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doi:10.1111/imj.16140

ORIGINAL ARTICLE

Western Australia remote aeromedical substance use disorders outcomes

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Key words
air ambulance, substance use disorder, mental health, rural and remote.

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Received 24 February 2023; accepted 22 May 2023.

Abstract

Introduction: Substance use disorders (SUDs) cause significant harm to regional Australians, who are more likely to misuse alcohol and other drugs (AODs) and encounter difficulty in accessing treatment services. The primary aims of this study were to describe the demographics of patients aeromedically retrieved from regional locations and compare hospital outcomes with a metropolitan-based cohort.
Aims: Retrospective case-controlled cohort study. Participants were aeromedically retrieved within Western Australia for SUDs between 1 July 2014 and 30 June 2019. Retrieved patients were case-matched based on age and hospital discharge diagnosis. Descriptive statistics and χ^2 analysis were used to summarise the findings.
Results: One hundred thirty-six (91.3%) aeromedical retrievals were found, with the majority being male ($n = 95$; 69.9%). These were case-matched to 427 metropolitan patients, the majority male ($n = 321$; 75.2%). Retrieved patients were more likely (all $P < 0.05$) Indigenous (odds ratio [OR], 9.35 [95% confidence interval (CI), 5.96–14.85]), unemployed (OR, 2.9 [95% CI, 1.41–6.80]), referred to a tertiary hospital (OR, 2.18 [95% CI, 1.24–3.86]) and to stay longer in hospital (OR, 1.08 [95% CI, 1.02–1.14]).
Discussion: Findings highlight that unmarried and/or unemployed males were overrepresented in the retrieval group, with over half identifying as Indigenous. Regional variation in retrievals was noted, while amphetamine-type stimulants featured prominently in the retrieval cohort, who experienced longer hospital stays and more restrictive treatment.
Conclusions: Comparing clinical outcomes for retrieved regional patients experiencing SUDs, service design and delivery should focus on offering culturally safe care for Indigenous people, catering for regional health care catchment areas, while ideally adopting collaborative and integrated approaches between AODs and mental health services.

Introduction

Findings from the Global Burden of Disease Study 2015[1] showed that mental health and substance use disorders (SUDs) were the leading contributors to the disease burden in Australia. In Australia, they are responsible for 6.7% of all diseases and injuries, resulting in 6660 deaths per year and costing the public AU$23 billion annually.[1] The burden of alcohol and other drug (AOD) problems in rural and remote Australians is substantial. Alcohol is the most commonly used substance in Australia, with related harms increasing with remoteness.[2–4] The consumption of alcohol is higher in rural and remote residents aged 14 years and older compared with metropolitan residents. In the Northern Territory, the proportion of young adults (18–24 years of age) exceeding the single-occasion risk guidelines for

Funding: None.
Conflict of interest: Dr Fergus W. Gardiner and Ms Breeanna Spring are employees of the Royal Flying Doctor Service Public Health Research Unit, Federation Office. No other conflicts of interest to declare.

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alcohol consumption increased from 51% in 2016 to 69% in 2019.[5] Rural and remote residents are more likely to consume alcohol in quantities that place them at an increased risk of alcohol-related injury and disease.[2–4]

SUDs are a collective term used to classify a group of disorders arising from clinically significant impairment and distress arising from using one or more substances. Symptoms can arise from physical, mental and behavioural disturbances.[6–8] The use of substances may precipitate mental distress in vulnerable individuals or exacerbate symptoms in those with an established mental health diagnosis.[6–8] People with an established mental health condition are more likely to report consuming alcohol at a risky level than those without an established condition.[5] Those with high or very high levels of psychological distress are more likely to report recent illicit substance use and the consumption of more than four standard drinks of alcohol on any one occasion.[5]

Rural and remote Australians are more likely to be daily smokers, with prevalence rates of 19.6% for remote and very remote areas, 13.4% for inner regional areas and 9.7% for major cities.[9] Smoking rates are higher for mothers who reside in very remote areas (36%) or in the most socioeconomic disadvantaged areas (18%) compared with those residing in major cities (6.9%).[9,10] Illicit substance use is respectively at higher rates in the preceding 12 months (18.6%) than their major city counterparts (16.7%).[9] Cannabis use is more widespread, with rural and remote residents more likely to report being current or ex-users than those residing in major cities.[9] They use more analgesia, opioid medication and other pharmaceuticals than residents in major cities.[9] Differing cultural attitudes and beliefs towards alcohol, smoking and illicit substances in rural and remote residents is a significant contributing factor in usage patterns.[4,9,11]

