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Strategic information for hospital service planning: a linked data study to inform an urban Aboriginal Health Liaison Officer program in Western Australia

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Abstract

Objectives. The aim of the present study was to provide descriptive planning data for a hospital-based Aboriginal Health Liaison Officer (AHLO) program, specifically quantifying episodes of care and outcomes within 28 days after discharge.

Methods. A follow-up study of Aboriginal in-patient hospital episodes was undertaken using person-based linked administrative data from four South Metropolitan hospitals in Perth, Western Australia (2006–11). Outcomes included 28-day deaths, emergency department (ED) presentations and in-patient re-admissions.

Results. There were 8041 eligible index admissions among 5113 individuals, with episode volumes increasing by 31% over the study period. Among patients 25 years and older, the highest ranking comorbidities included injury (47%), drug and alcohol disorders (41%), heart disease (40%), infection (40%), mental illness (31%) and diabetes (31%). Most events (96%) ended in a regular discharge. Within 28 days, 24% of events resulted in ED presentations and 20% resulted in hospital re-admissions. Emergency readmissions (13%) were twice as likely as booked re-admissions (7%). Stratified analyses showed poorer outcomes for older people, and for emergency and tertiary hospital admissions.

Conclusions. Future planning must address the greater service volumes anticipated. The high prevalence of comorbidities requires intensive case management to address case complexity. These data will inform the refinement of the AHLO program to improve in-patient experiences and outcomes.

What is known about the topic? The health gap between Aboriginal and non-Aboriginal Australians is well documented. Aboriginal people have significantly higher hospital utilisation rates, as well as higher rates of complications, comorbidities and discharges against medical advice (DAMA). Aboriginal patients receive most of their specialist services in hospital; however, detailed person-based analyses are limited and planning is often based on crude data.

What does this paper add? This is the first analysis of linked data focusing on Aboriginal patient flows and volume and 28-day health system outcomes following hospital admission for all causes in a large metropolitan setting. Because the data were linked, admissions belonging to a single episode of care were combined, ensuring that transfers were not counted as re-admissions. Linkage also allowed follow up across time. The results highlight the main disease groups for which Aboriginal patients are admitted, how this varies by age and the high proportion of patients returning to (any) hospital within 28 days, either through EDs or as booked (pre-arranged) admissions. These data aid in the planning of hospital-based Aboriginal health liaison services.

What are the implications for practitioners? The paper outlines the complexity with which many Aboriginal patients present to hospital and the risk of DAMA and re-admission. Clinical and organisational strategies can be put in place in

hospitals to address these risks and ensure improved continuity of care with community-based primary health services. The Western Australian South Metropolitan Health Service is reviewing these data and will monitor the impact of the hospital-based AHLO program.

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Introduction

The disparities in health between Aboriginal people and other Australians are substantial across the disease spectrum.[1] Aboriginal people have significantly higher hospital utilisation rates,[2,3] rates of complications, comorbidities[1,4,5] and discharges against medical advice (DAMA).[6–8] A recent health expenditure report indicates that Aboriginal patients receive almost all their specialist services in hospital.[9,10] Increasingly, the need for the hospital system to consider the special needs of Aboriginal patients during the hospital stay and after discharge is being recognised.[6]

In 2009, the Perth-based South Metropolitan Health Service (SMHS) and Aboriginal community representatives undertook consultations[11,12] to develop a strategy for improving health outcomes for Aboriginal people in the SMHS region (estimated Aboriginal population 15 317 in 2011[13]) admitted to two tertiary and three district hospitals administered by the SMHS. Initiatives to improve cultural safety, including a robust Aboriginal professional workforce, were seen as central to improving in-patient experiences and outcomes. Consequently, the Aboriginal Health Liaison Officer (AHLO) program was developed, with funding secured through the Council of Australian Governments' National Partnership Agreement on Closing the Gap in Indigenous Health Outcomes.[14] This program employs Aboriginal health professionals in the hospital system to improve the cultural capacity of hospitals by providing a liaison role to support the Aboriginal patient journey from the time of admission through to discharge planning and community referral. AHLOs were employed over a staggered period from mid-2010, with the program fully implemented in 2011.

