

## Original Research

# When chronic conditions become emergencies – a report from regional Queensland

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### Abstract

**Objective:** To describe chronic conditions and injuries as a proportion of total emergency presentations to a large public hospital in regional Queensland, and to investigate differences in presentation rates associated with Indigenous status.

**Design:** Cross-sectional analysis using Emergency Department Information System data between 1 July 2012 and 30 June 2014.

**Setting:** Regional Queensland, Australia.

**Participants:** A total of 95 238 emergency presentations were generated by 50 083 local residents living in the 10 statistical local areas (SLAs) immediately around the hospital.

**Main outcome measures:** Emergency presentations for chronic conditions and injuries identified from discharge ICD-10-AM principal diagnosis. Age-standardised presentation rates were calculated using the Australian 2001 reference population.

**Results:** Approximately half of all presentations were for chronic conditions (20.2%) and injuries (28.8%). Two-thirds of all chronic condition presentations were for mental and behavioural disorders (34.6%) and circulatory diseases (33.2%). Head injuries accounted for the highest proportion of injuries (18.9%). Age-standardised rates for major diagnostic groups were consistently higher for Indigenous residents, whose presentations were lower in mean age (95% CI) by 7.7 (7.3–8.1) years, 23% less likely to be potentially avoidable GP-type presentations [RR (95%

CI) = 0.77 (0.75–0.80)], 30% more likely to arrive by ambulance [1.31 (1.28–1.33)] and 11% more likely to require hospital admission [1.11 (1.08–1.13)].

**Conclusions:** Opportunities exist to enhance current coordinated hospital avoidance and primary health services in regional Queensland targeting common mental and circulatory disorders, especially for Indigenous Australians.

**KEY WORDS:** Aboriginal, Torres Strait Islander, Indigenous, chronic disease, emergency department, health disparity, hospital avoidance.

### Introduction

The prevalence of chronic conditions and injuries is rising in Australia corresponding with increased health service demand and costs.<sup>1,2</sup> Furthermore, the burden of disease and injury varies across Australia with regional and remote populations experiencing substantially higher age-standardised disability and lower life expectancy than major cities.<sup>3</sup> Based on 2003 national data, remote Australian populations have 26.5% greater burden of disease and injury than populations in major cities, with health adjusted life expectancy (HALE) at birth ranging from 73.5 years in major cities to 72.0 years in regional areas and 69.5 years in remote areas.<sup>3</sup>

The reasons for this geographical variation in health burden are multifactorial and complex, however, key considerations fall into three main categories. First, people living in rural and remote areas experience higher levels of socioeconomic disadvantage than those living in cities.<sup>4</sup> Secondly, people living in rural and remote areas have more difficulty accessing health services.<sup>5,6</sup> Thirdly, a higher proportion of Aboriginal or Torres Strait Islander (Indigenous) people live in rural and remote areas. This population suffers worse health

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Accepted for publication 6 July 2016.

**What is already known on this subject:**

- The prevalence of chronic conditions and injuries is rising in Australia with regional and remote populations experiencing substantially higher age-standardised disability and lower life expectancy than major cities.
- Indigenous people experience worse health throughout the life span than other Australians including higher rates of infant mortality, chronic disease, injury, hospitalisation and substantially lower life expectancy.

throughout the life span than other Australians and experience higher rates of infant mortality, chronic disease, injury, hospitalisation and substantially lower life expectancy.<sup>7</sup>

The relative scarcity of primary health care, medical and surgical specialists, rehabilitation and aged care in regional and remote areas generally results in public hospitals becoming the default provider for these services.<sup>8</sup> Predictably, these hospitals also experience higher rates of potentially avoidable emergency presentations and preventable hospitalisations.<sup>9,10</sup>

We describe here the chronic conditions and injuries as a proportion of total emergency presentations to a large regional hospital located in Queensland, Australia. We review the evidence in relation to Indigenous status, and identify opportunities for coordinated hospital avoidance especially targeting common chronic conditions.

## Methods

### Study population and setting

The large public tertiary-care hospital provides community-based and specialist health services for over 275 000 people living in regional Queensland, Australia. The majority of these health services are consumed by local residents living in the 10 statistical local areas (SLAs) immediately around the hospital. Results of this study are based on 95 238 emergency presentations generated by 50 083 local residents discharged between 1 July 2012 and 30 June 2014. The local Human Research Ethics Committee approved the study (HREC/13/QCH/131-880) and data were provided by Queensland Health.

### Demographic and other factors of interest

Factors of interest were determined from raw EDIS (Emergency Department Information System) data.

**What this study adds:**

- Emergency Department data from this large regional public hospital in Queensland shows that the two largest groups of chronic condition presentations were for mental and behavioural disorders and circulatory diseases. Head injuries accounted for highest proportion of injuries.
- Opportunities exist to enhance current coordinated hospital avoidance and primary health services in regional Queensland targeting common chronic mental, circulatory, digestive and respiratory disorders and injuries, especially for Indigenous Australians.