Accessing community alcohol and drug treatment services is more difficult for rural and remote residents than those residing in major cities. People residing in remote and very remote areas travel on average 90 min or 102.7 km to access treatment supports, contrasting with 18.2 min or 13.2 km for those residing in major cities.[12] Travel times are often greater for Indigenous Australian people who are more likely to reside in very remote areas.[12] Geographical isolation and a dearth of treatment services may contribute to adverse health outcomes associated with rural and remote AOD use. In turn, emergency aeromedical retrievals are increasingly needed for specialist medical treatment beyond the local community service capacity. Previous research has shown a correlation between the removal of primary health care services and increasing aeromedical retrievals in rural settings.[4,13] Medicare-subsided mental health–specific services reduce significantly with increasing remoteness; service provision is 2.7 times less in remote areas and 5.6 times less in very remote areas.[14]

Due to the expansive size of Western Australia (WA), aeromedical retrieval services are an integral part of ensuring that rural and remote patients have access to appropriate acute medical care. SUDs accounted for 14.2% of the aeromedical retrievals for mental and behavioural disorders between 2014 and 2017.[15,16]

Aims

The aims of this study are to (between 1 July 2014 and 30 June 2019):

1. describe the demographics of patients aeromedically evacuated for SUDs,
2. describe the outcomes of these patients once they have been transferred to a metropolitan hospital and
3. compare the aeromedically retrieved group with a similar metropolitan-based case-controlled group with the same discharge diagnosis.

Hypothesis

Our null hypothesis states that there are no differences in the health care requirements and outcomes between rural and remote patients retrieved due to a SUD diagnosis, with metropolitan patients presenting with similar problems.

Methods

Setting

The current study was set in WA, the largest Australian state covering over 2.5 million km^2. WA has a population of nearly 2.6 million people, with most residing in the South-western metropolitan and regional locations (79%).[17]

Our study explores communities and patients from what the Australian Statistical Geography Standard shows as remote and very remote settings.[18] The people residing in these remote and very remote communities are challenged and burdened by considerable distance to reach equitable health care compared with their urban counterparts.[19] Between the years 2014 and 2019, this study involved five aeromedical retrieval bases responding to SUDs-related mental health emergencies throughout WA.

Statistical analysis

This study used a matched case-controlled cohort to describe and analyse the characteristics of rural and remote patients aeromedically evacuated to a metropolitan hospital with a SUD diagnosis. A group of metropolitan-based patients with

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the same discharge diagnoses as the evacuated patients was used as a comparison.

Data were collected on all emergency retrievals performed (e.g. patient information, primary diagnosis, treatment, pick-up location, destination and staff present). Aeromedical retrieval records were used to obtain Hospital Morbidity Data Collection (HMDC) through the Data Linkage Branch (DLB), Department of Health (DOH) WA. The DLB manages, creates and maintains data linkages within and between a wide range of data sets within the DOH WA system, providing the study team with linked data to the aeromedically retrieved cohort (ARC). Matching the transfer records and the HMDC occurred if there was an admission to a metropolitan hospital within 1 week of arrival, enabling the description of characteristics of rural and remote patients transferred due to a SUD diagnosis.

ARC inclusion criteria

- Aeromedical retrievals between 1 July 2014 and 30 June 2019,
- diagnosis at the point of aeromedical retrieval F10-19 consistent with the *International Statistical Classification of Diseases, 10th Revision* (*ICD-10*), chapter V F10-F19 Mental and behavioural disorders due to psychoactive substance use[20] and
- age 18 years or older.

An age similar–matched comparison group of metropolitan-based patients with the same discharge diagnoses (primary and secondary SUD diagnoses) was identified by the DLB and used as a control group. HMDC for the matched comparison group was identified by DLB staff not associated with this study.