The aim of the present study was to provide strategic, descriptive data on Aboriginal patients admitted to four of the five hospitals in the SMHS during two periods before the AHLO program (2006–07 and 2008–09) and one spanning the staggered implementation period (2010–11). The objectives were to provide demographic and health profiles of Aboriginal people who were hospital in-patients during usual working hours, to quantify episodes of care and to determine health service outcomes within 28 days following discharge.

Methods

All Aboriginal in-patient admissions to four SMHS hospitals (including a tertiary centre) between 2006 and 2011 were identified in the Western Australian (WA) Hospital Morbidity Data Collection (HMDC). One hospital was not included in the study because it had a pre-existing AHLO program. The WA Data Linkage System[15] enabled links between events at the person level, such that hospital admissions, emergency department (ED) presentations and death records for patients could be merged using unique encrypted identifiers.

Because referral to the AHLO program was dependent on Aboriginal status being electronically recorded, patients were considered Aboriginal if this was recorded on the admission record of their index admission. Statistical Local Area codes derived from the residential address recorded on the index admission were mapped to WA health regions.

'Index admissions' were those occurring wholly or in part during regular work hours at any of the study hospitals. Regular work hours were defined as occurring between 9 am and 4 pm daily during weekdays to coincide with the AHLOs' working hours. Same-day admissions and admissions that started and ended within the same weekend were not included as index admissions. For each person, the first index admission in the period and subsequent admissions with admission dates more than 28 days after a previous index episode were included. Consequently, one person could have multiple index admissions.

'Index episodes' were defined as a series of continuous admissions (including an index admission), regardless of location, including transfers. Admissions belonged to the same index episode if the discharge time of the first admission was within 24 h of the admission time of the second.

'Index events' covered the index episode plus any re-admissions and/or outcomes occurring within 28 days of the discharge date of the index episode.

Six different event outcomes were considered: DAMA and in-hospital mortality pertaining to the index episode; ED presentations within 28-days; booked and emergency in-patient re-admissions within 28 days; and death in the 28-day period following discharge. Confidence intervals (95% CI) were calculated for these outcomes. Patient flows were determined from numbers of events and outcomes, by sex, age group, hospital, district or region of residence and index admission type (emergency or booked).

A profile of individuals with index admissions in each of three periods 2006–07, 2008–09 and 2010–11 was created. Age, sex, district of residence, study hospital and comorbidity variables were analysed for the first index admission for each person for each period. To assess comorbidity, principal and secondary diagnoses were analysed from the index admission as well as other hospital admissions over the preceding 5 years. The following conditions were investigated: diabetes, chronic kidney disease (CKD), chronic obstructive pulmonary disease (COPD), asthma, cancer, heart disease (any), ischaemic heart disease (IHD), heart failure, cerebrovascular disease, dementia, mental conditions, alcohol and drug disorders (including mental and behavioural disorders due to tobacco use), infections, injury and poisoning. A history of obstetric admissions was also noted.

The study was approved by the Curtin University Ethics Committee, the WA Aboriginal Health Ethics Committee and the Department of Health WA Human Research Ethics Committee.

Results

Between 2006 and 2011, 8041 eligible index admissions among 5113 individuals were selected from the study hospitals. The number of index admissions increased from 2355 in 2006–07, to 3075 in 2010–11, reflecting an increase of 30.6% over the period.

Person-based characteristics

Over the period 2006–11, approximately 40% of patients were under 25 years of age (Table 1), with mean age increasing from 31.0 years (95% CI 30.0–31.9 years) in 2006–07 to 32.4 years (95% CI 31.6–33.2 years) in 2010–11. Women (53% in the first two periods, 57% in the last period) comprised a larger percentage of the patient population than men. Most patients (70%) lived in the SMHS region, with the Kimberley and North Metropolitan regions also contributing sizeable patient numbers (6%–10%).