Presentations were linked to individuals using unique Unit Record Numbers (URN). Presentations per person were calculated as number of presentations per URN. Potentially avoidable GP-type presentations (GP-type presentations) were defined using National Healthcare Agreement performance indicator criteria<sup>11</sup>: (i) allocated a triage category of 4 (semi-urgent) or 5 (non-urgent) and (ii) did not arrive by ambulance or by police or correctional vehicle and (iii) at the end of the episode, was not admitted to the hospital, was not referred to another hospital, and did not die.

## Chronic conditions and injuries

Selected chronic conditions and injuries were identified from the principal diagnosis codes at discharge using ICD-10-AM (International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification)<sup>12</sup> (Table S1).

### Chronic conditions

As there is no internationally accepted definition for chronic disease, this study adopted a broad interpretation available from both the local and international literature.<sup>13–15</sup> Conditions were selected if they (i) were long-term in nature (ii) required medical attention to be effectively managed, and (iii) were likely to cause long-term physical/mental disability.

### Injuries

Injuries were defined using ICD-10-AM codes S00–T98 (Injury, poisoning and certain other consequences of external causes). There were 743 presentations where primary S-T codes had been substituted for codes V01–Y98 (External causes of morbidity and mortality) and

subsequently these were used in analyses defining overall injury numbers. Codes for 'intentional self-harm' (X60-84) were included as a category of chronic conditions under the ICD-10-AM chapter for Mental and behavioural disorders (F00-99).

### Acute conditions

All other presentations not considered chronic or injury related were assigned as acute conditions.

### Statistical analysis

Analyses were performed with STATA 13.1 (Stata Corp, College Station, Texas, USA). To assist in interpretation of population characteristics relative risk estimates were calculated using generalised linear modelling with a log link and binomial distribution.<sup>16</sup> Crude rates of presentations per 1000 population were calculated using estimated residential population data sourced from the Queensland Regional Database maintained by the Queensland Government Statistician's Office.<sup>17</sup> Data were extracted in 5-year age groups for the Local Government Areas for the two latest financial years - 1 July 2011 to 30 June 2013.

The age distribution for Indigenous people presenting to the emergency department (ED) was different to non-Indigenous people. To enable comparisons of presentation rates between these two groups and other populations, crude rates were directly age-standardised to the 30 June 2001 Australian Standard Population maintained by the Australian Bureau of Statistics.<sup>18</sup> The standardisation methodology<sup>19</sup> involved calculating the age-specific presentation rates for the two groups (Indigenous and non-Indigenous), multiplying these rates by the corresponding Australian standard population for each age group, summing these products and dividing the summed rates by the total Australian standard population for both groups' presentations separately. Age-standardised rate ratios (RR) and their 95% confidence intervals (CI) were calculated using STATA's Incident Rate (ir) function based on the age-standardised expected counts of presentations for both groups and the observed presentations. Confidence limits were set at the 95% level and the age-standardised rate ratios were verified using Poisson regression for incident rate ratios.

## Results

### All presentations

There were 95 238 emergency presentations generated by 50 083 people over the 2-year period (Table 1). Females accounted for 47.7% of all presentations, and

the majority of emergency presentations according to 5-year age groups (Figure 1) were among infants and toddlers aged 0–4 years (10.7%), followed by those between 20–24 years and 25–29 years (7.5%, respectively). The age-distribution of presentations was lower for Indigenous people (Figure 1). Approximately 35.5% of presentations arrived by ambulance and 34.3% resulted in admission to hospital. Median length of stay and associated interquartile range [LOS (IQR)] was 3:00 (1:51–4:50) hours and varied widely according to the type of principal diagnosis. GP-type presentations represented one quarter of all episodes (25.2%) and accounted for most of the relatively small variation in the proportion of daily emergency presentations (Figure 2) with the majority of these occurring on Sunday (17.2%), Monday (15.6%) and Saturday (14.7%).

Indigenous people represented 17.9% of all emergency presentations despite accounting for only 12.9% of the local government area populations. Compared with all other presentations, Indigenous presentations were 7.7 (7.3–8.1) years younger, 23% less likely to be GP-type presentations [RR (95% CI) = 0.77 (0.75–0.80)], 30% more likely to be associated with arrival by ambulance [1.31 (1.28–1.33)] and 11% more likely to require hospital admission [1.11 (1.08–1.13)].