Metropolitan control cohort inclusion criteria

- Metropolitan postcode from the HMDC,
- principal diagnosis, codiagnosis or additional diagnosis consistent with *ICD-10*, chapter V F10-F19 Mental and behavioural disorders due to psychoactive substance use,
- same sex,
- same age group (18–24, 25–34, 35–44, 45 years and older),
- same separation year and
- same mental health legal status.

Four controls were requested for each ARC case to improve the strength of the statistical analysis and modelling of results. HMDC from the ARC and the metropolitan control cohort (MCC) were analysed using descriptive statistics and χ^2 analysis to summarise findings, with significance determined at $P \leq 0.05$. A mixed-effects logistic regression with clusters induced by the matching as a random effect was used to estimate the effect of the group (ARC or MCC) on various outcomes. Outcomes were dichotomised to fit the logistic regression model. A sensitivity analysis including the matching variables as fixed effects was also undertaken, as was an analysis omitting the persons with more than one admission during the time. Ethics approval was obtained through the DOH WA Human Research Ethics Committee (reference number RGS3307) and the WA Aboriginal Health Ethics Committee (reference number 1028).

Results

Linkage results

There were 1016 aeromedical retrievals for mental and behavioural disorders (*ICD-10* chapter V) in WA, with 149 (14.7%) related to SUDs over the study period.[16] One hundred thirty-six patients aeromedically retrieved were able to be linked with HMDC from admission to a metropolitan hospital within 1 week of the retrieval date. Four hundred twenty-seven metropolitan patients presenting with SUDs were used to create the MCC for comparison. Table 1 shows the primary, secondary and tertiary diagnoses for both patient cohorts. The most prevalent referring regional hospitals were Geraldton Health Campus ($n = 64$; 42.7%), Carnarvon Health Campus ($n = 19$; 12.7%) and Kalgoorlie Health Campus ($n = 15$; 10.0%). Figure 1 shows the locations of retrieval sites within rural and remote WA.

Aeromedically retrieved cohort

Demographics

Most patients in the ARC ($n = 136$; 100%) were male ($n = 95$; 69.9%) and aged between 18 and 72 years. The most prevalent age was 30 to 34 years ($n = 32$; 23.5%), followed by 20 to 24 years ($n = 28$; 20.6%). Most patients were aged 44 years and younger ($n = 123$; 91.0%). They were more likely to identify as Aboriginal ($n = 77$; 56.6%) and be 'never married' ($n = 106$; 77.9%). Twenty-nine (21.3%) were recorded as unemployed. There were five (3.4%) deaths in the ARC and 20 (4.7%) deaths in the MCC.

ICD-10 Edition 2, Chapter V primary diagnosis F10-F19 SUDs

The ARC had a total of 839 diagnoses: five ARC patients had a primary diagnosis alone, nine patients had two

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diagnoses, 17 patients had three diagnoses, 18 patients had four diagnoses, 22 patients had five diagnoses and 65 had six or more diagnoses. Ninety-nine (72.8%) of the patients within the ARC had a primary diagnosis of F10–F19. Stimulant-related disorders (F15) were most prevalent ($n = 35$; 25.7%), followed by psychoactive substance-related disorders (F19) ($n = 34$; 25%), cannabis-related disorders (F12) ($n = 19$; 14%), and alcohol-related disorders (F10) ($n = 6$; 4.4%). Table 2 shows the demographics and diagnoses for both the ARC and MCC patients.

More males ($n = 69$; 69.7%) than females ($n = 30$; 30.3%) received an F10–F19 diagnosis. Cannabis-related disorders (F12) were twice as prevalent in males ($n = 12$; 12.1%) compared with females ($n = 7$; 7.1%). Stimulant-related disorders (F15) had similar prevalence differences in males ($n = 22$; 22.2%) and females ($n = 13$; 13.1%). Alcohol-related disorders (F10) were five times more prevalent in males ($n = 5$; 5.1%) compared with females ($n = 1$; 1.0%). Males were twice as likely as females to be diagnosed with opioid-related disorders (F11). Sedative, hypnotic or anxiolytic-related disorders were diagnosed equally among males and females. An ARC patient was more likely to require mental health care ($n = 94$; 69.1%), with most care delivered involuntarily ($n = 68$; 50.0%) compared with voluntarily ($n = 26$; 19.1%).