The comorbidity profiles were similar for people who were admitted over the three time periods. Injury (39%–41%), infection (37%–38%), drug- (including dependency and harmful tobacco use) and alcohol-related admissions (34%) and heart diseases (25%–27%) were the comorbidities most commonly recorded in the preceding 5 years or at the index admission (Table 1). Histories of admissions for infection (32%) and injury (31%) ranked highest and second highest for those under 25 years of age. Among patients 25 years and older, high ranking comorbidities included injury (47%), drug and alcohol

Table 1. Profile of Aboriginal people admitted to four study hospitals 2006–11

Data show the number of individuals in each group, with percentages in parentheses. Note, some individuals overlapped between years; the total number of individuals over the three time periods was 5113. WA, Western Australia

	2006 and 2007 (n = 1827)	2008 and 2009 (n = 2008)	2010 and 2011 (n = 2339)
Age group (years)			
0–14	392 (21%)	383 (19%)	409 (17%)
15–24	339 (19%)	390 (19%)	471 (20%)
25–44	624 (34%)	661 (33%)	798 (34%)
45–64	364 (20%)	452 (23%)	527 (23%)
65+	108 (6%)	122 (6%)	134 (6%)
Sex			
Male	851 (47%)	950 (47%)	1010 (43%)
Female	976 (53%)	1058 (53%)	1229 (57%)
Residence			
South Metropolitan WA	1272 (70%)	1383 (69%)	1620 (69%)
North Metropolitan WA	112 (6%)	129 (6%)	153 (7%)
Kimberley	187 (10%)	208 (10%)	215 (9%)
Other	256 (14%)	288 (14%)	351 (15%)
History of health conditions[A]			
Injury	711 (39%)	778 (39%)	967 (41%)
Infection	700 (38%)	764 (38%)	875 (37%)
Drug and alcohol[B]	626 (34%)	680 (34%)	784 (34%)
Heart	475 (26%)	541 (27%)	593 (25%)
Diabetes	394 (22%)	433 (22%)	477 (20%)
Mental health	318 (17%)	319 (16%)	416 (18%)
Pregnancy/birth	310 (17%)	342 (17%)	452 (19%)
Asthma	128 (7%)	128 (6%)	131 (6%)
Chronic kidney	104 (6%)	137 (7%)	153 (7%)
Chronic lung	76 (4%)	80 (4%)	83 (4%)
Stroke	59 (3%)	55 (3%)	67 (3%)
Cancer	42 (2%)	58 (3%)	51 (2%)
Dementia	14 (1%)	15 (1%)	15 (1%)
Patients 25 years and over with a history of selected chronic conditions[C]			
None	539 (49%)	602 (49%)	746 (51%)
1	225 (21%)	254 (21%)	319 (22%)
2	219 (20%)	240 (19%)	252 (17%)
3	99 (9%)	125 (10%)	126 (9%)
4	14 (1%)	14 (1%)	16 (1%)

[A]Some patients had multiple comorbidities.

[B]Drug and alcohol includes mental and behavioural disorders due to tobacco use (e.g. dependence or harmful use of tobacco connected to specific conditions).

[C]Diabetes, chronic kidney disease, heart disease, chronic lung disease.

Table 2. Top 10 principal diagnoses in broad condition groups for index admissions to study hospitals, by broad age group
Data show the number of individuals in each group, with percentages in parentheses. COPD, chronic obstructive pulmonary disease