### Chronic conditions

Chronic conditions accounted for 20.2% of all emergency presentations (19 267) (Table 1). Chronic conditions were on average 12.2 (11.8–12.6) years older than all other presentations and were more likely to arrive by ambulance, have longer length of stay and be admitted. Over 85% of all chronic condition presentations were related to mental and behavioural disorders (34.6%,  $n = 6670$ ), diseases of the circulatory system (33.2%,  $n = 6395$ ), digestive system disorders (9.2%,  $n = 1766$ ) and respiratory conditions (8.5%,  $n = 1630$ ). The highest number of presentations were for ischaemic heart disease (IHD), psychoactive substance use, chronic lower respiratory tract conditions (mostly asthma and chronic obstructive pulmonary disease, (COPD)), intentional self-harm, schizotypal and delusional disorders, oral health conditions and other forms of heart disease (mostly cardiac arrhythmia and heart failure). The characteristics for Indigenous people were similar except that females were more likely to present with a chronic condition than males and age-standardised rates for all major diagnostic groups were consistently higher.

### Injury

Injuries comprised 28.8% of all emergency presentations (27 403) (Table 1). Compared with all other

TABLE 1: Characteristics of 95 238 emergency department presentations, 01 July 2012 - 30 June 2014, local residents only.\*

ICD-10-AM Chapters†	Presentations		Rate/1000 population					Arrive by		LOS (IQR)	Admitted
	Total (n)	Individuals	Rate/person	Crude‡	Age-standardised§ (95% CI)	Female (%)	Age (SD)	Ambulance			
All presentations	95 238	50 083	1.9	280.7	283.9 (282.4-285.4)	47.7	37.1 (24.0)	35.5	25.2	180 (111-290)	34.3
Acute conditions	48 568	29 505	1.6	143.1	144.3 (143.1-145.4)	52.1	35.9 (24.7)	31.9	22.6	192 (119-301)	34.9
Chronic conditions	19 267	11 936	1.6	56.8	58.2 (57.4-59.0)	45.7	46.9 (21.5)	48.6	10.3	237 (147-492)	53.0
Injuries	27 403	21 106	1.3	80.8	81.5 (80.5-82.4)	41.3	32.4 (22.3)	32.7	40.4	136 (88-204)	19.9
Aboriginal & Torres Strait Islander	17 020	7555	2.3	387.3	455.7 (450.3-461.1)	52.2	30.8 (20.2)	44.0	20.3	182 (112-295)	37.3
Acute conditions	9108	4879	1.9	207.2	238.7 (233.8-243.7)	56.2	29.4 (21.2)	39.9	20.0	187 (117-297)	36.6
Chronic conditions	3719	1995	1.9	84.6	120.7 (116.6-124.7)	51.8	39.7 (17.8)	53.2	9.0	233 (140-494)	54.8
Neoplasms	29	25	1.2	0.7	1.4 (0.8-2.0)	51.7	53.2 (20.7)	37.9	13.8	382 (228-793)	75.9
Endocrine, nutritional, metabolic	50	39	1.3	1.1	1.5 (1.0-2.0)	46.0	39.2 (18.5)	34.0	4.0	237 (139-383)	80.0
Mental & behavioural disorders	1462	809	1.8	33.3	38.3 (36.3-40.4)	48.6	33.6 (13.2)	46.6	5.5	217 (122-531)	49.0
Nervous system	153	103	1.5	3.5	4.9 (4.0-5.8)	53.6	38.9 (17.5)	79.7	6.5	238 (166-413)	47.7
Circulatory system	1002	635	1.6	22.8	41.8 (39.0-44.6)	53.3	50.3 (14.5)	68.3	2.4	325 (185-589)	74.2
Respiratory system	395	216	1.8	9	13.2 (11.7-14.8)	56.7	39.0 (24.3)	61.8	4.3	238 (154-484)	58.2
Digestive system	299	266	1.1	6.8	7.9 (6.9-8.9)	56.9	31.8 (15.9)	26.1	37.1	160 (98-237)	22.7
Musculoskeletal, connective tissue	154	114	1.4	3.5	5.8 (4.9-6.8)	37.7	45.9 (17.2)	47.4	34.4	217 (128-333)	32.5
Other chronic conditions**	175	120	1.5	4	5.7 (4.7-6.7)	61.7	37.9 (22.4)	38.9	20.0	232 (132-469)	53.7
Injuries	4193	3031	1.4	95.4	96.3 (93.1-99.5)	43.8	26.1 (17.4)	44.6	30.9	143 (91-211)	23.5
Non-Indigenous	77 057	41 616	1.9	260.9	264.2 (262.6-265.8)	46.7	38.5 (24.5)	33.7	26.3	180 (111-290)	33.7
Acute conditions	38 850	24 131	1.6	131.5	133.3 (132.1-134.5)	51.2	37.4 (25.2)	30.0	23.2	193 (120-302)	34.7
Chronic conditions	15 356	9768	1.6	52	51.7 (50.9-52.5)	44.3	48.6 (22.0)	47.5	10.5	237 (148-493)	52.7
Neoplasms	402	325	1.2	1.4	1.3 (1.2-1.4)	46.5	60.2 (16.2)	51.0	5.7	356 (230-631)	72.4
Endocrine, nutritional, metabolic	117	88	1.3	0.4	0.4 (0.3-0.5)	38.5	38.1 (22.1)	46.2	7.7	383 (217-549)	83.8
Mental & behavioural disorders	5134	2876	1.8	17.4	17.7 (17.3-18.2)	42.9	37.2 (17.0)	42.2	9.5	232 (136-674)	46.3
Nervous system	734	602	1.2	2.5	2.5 (2.3-2.7)	45.8	50.2 (22.8)	65.3	11.0	276 (178-502)	48.6