ARC versus MCC

In unadjusted terms for person-related outcomes, comparing the odds of an ARC patient with an MCC patient, they were almost three times higher for unemployed (odds ratio [OR], 2.90 [95% confidence interval (CI), 1.41–6.80], $P = 0.007$), over nine times higher for Indigenous (OR, 9.35 [95% CI, 5.96–14.85] $P < 0.001$) and half of the size to be born overseas (OR, 0.49 [95% CI, 0.28–0.80] $P = 0.007$). The ORs of admission-related criteria for an ARC patient were over two times higher for admission to a tertiary hospital (OR, 2.18 [95% CI, 1.24–3.86], $P = 0.007$), two-thirds of the size for discharging home (OR, 0.3, [95% CI, 0.22–0.59], $P < 0.001$), 8% longer for length of stay (OR, 1.08 [95% CI, 1.02–1.14], $P = 0.008$) and a third of the size for access to leave days (OR, 0.35 [95% CI, 0.23–0.53] $P < 0.001$) and leave periods (OR, 0.39 [95% CI, 0.21–0.66] $P < 0.001$). The model with matching variables as fixed effects showed that an ARC patient was nearly twice as likely to be unmarried (adjusted OR, 1.98 [95% CI, 1.05–3.73] $P = 0.034$). See Table 3 for further details.

We investigated whether the matching was better described by a model adjusted for the matching variables of age, sex, year of separation and two-digit primary diagnosis. The results were not materially different from the random-effect model and are shown in Table 3.

Discussion

Our study confirms findings well described in the literature, indicating that unmarried, unemployed, young adult males are over represented in requiring acute AOD and related mental health aeromedical retrieval in rural and remote Australia.[3] Multiple substances used, complexity and co-occurrence of mental disorders are highly prevalent in the ARC. This paper adds to the evidence

Table 1 Summary of the ARC ($N = 136$) and MCC ($N = 427$) primary, secondary, third and fourth discharge diagnoses

	Primary diagnosis		Secondary diagnosis		Third diagnosis		Fourth diagnosis		Total diagnostic count
	ARC $n = 136$ (100%)	MCC $n = 427$ (100%)	ARC $n = 131$ (100%)	MCC $n = 405$ (100%)	ARC $n = 122$ (100%)	MCC $n = 358$ (100%)	ARC $n = 105$ (100%)	MCC $n = 293$ (100%)	ARC + MCC $n = 1977$
F10 *Alcohol-related disorders*	6 (4.4%)	14 (3.3%)	12 (9.2%)	43 (10.6%)	16 (13.1%)	20 (5.6%)	5 (4.8%)	26 (8.9%)	**142**
F11 *Opioid-related disorders*	*	*	*	*	*	12 (3.4%)	*	7 (2.4%)	**37**
F12 *Cannabis-related disorders*	19 (14.0%)	60 (14.1%)	31 (23.7%)	68 (16.8%)	22 (18.0%)	55 (15.4%)	8 (7.6%)	16 (5.5%)	**279**
F15 *Other stimulant-related disorders*	35 (25.7%)	121 (28.3%)	39 (29.8%)	106 (26.2%)	21 (17.2%)	59 (16.5%)	11 (10.5%)	21 (7.2%)	**413**
F19 *Other psychoactive substance-related disorders*	34 (25.0%)	126 (29.5%)	*	17 (4.2%)	*	7 (2.0%)	*	*	**195**
Additional diagnosis captured outside SUDS disorder F10–F19 codes	37 (27.2%)	101 (23.7%)	38 (29.0%)	158 (39.0%)	58 (47.5%)	197 (55.0%)	74 (70.5%)	212 (72.4%)	**875**

Specific F10–F19 disorder codes are described, with the remaining diagnosis codes accounted for as 'other.' Data are number (percentage of column number). Identifiable data represented $n = *$.
ARC, aeromedically retrieved cohort; MCC, metropolitan control cohort; SUD, substance use disorder.

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Figure 1 Map of aeromedical retrievals for the aeromedically retrieved cohort.