0–14 years		15–24 years		25–44 years		45–64 years		65+ years	
1. Acute respiratory infections	313 (22%)	1. Delivery (without complication)	141 (10%)	1. Serious psychiatric disorders	198 (7%)	1. Ischaemic heart disease	250 (13%)	1. Ischaemic heart disease	51 (9%)
2. Conditions during perinatal period	151 (11%)	2. Intestinal infectious diseases	140 (10%)	2. Disorders of the gall bladder, biliary tract and pancreas	147 (5%)	2. Impaired glucose and diabetes	120 (6%)	2. COPD (chronic bronchitis, emphysema, bronchiectasis)	46 (8%)
3. Influenza and pneumonia	92 (7%)	3. Serious psychiatric disorders	136 (10%)	3. Interpersonal violence	131 (5%)	3. Symptoms or signs of circulation and/or respiration	103 (5%)	3. Health services for other procedures and health care	41 (7%)
4. Infections of skin and subcutaneous tissue	88 (6%)	4. Falls	87 (6%)	4. Alcohol and drug disorders	128 (5%)	4. Influenza and pneumonia	85 (4%)	4. Other forms of heart disease	39 (7%)
5. Intestinal infectious diseases	76 (5%)	5. Conditions; pregnancy, birth and puerperium	78 (6%)	5. Infections of skin and subcutaneous tissue	126 (5%)	5. Other forms of heart disease	77 (4%)	5. Influenza and pneumonia	31 (5%)
6. Viral infections	71 (5%)	6. Alcohol and drug disorders	64 (5%)	6. Ischaemic heart disease	124 (5%)	6. Other diseases of the urinary system	73 (4%)	6. Impaired glucose and diabetes	27 (5%)
7. Asthma	62 (4%)	7. Maternal care: possible problems	53 (4%)	7. Delivery (without complication)	111 (4%)	7. COPD (chronic bronchitis, emphysema, bronchiectasis)	69 (3%)	7. Other diseases of the urinary system	26 (4%)
8. Falls	53 (4%)	8. Anxiety disorders	51 (4%)	8. Influenza and pneumonia	90 (3%)	8. Disorders of the gall bladder, biliary tract and pancreas	69 (3%)	8. Symptoms or signs of circulation and/or respiration	25 (4%)
9. General symptoms and signs	49 (4%)	9. Other unintentional injuries	49 (4%)	9. Anxiety disorders	85 (3%)	9. Infections of skin and subcutaneous tissue	65 (3%)	9. Falls	22 (4%)
10. Other diseases of the respiratory system	45 (3%)	10. Interpersonal violence	48 (3%)	10. Symptoms or signs of circulation and/or respiration	84 (3%)	10. Health services for other procedures and health care	61 (3%)	10. Arthropathies (joints)	19 (3%)

disorders (41%), heart disease (40%) and infection (40%). Diabetes and mental health conditions were coded in the admission records within the last 5 years in 31% of patients (data not shown). Half the patients who were 25 years and older had at least one previous or current hospital diagnosis for one or more of diabetes, heart disease, CKD or COPD (Table 1). Approximately one in 10 patients had three or four of these conditions. These patterns remained relatively stable over the three time periods examined.

Event-based results

An analysis of principal diagnoses for index admissions by disease system identified diseases of the respiratory system, mental illness, injury and poisoning, obstetrics and diseases of the digestive system as ranking highest across all study periods, with IHD, acute respiratory infections, skin infections and serious psychiatric disorders being the highest ranking broad disease groups coded as principal diagnoses for all ages combined (data not shown). Infectious diseases ranked highly among children, with psychiatric disorders, substance disorders, injuries and maternity-related admissions being high in the 15–24 and 25–44 years age groups (Table 2). IHD ranked highly from 25 years of age, being the highest ranking condition from 45 years of age onwards with other chronic diseases also dominating. Rankings were similar over time (data not shown).

The patient flows for all ages combined are shown in Fig. 1. Of the 8041 events, 96% ended in a regular discharge, with 3% DAMA, 1% ($n = 66$) deaths in hospital and a further 11 deaths outside the hospital within 28 days. Approximately one-third of the events occurred in each of the 0–24, 25–44 and 45+ years age groups (Table 3). DAMA rates peaked in the 25–44 years age group (4.7%). The proportion of in-hospital deaths increased with age, although the actual number of deaths was highest in the 45–64 year group.

ED presentations within 28 days of index discharge increased steadily with age, from 17% in the 0–14 years age group to 31% in the oldest age group. The percentage of these ED presentations resulting in hospital re-admission increased with age from approximately one-third at younger ages to approximately half in the oldest age group. The percentage of events with at least one in-patient re-admission also increased with age, stabilising after 45 years of age. Similarly, in terms of booked re-admissions, the percentage increased substantially from 6% in the 25–44 years age group to 12%–13% for 45+ years. Emergency re-admissions (via the ED or not) increased with age from 8% in children to 21% in the 65+ years age group. Total 28-day deaths increased to 3.6% in the oldest age group.