(continued)

TABLE 1: (continued)

ICD-10-AM Chapters†	Presentations		Rate/1000 population					GP-type¶	LOS (IQR)	Admitted	
	Total (n)	Individuals	Rate/person	Crude‡	Age-standardised§	Female (%)	Age (SD)				Arrive by Ambulance
Circulatory system	5334	3967	1.3	18.1	17.6 (17.1–18.0)	43.9	61.2 (17.5)	58.5	3.9	269 (168–492)	64.6
Respiratory system	1221	814	1.5	4.1	4.2 (4.0–4.4)	46.5	45.6 (29.6)	55.2	5.1	238 (160–459)	57.6
Digestive system	1445	1215	1.2	4.9	4.9 (4.6–5.1)	46.9	42.0 (20.3)	25.1	26.6	212 (117–373)	40.1
Musculoskeletal, connective tissue	545	474	1.1	1.9	1.8 (1.6–1.9)	42.9	50.6 (18.9)	34.3	34.5	198 (124–314)	32.7
Other chronic conditions**	424	375	1.1	1.4	1.4 (1.3–1.6)	51.4	47.8 (24.9)	11.8	40.8	140 (91–232)	19.8
Injuries	22 851	17 750	1.3	77.4	79.2 (78.2–80.2)	40.9	33.6 (22.9)	30.5	42.1	135 (87–203)	19.3

\*Values given are percentage of total number unless otherwise stipulated. LOS (IQR) = length of stay (interquartile range) in emergency department; 95% CI = 95% confidence interval; SD = standard deviation; Indigenous status missing for 1161 (1.2%) emergency presentations. †Refer to online supplementary information for definitions of chronic conditions and injury. ‡Rates calculated based on 2012 and 2013 Indigenous population estimates for the 10 SLAs by the Queensland Government Statistician's Office ([http://qrsis.oestr.qld.gov.au/pls/qis\\_public/QIS1110W\\$COLLGRP.Startup?p\\_user\\_id=edtert](http://qrsis.oestr.qld.gov.au/pls/qis_public/QIS1110W$COLLGRP.Startup?p_user_id=edtert)). §Rates standardised to the ABS 30 June 2001 Australian Standard Population (Australian Bureau of Statistics, Cat no. 31010DO003\_201212). ¶GP-type = potentially avoidable GP-type presentation and was defined as (i) triage category 4 or 5, and (ii) did not arrive by ambulance/police/correctional vehicle, and (iii) not admitted to the hospital, was not referred to another hospital, and did not die. \*\*Other chronic conditions include: Infectious, parasitic (A00–B99), Blood, blood-forming organs, certain immune (D50–D89), Eye and adnexa (H00–H59), Ear and mastoid process (H60–H95), Skin and subcutaneous tissue (L00–L99), Genitourinary system (N00–N99).