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Table 2 Demographics and diagnoses for the ARC and MCC

Data variable	ARC morbidity complete primary diagnosis summary	MCC complete primary diagnosis summary
Age groups, y	**(*n* = 136) 31.52 ± 10.234**	**(*n* = 427) 30.85 ± 10.097**
18–19	11 (8.1%)	26 (6.1%)
20–24	28 (20.6%)	99 (23.2%)
25–29	24 (17.6%)	86 (20.1%)
30–34	32 (23.5%)	102 (23.9%)
35–39	14 (10.3%)	49 (11.5%)
40–44	14 (10.3%)	35 (8.2%)
45–49	6 (4.4%)	9 (2.1%)
50–84	7 (5.1%)	21 (4.9%)
Sex	**(*n* = 136)**	**(*n* = 427)**
Female	41 (30.1%)	106 (24.8%)
Male	95 (69.9%)	321 (75.2%)
Indigenous status	**(*n* = 136)**	**(*n* = 427)**
Neither Aboriginal nor Torres Strait Islander origin	57 (41.9%)	371 (86.9%)
Both Aboriginal and Torres Strait Islander origin	*	*
Aboriginal not Torres Strait Islander origin	77 (56.6%)	54 (12.6%)
Marital status	**(*n* = 136)**	**(*n* = 427)**
Never married	106 (77.9%)	349 (81.7%)
Widowed	*	*
Divorced	*	9 (2.1%)
Separated	5 (3.7%)	13 (3.0%)
Married (including *de facto*)	18 (13.2%)	49 (11.5%)
Not stated	*	6 (1.4%)
Employment status	**(*n* = 136)**	**(*n* = 427)**
Student	*	8 (1.9%)
Employed	8 (5.9%)	61 (14.3%)
Unemployed	29 (21.3%)	145 (24.0%)
Home duties	0 (0.0%)	11 (2.6%)
Retired	0 (0.0%)	*
Pensioner	7 (5.1%)	22 (5.2%)
Other	91 (66.9%)	176 (41.2%)
Hospital category	**(*n* = 136)**	**(*n* = 427)**
Tertiary	46 (33.8%)	106 (24.8%)
Public metro	87 (64.0%)	212 (49.6%)
Rural (public/private)	0 (0.0%)	20 (4.7%)
Private metro	*	89 (20.8%)
ICD-10 Edition 2, Chapter V Primary diagnosis	**(*n* = 136)**	**(*n* = 427)**
F10 Mental and behavioural disorders due to use of alcohol	6 (4.4%)	13 (3.3%)
F11 Mental and behavioural disorders due to the use of opioids	*	*
F12 Mental and behavioural disorders due to the use of cannabinoids	19 (14.0%)	60 (14.1%)
F13 Mental and behavioural disorders due to use of sedatives, hypnotics or anxiolytic	*	*
F15 Mental and behavioural disorders due to use of other stimulants, including caffeine	35 (25.7%)	121 (28.3%)
F19 Mental and behavioural disorders due to multiple drug use and use of other psychoactive substances	34 (25.0%)	126 (29.5%)
F20 Schizophrenia	13 (9.6%)	52 (12.2%)
F23 Acute and transient psychotic disorders	*	0 (0.0%)
F25 Schizoaffective disorders	5 (3.7%)	17 (4.0%)
F30 Manic episode	*	0 (0.0%)
T43 Poisoning by, adverse effect of and underdosing of psychotropic drugs, not elsewhere classified	*	9 (2.1%)

Data are number (percentage of the total number) and mean ± standard deviation. The number of participants available for each variable is stated in the separate column. Identifiable data represented *n* = *. ARC, aeromedically retrieved cohort; MCC, metropolitan control cohort.

base by providing additional information concerning the aeromedical retrieval of patients from rural and remote locations, i.e. when severity of morbidity and acuity of care required is greater than the resources available at the retrieval location.