Stratified data by sex, hospital, time period, location of residence and index admission type are not shown. However, results for the tertiary hospital had poorer outcomes than all the other study hospitals, as reflected by higher crude proportions of in-hospital mortality (1.3% vs 0.4%), DAMA (4.2% vs 1.9%), presentations to ED (28% vs 20%) and emergency (16% vs 12%) in-patient re-admission rates. Events starting with booked admissions had better outcomes than emergency admissions in terms of index admissions resulting in DAMA (1.3% vs 3.5%), emergency 28-day re-admissions (9% vs 15%) and booked 28-day re-admissions (11% vs 6%).

Discussion

By using linked in-patient, emergency and mortality data, the present study provides a comprehensive overview of predominantly urban Aboriginal patients eligible for the services offered by AHLOs in SMHS hospitals. The study estimates the number of patients accessing these hospitals, as well as the volume of events and their health service outcomes. To our knowledge, such an overview of hospital utilisation by Aboriginal people has not been undertaken before in Australia. Although 40% of patients were

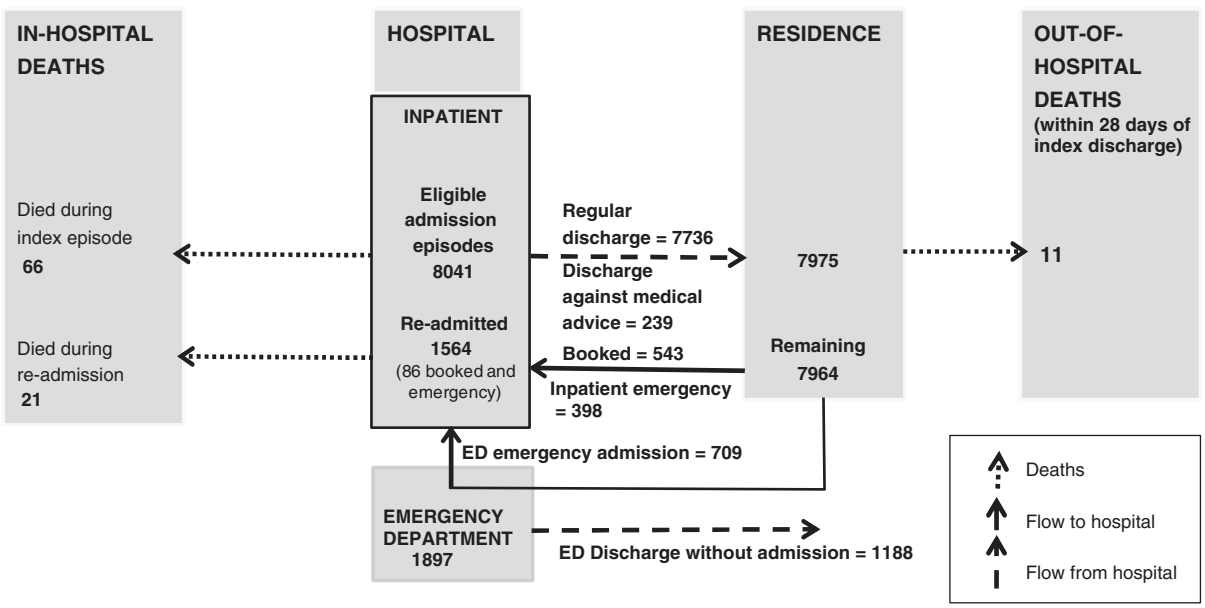

Fig. 1. Flow chart of admission events and outcomes in patients admitted to study hospitals during regular hours, 2006–2011.