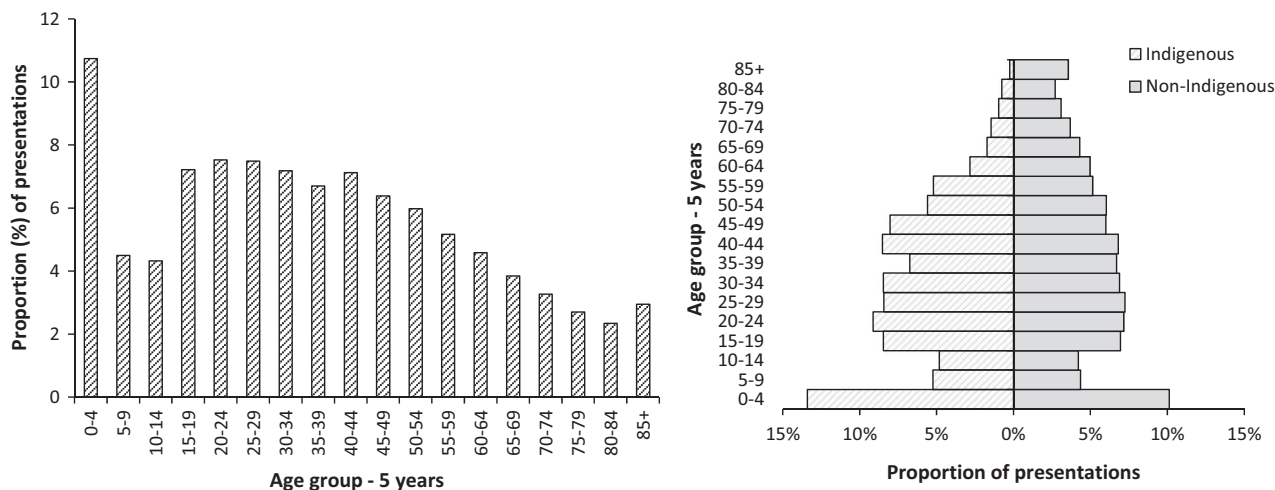


FIGURE 1: Age distribution for 95 238 emergency presentations, 01 July 2012 - 30 June 2014, by 5-year age groups and Indigenous status, local residents only.

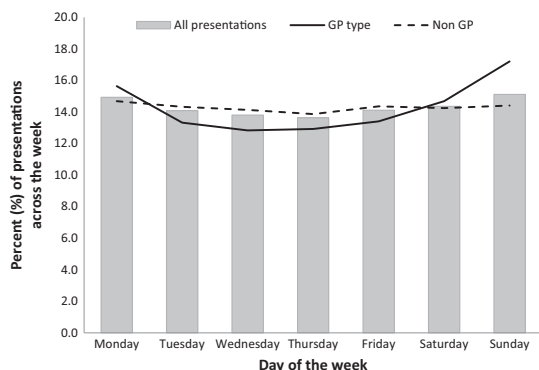


FIGURE 2: Total daily emergency presentations as a proportion of total weekly, GP-type (24 046) and non-GP-type presentations (71 192), 01 July 2012 - 30 June 2014.

presentations injury presentations were 6.6 (6.2–6.9) years younger, more likely to be male, less likely to arrive by ambulance, involved shorter length of stay, less likely to be admitted and more likely to be GP-type presentations. Significant differences were noted for Indigenous presentations. Emergency presentations for injury were more likely to be female, to arrive by ambulance, to be admitted and were less likely to be a GP-type presentation. Age-standardised rates for all injuries were also consistently higher.

### Age-standardised rate ratios

The age-standardised chronic condition presentation rate for Indigenous people was more than twice that of other people [2.33 (2.26–2.51)] (Table 2). Rates were more than three times higher for chronic respiratory conditions [3.15 (2.85–3.48)], two and a half

times higher for circulatory conditions [2.38 (2.26–2.51)], two times higher for mental and behavioural disorders [2.16 (2.04–2.28)], 60% higher for digestive conditions [1.62 (1.44–1.83)] and 22% higher for injury [1.22 (1.18–1.26)].

### Visits per person

Approximately 31 146 people (62.2%) attended emergency only once in the 2 years, 9974 (19.9%) attended twice, 4102 (8.2%) attended three times and 4861 people (9.7%) attended four or more times (data not tabled). As the number of presentations for each person increased, the proportion of presentations for chronic conditions increased (Figure 3), injuries declined and acute presentations remained stable. The proportion of Indigenous people rose steadily from 14% ( $n = 4224$ ) of those attending only once, to 30% ( $n = 171$ ) for those presenting 10 times.

### Discussion

Chronic conditions and injuries accounted for nearly half of all emergency presentations to this large public hospital in regional Queensland. The majority of chronic conditions were related to mental, circulatory, digestive and respiratory disorders. Head injuries accounted for the highest proportion of all injuries. Age-standardised rates for all these conditions were consistently higher for Indigenous people, whose presentations were lower in age, less likely to be GP-type presentations, and more likely to be associated with arrival by ambulance and admission to hospital.

The 2-year EDIS dataset available for analysis was extensive with minimal missing data and considerable

TABLE 2: ICD-10-AM principal diagnosis codes for selected major chronic condition and injury presentations to the emergency department, 01 July 2012 - 30 June 2014, by Indigenous status