In WA, a relatively high proportion of Indigenous people live in remote and very remote areas (42%); however, this falls to 15% in outer regional areas and larger centres such as Geraldton and Kalgoorlie.[21] As over half of the ARC were Indigenous, our findings add to the suggestion that the needs of rural and remote Indigenous populations

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Table 3 ORs for the effect of the group on person-related and admission-related characteristics, with models adjusted for clusters induced by the matching (A) and models adjusted for the matching variables of age, sex, year of separation and two-digit primary diagnosis (B)

	Unadjusted OR (A)		Adjusted OR (A)		Unadjusted OR (B)		Adjusted OR (B)	
Characteristic	OR (95% CI)	*P* value	OR (95% CI)	*P* value	OR (95% CI)	*P* value	OR (95% CI)	*P* value
Person-related								
Employment status (outcome = unemployed)	**2.90 (1.41–6.80)**	**0.007**	1.90 (0.61–7.36)	0.302	**2.82 (1.37–6.63)**	**0.009**	1.27 (0.52–3.39)	0.611
Marital status (outcome = unmarried)	1.22 (0.70–2.07)	0.471	**1.98 (1.05–3.73)**	**0.034**	1.18 (0.66–2.04)	0.567	1.89 (0.91–3.90)	0.084
Indigenous status (outcome = Indigenous)	**9.35 (5.96–14.85)**	**<0.001**	**6.64 (3.62–12.48)**	**<0.001**	**10.20 (6.37–16.6)**	**<0.001**	NA*	NA*
Country of birth (outcome = overseas-born)	**0.49 (0.28–0.80)**	**0.007**	0.51 (0.22–1.10)	0.096	**0.47 (0.27–0.79)**	**0.006**	0.90 (0.47–1.69)	0.751
Mortality	0.34 (0.06–1.31)	0.164	NA*	NA*	NA*	NA*	NA*	NA*
Admission-related								
Hospital category (outcome = tertiary)	**2.18 (1.24–3.86)**	**0.007**	1.39 (0.49–3.73)	0.517	**1.82 (1.13–2.93)**	**0.014**	**2.49 (1.15–5.47)**	**0.021**
Care type (outcome = nonacute)	0.97 (0.64–1.48)	0.878	0.67 (0.25–1.95)	0.447	0.98 (0.61–1.58)	0.924	NA*	NA*
Mode of separation (outcome = home)	**0.36 (0.22–0.59)**	**<0.001**	1.50 (0.65–3.67)	0.355	**0.39 (0.25–0.64)**	**<0.001**	NA*	NA*
Length of stay	**1.08 (1.02–1.14)**	**0.008**	**1.19 (1.11–1.28)**	**<0.001**	**1.09 (1.03–1.15)**	**0.002**	**1.42 (1.33–1.51)**	**<0.001**
Days of leave	**0.35 (0.23–0.53)**	**<0.001**	0.73 (0.45–1.12)	0.167	**0.69 (0.50–0.95)**	**0.025**	0.66 (0.39–1,13)	0.123
Leave periods	**0.39 (0.21–0.66)**	**<0.001**	0.75 (0.39–1.35)	0.357	**0.40 (0.23–0.71)**	**0.001**	NA*	NA*
Mental health status (outcome = involuntary)	0.93 (0.01–67.8)	0.974	1.08 (0.53–2.24)	0.827	1.13 (0.56–2.32)	0.741	1.87 (0.76–4.86)	0.184

The cluster effects in the mixed model for Indigenous status, marital status, care type, days of leave and leave periods were not identifiable. Hence, the results quoted are for a fixed-effects model. Length of stay, days of leave and leave periods are modelled with a Poisson distribution. Baseline = metropolitan control cohort. Figures in bold indicate statistically significant results. NA*: Model resulted in fitted values at the boundary, results unstable.
CI, confidence interval; OR, odds ratio.

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are higher than non-Indigenous Australians. Ensuring that services are culturally safe, community designed and controlled, accessible to key at-risk groups and address the complexities of confidentiality in small populations and remote locations are recognised strategies in providing services to patients who often present late in their illness progression, acutely unwell.[22]

