32	99.03
2795	1	0.32	99.35
2800	1	0.32	99.68
2871	1	0.32	100.00
Total	308	100.00	

Appendix two

Relationship between age and injury severity in adult cyclists