Table 3. Study 28-day outcomes following episodes of care to four South Metropolitan hospitals by age group: 2006–11

95% CI, 95% confidence interval of the percentage. DAMA, discharge against medical advice; ED, emergency department; n/a, not applicable

	0–14 years		15–24 years		25–44 years		45–64 years		65+ years		All ages	
	n	% (95% CI)	*n*	% (95% CI)	*n*	% (95% CI)	*n*	% (95% CI)	*n*	% (95% CI)	*n*	% (95% CI)
During index hospital episode												
All events	1393	17	1400	17	2684	33	1979	25	585	7	8041	100
DAMA	<5		40	2.9 (2.0–3.7)	127	4.7 (3.9–5.6)	61	3.1 (2.4–3.9)	7	1.2 (0.3–2.1)	239	3 (2.6–3.3)
In-hospital deaths during index episode	0	0	<5	n/a	18	0.7 (0.4–1.0)	33	1.7 (1.1–2.2)	14	2.4 (1.2–3.6)	66	1 (0.6–1.0)
Within 28 days of index discharge date												
At least 1 ED presentation	230	17 (15–18)	262	19 (17–21)	696	26 (24–28)	535	28 (26–30)	174	31 (27–39)	1897	24 (23–24)
Post-index ED with hospital admission	82	36 (29–42)	78	30 (24–35)	233	33 (30–37)	227	42 (38–47)	89	51 (47–55)	709	37 (35–40)
At least 1 hospital re-admission	131	9 (8–11)	183	13 (11–15)	534	20 (19–22)	539	28 (26–30)	177	31 (27–35)	1564	20 (19–20)
At least 1 booked hospital readmission	20	1 (0.8–2.1)	44	3 (2–4)	167	6 (5–7)	239	12 (11–14)	73	13 (10–16))	543	7 (6–7)
At least 1 emergency hospital readmission	115	8 (7–10)	142	10 (9–12)	397	15 (14–16)	335	17 (16–19)	118	21 (18–24)	1107	14 (13–15)
Ratio emergency : booked re-admissions	5.8		3.2		2.4		1.4		1.6		2.0	
No. booked re-admissions per event												
0	1373	99 (98–99)	1356	97 (96–98)	2517	94 (93–95)	1740	88 (87–89)	512	88 (85–90)	7498	93 (93–94)
1	20	1	37	3	77	3	100	5	21	4	255	3
2	0	0	<5	n/a	13	0	9	0	<5	n/a	30	0
3 to 8	0	0	<5	n/a	14	1	29	1	5	1	51	1
9 +	0	0	0	0	63	2	101	5	43	7	207	3
No. emergency re-admissions per event												
0	1278	92 (90–93)	1258	90 (88–91)	2287	85 (84–87)	1644	83 (81–85)	467	80 (77–83)	6934	86 (85–87)
1	98	7	122	9	309	12	278	14	104	18	911	11
2	12	1	19	1	60	2	48	2	11	2	150	2
3+	5	0	<5	n/a	28	1	9	0	<5	n/a	46	1
No. ED presentations per event												
0	1163	84 (82–85)	1138	81 (79–83)	1988	74 (72–76)	1444	73 (71–75)	411	70 (67–74)	6144	76 (76–77)
1	160	11	178	13	413	15	355	18	110	19	1216	15
2	53	4	56	4	145	5	98	5	41	7	393	5
3	14	1	15	1	63	2	43	2	8	1	143	2
4	<5	n/a	7	1	27	1	17	1	6	1	58	1
5+	<5	n/a	6	0	48	2	22	1	9	2	87	1
Total 28-day deaths	0	0	<5	n/a	23	0.9 (0.5–1.2)	53	2.7 (2.0–3.4)	21	3.6 (2.1–5.1)	98	1.2 (1–1.5)

under 25 years of age, the data suggest that the age of Aboriginal people using SMHS hospitals is increasing. Consistent with findings elsewhere,[1,4,16] the high burden of comorbidity has been demonstrated, with approximately half the admitted patients 25 years and older having either a current or past admission in which they were treated for at least one of diabetes, heart disease, CKD or COPD. IHD, acute respiratory infections, serious psychiatric disorders and skin infections were the highest ranking specific disease groups for which Aboriginal people were admitted.