ICD-10-AM Principal Diagnosis Codes*	Aboriginal and Torres Strait Islander				Non-Indigenous			
	Total†		Rate/1000 population		Total†		Rate/1000 population	
	n	n (%)	Crude‡	Age-standardised§ (95% CI)	n	n (%)	Crude‡	Age-standardised§ (95% CI)
Chronic conditions	19 267	3719	84.6	120.7 (116.6–124.7)	15 356	52	51.7 (50.9–52.5)	2.33 (2.26–2.41)
Circulatory system	6395	1002	22.8	41.8 (39.0–44.6)	5334	18.1	17.6 (17.1–18.0)	2.38 (2.26–2.51)
Ischaemic heart diseases	3550	646 (64.5)	14.7	26.0 (23.9–28.2)	2864 (53.7)	9.7	9.3 (8.9–9.6)	2.81 (2.62–3.01)
Other heart diseases	1472	176 (17.6)	4	8.1 (6.8–9.5)	1284 (24.1)	4.4	4.3 (4.1–4.6)	1.87 (1.66–2.10)
Cerebrovascular diseases	438	76 (7.6)	1.7	3.6 (2.7–4.5)	361 (6.8)	1.2	1.2 (1.1–1.3)	2.98 (2.46–3.61)
Mental, behavioural disorders	6670	1462	33.3	38.3 (36.3–40.4)	5134	17.4	17.7 (17.3–18.2)	2.16 (2.04–2.28)
Psychoactive substance use	1498	493 (33.7)	11.2	14.2 (12.9–15.5)	982 (19.1)	3.3	3.3 (3.1–3.6)	4.24 (3.83–4.69)
Intentional self-harm	1474	298 (20.4)	6.8	6.8 (5.9–7.6)	1161 (22.6)	3.9	4.1 (3.8–4.3)	1.65 (1.45–1.88)
Schizophrenia, schizotypal & delusional disorders	967	286 (19.6)	6.5	7.3 (6.4–8.1)	677 (13.2)	2.3	2.3 (2.1–2.5)	3.13 (2.73–3.59)
Neurotic, stress-related & somatoform disorders	1008	132 (9.0)	3	3.4 (2.7–4.0)	863 (16.8)	2.9	3.0 (2.8–3.2)	1.13 (0.95–1.35)
Mood [affective] disorders	696	72 (4.9)	1.6	1.8 (1.4–2.3)	615 (12.0)	2.1	2.1 (1.9–2.2)	0.87 (0.68–1.10)
Respiratory	1630	395	9.0	13.2 (11.7–14.8)	1221	4.1	4.2 (4.0–4.4)	3.15 (2.85–3.48)
Chronic lower respiratory diseases	1623	394 (99.7)	9	13.2 (11.7–14.7)	1215 (99.5)	4.1	4.2 (3.9–4.4)	3.16 (2.86–3.49)
Chronic obstructive pulmonary disease	801	190 (48.1)	4.3	8.8 (7.4–10.1)	606 (49.6)	2.1	2.1 (1.9–2.2)	4.21 (3.70–4.79)
Asthma	822	204 (51.6)	4.6	4.5 (3.7–5.2)	609 (49.9)	2.1	2.1 (1.9–2.3)	2.12 (1.80–2.50)
Digestive	1766	299	6.8	7.9 (6.9–8.9)	1445	4.9	4.9 (4.6–5.1)	1.62 (1.44–1.83)
Diseases of oral cavity, salivary glands & jaws	809	214 (71.6)	4.9	4.9 (4.2–5.6)	583 (40.3)	2	2.0 (1.8–2.2)	2.45 (2.09–2.87)
Diseases of oesophagus, stomach & duodenum	426	62 (20.7)	1.4	2.0 (1.4–2.5)	355 (24.6)	1.2	1.2 (1.1–1.3)	1.61 (1.25–2.04)
Gastro-oesophageal reflux disease	271	43 (14.4)	1	1.3 (0.8–1.7)	222 (15.4)	0.8	0.8 (0.7–0.9)	1.69 (1.24–2.27)
Liver diseases	160	16 (5.4)	0.4	0.6 (0.3–0.9)	143 (9.9)	0.5	0.5 (0.4–0.5)	1.25 (0.78–1.93)
Endocrine	169	50	1.1	1.5 (1.0–2.0)	117	0.4	0.4 (0.3–0.5)	3.64 (2.65–4.96)
Diabetes Mellitus	163	50	1.1	1.5 (1.0–2.0)	111 (94.9)	0.4	0.4 (0.3–0.5)	3.83 (2.78–5.24)
Injury	27 403	4193 (100.0)	95.4	96.3 (93.1–99.5)	22 851	77.4	79.2 (78.2–80.2)	1.22 (1.18–1.26)
Head	5191	1074 (25.6)	24.4	23.6 (22.0–25.1)	4029 (17.6)	13.6	14.0 (13.6–14.4)	1.68 (1.57–1.80)
Abdomen, lower back, lumbar spine & pelvis	1800	225 (5.4)	5.1	6.3 (5.4–7.2)	1558 (6.8)	5.3	5.3 (5.0–5.5)	1.20 (1.05–1.36)

\*Refer to online supplementary information for definitions of chronic conditions and injury. †Indigenous status missing for 1161 (1.2%) emergency presentations. ‡Rates calculated based on 2012 and 2013 Indigenous population estimates for the 10 SLAs by the Queensland Government Statistician's Office ([http://qrsis.oesr.qld.gov.au/pls/qis\\_public/QIS110W\\$COLLGRP.Startup?p\\_user\\_id=edtert](http://qrsis.oesr.qld.gov.au/pls/qis_public/QIS110W$COLLGRP.Startup?p_user_id=edtert)). §Rates standardised to the ABS 30 June 2001 Australian Standard Population (Australian Bureau of Statistics, Cat no. 31010DO003\_201212).