These findings need to be seen in the context of the substantial health differentials between Aboriginal and non-Aboriginal Australians, as exemplified by a 10-year life expectancy gap[17] and a 2.4-fold greater age-standardised burden of disease (as measured by disability-adjusted life years).[1] Indeed, the most common admission diagnoses and comorbidities observed in the present study are also observed in studies that compare Aboriginal and non-Aboriginal disease burden, showing high relative risk (RR) of diabetes (RR 5.1), cardiovascular disease (RR 4.6) and chronic respiratory conditions (RR 2.5) among Aboriginal people.[1]

The increased number of events over the study period, as well as the projected increase and aging of the Aboriginal population,[18] indicates that greater service volumes will need to be planned for in the future. The high prevalence of chronic diseases among patients, particularly the presence of multiple comorbidities in adults, requires intensive case management in both hospital and community settings. Alcohol and drug issues, including smoking, need to be integrated into the clinical management of patients in the hospital setting, including appropriate discharge planning to ensure support in the community.

Study outcomes were remarkably similar over the 2006–07, 2008–09 and 2010–11 periods. Almost one-quarter of events had a subsequent presentation to an ED within 28 days of discharge. Over one in five index events were followed by an in-patient re-admission within 28 days, with 7% having at least one booked re-admission and 13% having at least one emergency re-admission. Outcomes were better for booked compared with emergency re-admissions. Opportunities to identify and manage health problems early, in particular chronic diseases that benefit from planned admissions, can provide cost savings, especially where complications can be avoided.

Relative to Aboriginal Australians as a whole,[6] the proportion of DAMA was marginally higher (3% vs 2.5%), varying by age, hospital, sex and admission type. Improvements in the cultural security of hospitals, of which AHLOs are an important component, may reduce premature departure in time.[6,8] Language translation services, cultural orientation for staff and post-discharge liaison and follow up need further development.[19]

The poorer outcomes observed in the tertiary centre reflect the higher case complexity, cultural diversity and wide-ranging patient needs. As a consequence, AHLO workforce numbers, resources and training input may need to be higher at tertiary hospitals than other metropolitan hospitals.

These data endorse a role for AHLOs in SMHS hospitals. Supporting patients and their families in the hospital setting, facilitating cultural orientation of non-Aboriginal staff, contributing to discharge planning and liaising with community agencies and primary medical and allied health services are key aspects of the role.[20] Currently the focus of the service is on in-patients and is only available during office hours, limiting the reach of the service and potential benefits. The high proportion of patients presenting to the ED (often with multiple presentations) suggests that AHLOs also have a role to play in EDs. This role will require additional training and skill, given the short-term and acute nature of ED presentations. An expanded role cannot achieve better outcomes without adequate resourcing[21] and possibly areas of specialisation.

Although innovative and informative, the present study has several limitations. The exclusion of some hospitals and index events out of work hours means that the findings cannot be generalised to all Aboriginal patients, nor same-day patients. This study does not provide insight into hospital admissions that began and ended over a single weekend. However, it was a deliberate decision to profile admissions involving Aboriginal patients who could reasonably expect to be seen by an AHLO during their in-patient event. In addition, the study was designed to capture only those patients who could be referred to AHLOs on the basis of identification in the hospital system. Thus, the study may have underestimated the number of Aboriginal patients due to underidentification of Aboriginal status in hospital data.[22] Although restriction to Aboriginal patients meant that it was not possible to benchmark outcomes against those of non-Aboriginal patients, a detailed Aboriginal patient profile is described and the analysis is not dominated by well-established Aboriginal–non-Aboriginal disparities. Because there is no reliable method for determining whether a re-admission is related to a previous admission, our re-admission rate is a crude measure of outcome. ED presentations were not analysed in their own right, but rather as an outcome of an in-patient event. In addition, due to the staggered introduction of the program, a clear before and after period could not be identified, and thus the analysis is predominantly descriptive. Because we did not investigate length of stay in the present study, future work could strengthen estimation of hospital utilisation by examining the importance of length of stay as a service level indicator.

Planning for Aboriginal health requires understanding of the cultural needs, epidemiology and service use of the Aboriginal population, and applying this understanding to practice. Through its use of linked data, the present study has provided detailed quantitative information on the patient flows and outcomes for Aboriginal patients in a metropolitan setting and is being used for strategic and operational planning of health services. Because linked data are now available in all Australian jurisdictions, this approach will have applications across Australia.

Competing interests

There are no competing interests.

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