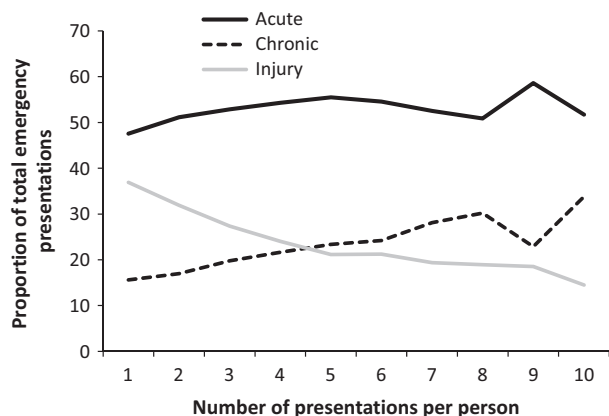


FIGURE 3: Presentation types as a proportion of all emergency presentations per person, 01 July 2012 - 30 June 2014, local residents only.

care was taken to restrict the analysis to just those people most likely to be considered local residents. A distinctive feature of this research is that the dataset was linked to individuals using their unique URN to report on individuals as well as episodes. However, the results presented are only as accurate as the data provided and we know that these are subject to human and other forms of error inherent to some degree in any health administrative data collection system. For example, a recent report on the quality of Indigenous identification in Australian public hospital separations found that 93% of Indigenous and 99% of non-Indigenous separations were identified correctly in similar outer regional areas.<sup>20</sup> Comparable quality work is not available for national emergency presentations, however, it is likely that the true numbers of Indigenous people in our dataset (and hence our age-standardised estimates) are higher than we report here.

Care needs to be taken interpreting results using the emergency principal diagnosis codes at discharge. Accuracy of these codes is influenced by several factors. Firstly, while the full set of ICD-10-AM codes (~16 500) are used in determining the diagnosis of hospital admissions, the EDIS dataset utilises a much smaller subset of codes (~1000).<sup>21</sup> Secondly, whereas hospital admissions data has the capacity to record multiple 'secondary' diagnosis codes to reflect all conditions treated, EDIS data only contains a single diagnostic code to represent the reason for emergency presentation. A recent study conducted by Queensland Health testing consistency between EDIS diagnosis and the diagnosis assigned following the corresponding inpatient admission found substantial variation depending on diagnosis type.<sup>22</sup> Consistency was highest for easily identifiable conditions such as asthma (84.3%) and injury (85.3%), and lower for conditions with more ambiguous symptoms such as viral infections (40.4%). Thirdly, people seek medical

care often as the result of a complex interaction between multiple co-morbidities and psychosocial factors, so allocating a single diagnosis will inevitably underestimate the burden of some chronic conditions. For example, many diagnoses for acute presentations do not reflect the underlying chronic condition responsible for the presentation such as a foot infection secondary to type 2 diabetes, or a fall injury secondary to a chronic musculo-skeletal condition. Finally, the emergency principal diagnosis should only be considered preliminary in nature. It is based on a short review period, often under administrative pressures to provide a diagnosis and without the entire range of diagnostic procedures available during a hospital admission. The misclassification of diagnostic codes may have affected the associations observed in this cohort. In particular the contribution of chronic disease driving ED presentations is likely to be far higher than reported here.

Cases we have identified as GP-type presentations are based on the National Healthcare Agreement performance indicator #19<sup>23</sup> and numbers are likely to be lower than reported here. This indicator is not a measure of hospital performance but rather of access to appropriate non-hospital primary and other community health services. The AIHW is currently revising this indicator as it does not include patients referred to emergency by their GP, day of week, time of day and length of treatment.

While emergency presentations for injury were relatively easy to define with ICD-10-AM codes, there is no international standard for what defines a chronic condition. We were careful to include a broad range of presentations in our definition that would be acceptable to (and inclusive of) those used in other studies. A recent national report of emergency presentations to Australian public hospitals found that the proportion of all presentations was 27.7% for injuries (combining S-Y ICD-10-AM codes), 4.7% for diseases of the circulatory system and 3.5% for mental and behavioural disorders.<sup>24</sup> Calculated in a similar fashion, we found that the proportion of emergency presentations for injury (28.8%), circulatory system (6.7%) and mental and behavioural disorders (5.5%) was substantially higher in this regional area of Queensland than those reported nationally.

Indigenous people were younger, less likely to have a GP-type presentation and more likely to require admission to hospital. Combined, these data reflect the greater health burden already known to exist in this population and somewhat explains the higher presentation rates observed in our cohort. We found that Indigenous people represented 17.9% of all emergency presentations while accounting for only 12.9% of the local population. These disparate figures are consistent across all Australian states and territories regardless of the proportion of Indigenous people in the



population.<sup>24</sup> Nationally, Indigenous people comprise 2.6% of the population and account for 5.4% of all emergency presentations. Differences also exist by remoteness. A recent study comparing emergency presentations of Victorian Indigenous people with non-Indigenous people during the 2006/2007 financial year found that while presentation rates in metropolitan areas were similar, Indigenous people (684 per 1000) in rural areas presented 2.3 times more often than non-Indigenous people (297 per 1000).<sup>25</sup> Authors state this reflects higher rates for injury and poisoning, respiratory conditions and mental disorders in these areas. The overall presentation rate reported in this study was slightly higher than in our cohort where Indigenous people (387 per 1000) presented 1.5 times more often than non-Indigenous people (261 per 1000). This may be because general health and the provision of health services are better in regional populations compared with those that are more remote.

Our study has identified opportunities to reduce emergency presentations to this large regional hospital. One-quarter of all presentations were for GP-type presentations with a large proportion of these occurring on Saturday, Sunday and Monday. This may reflect the relative paucity of GP services available within the region at these times and the difficulty in obtaining a GP appointment in a timely fashion. While the hospital cannot mandate the availability of privately owned primary health care services, reducing emergency presentations may be possible by improving community awareness of available non-hospital local resources at these times, improving communication between hospital, GP and ambulance services or trialling hospital-led primary health services separate to the ED. An example of this would be to provide a minor injuries clinic as 40% of injuries observed in our cohort were for GP-type presentations. Telehealth initiatives could also be trialled to support people in their homes, where appropriate, for prevention of acute emergency presentations of common chronic conditions such as COPD, asthma, angina and heart failure.

The hospital currently supports several programs providing coordinated care for high-risk and complex patients. These include case management, hospital in the home, post-acute care and community rehabilitation services. As most of these clients have a GP, preventing unnecessary emergency presentations among these people is likely to involve working with Primary Health Networks to strengthen GPs as the central care provider (medical home) rather than the hospital. Strategies to facilitate this process might include dedicated hospital/primary health coordinators for high-risk clients and shared medical records. The hospital is also currently transitioning toward the delivery of a paperless integrated electronic Medical Record (ieMR)

in cooperation with Queensland Health which involves the capacity for electronic patient notes, referral, reporting and discharge summaries. This may ultimately assist in strengthening the role of primary health care providers through better communication. Ongoing assessment of the effectiveness of these initiatives should be a key consideration in the future.

Our study revealed a large proportion of chronic conditions attending the ED. While care coordination programs for these conditions are common in Australia a recent review has found that their effectiveness in reducing unnecessary emergency and hospital episodes is currently inconclusive and warrants further investigation.<sup>26</sup> A systematic review of interventions for reducing ambulatory sensitive hospitalisations proposed that interventions are more effective if they are directed towards specific conditions.<sup>27</sup> In our cohort we identified the most common chronic conditions potentially conducive to care-coordination programs were IHD, cardiac arrhythmias, heart failure, psychoactive substance use, asthma, COPD and oral health.

We observed that Indigenous people experienced higher rates of emergency presentation for almost all conditions. This is consistent with copious national and other reports on Indigenous health disparities.<sup>1,5,7,28,29</sup> Although the local hospital has trialled initiatives that specifically target Indigenous Australians, much of the work is performed by the Aboriginal Community Controlled Health Services (ACCHS) in the area. Our results suggest that more could be done in supporting this area. Presentation to ED seems largely appropriate given that Indigenous people in our cohort presented with more urgency and were more likely to require admission. However, this does not lessen the importance for hospitals to trial strategies aimed at reducing emergency presentations. Rather, strategies should be targeted upstream at high-risk groups and individuals to achieve greater self-management of common conditions in association with the local ACCHS. A recent review on the impact of initiatives to reduce potentially avoidable hospitalisations<sup>30</sup> found that interventions aimed at Indigenous people are rare and unlikely to be successful unless a multifactorial program design is implemented.

Our results suggest that opportunities exist to enhance current coordinated hospital avoidance and discharge support services aimed at reducing emergency presentations for common chronic mental, circulatory, digestive and respiratory disorders. Programs specifically designed for Indigenous people are warranted given the higher burden of disease and injury observed within this local population. Future research should focus on the implementation and prospective evaluation of these hospital-led programs to optimise limited health care resources and provide timely

evidence regarding efficiency, effectiveness and cost-effectiveness. While these programs should be aimed at improving individual health problems they are not a replacement for government policies, strategies and initiatives that aim to reduce the upstream causes of ill health such as socioeconomic disadvantage and inadequate health service distribution.

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## Supporting Information

Additional Supporting Information may be found in the online version of this article:

Table S1 ICD-10-AM chapters and codes used for defining chronic conditions and injuries from principal diagnosis at discharge for 95 238 emergency presentations, 1 July 2012 to 30 June 2014.