During our study period, over a quarter of retrievals were related to amphetamine-type stimulants, consistent with epidemiological and clinical studies in rural and remote WA over the same study period.[11,23,24] Combinations of multiple substances accounted for another quarter of retrievals, while cannabis-related retrievals accounted for approximately one in six cases, consistent with previous research showing the more widespread use of cannabis in rural and remote residents.[9] Of note was the low number of alcohol-related retrievals, despite relatively high rates of alcohol consumption and associated harms being identified in rural and remote WA.[3] Possible explanations include reduced screening, recognition or reporting of alcohol-related problems and use disorders, management locally therefore negating the need for retrieval, alcohol-related problems are rarely considered severe enough to justify involuntary mental health management and aeromedical retrieval, or that health care services may already have the existing capacity to manage more commonly accepted alcohol-related problems in rural and remote locations, offering a more strength-based explanation.[3] However, the higher rates of alcohol use disorder in discharge diagnoses compared with the ARC and MCC, as shown in Table 2, suggests that the former explanation of under recognition of alcohol's role in the retrieval requests may be more likely. Better integration of AOD and mental health services may improve the recognition and treatment of rural and remote alcohol-related problems.

It is known that associated AOD morbidity worsens with increasing remoteness.[3] Our study, in part, confirms the trend towards rural and remote locations being associated with high levels of acute care being required and longer lengths of hospital stays. When considering service design, commissioning and provision of AOD and supporting mental health services, the absence of acute mental health capacity in specific regions in WA is noteworthy. The top two retrieval sites during the study period were Geraldton and Carnarvon, both located in the Midwest region. As the third largest region by population (outside of metropolitan Perth) and area,[25] the Midwest has no acute AOD or mental health beds within its existing health care service system. Concurrently, comparably sized regions with better resourcing, such as the Great Southern region, with 16 acute mental health beds, an emergency department and a high-dependency unit, all staffed by specialists, had no aeromedical retrievals for SUDs during the study period. We suggest these findings, focussing solely on the acute SUDs presentations, likely significantly underrepresent the resourcing deficits and disparities in rural and remote AOD and mental health services throughout regional WA. Given the heterogeneity of regional resourcing and service configuration across Australia,[26] our findings challenge commissioning agencies and governments to ensure adequate or equitable access to AOD and mental health services across rural and remote Australia.

In a state with only one publicly available AOD specialist inpatient service,[27] our study highlights the important role mental health inpatient units and mental health legislation and regulations play in providing acute care to people with SUDs. This is particularly relevant for rural and remote residents with SUDs who are transported hundreds of kilometres from their families, communities and supports. This was demonstrated in the ARC with the majority receiving mental health care at the destination hospital. Despite the siloing and subspecialisation of AOD from mental health services in many jurisdictions, particularly in large metropolitan centres, coordinated generalist services involving integrated AOD and mental health services may be a better fit for rural and remote resource centres. Facilities that are accessible, adequately resourced and contain generalist expertise are more likely to be sustainable service models than the reductionist specialisation approaches utilised in metropolitan centres. Regionally, this is clinically and economically pragmatic. Ensuring that resourcing and planning extends to developing culturally competent clinicians with AOD training and expertise remains challenging but must emerge as a priority in rural and remote health care service commissioning and development.

In conjunction with increased length of hospital stay and higher acute care requirements, the nature of the care context and environment warrants further consideration and research for people requiring aeromedical retrieval for SUDs. Our study suggests that more restrictive forms of care and fewer trials or less time on leave from hospital care occurs for patients from rural and remote locations. Despite some gaps in the data, this finding warrants further investigation in the context of applying a human rights framework to rural and remote residents, particularly those identifying as Indigenous, when experiencing SUDs and requiring acute care.

Finally, there are several limitations of our study that warrant acknowledgement. The first is recognising that alcohol and drug trends fluctuate, and the study period addresses aeromedical retrievals between 2014 and 2019, and therefore needs to address issues that may

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arise from COVID-19 and related population/service changes. Additionally, there are several confounding factors that limit the extent to which the matched controlled analysis can provide. Attempts to address this limitation include using a 1:4 (nonmetropolitan to metropolitan) matching, while controlling for sex, age, legal status and discharge diagnoses. Nonetheless, we were unable to compare within aeromedical retrieval locations, and assumptions of the severity of illness may be conflated with a lack of local resources, or vice versa. Other confounding factors, including logistic, sociodemographic and economic factors, were not accounted for in our research. More complex data sets are required to undertake these analyses beyond the scope of this study.

Conclusions

This novel study adds to the evidence of care disparities and increased complexities for rural and remote people with SUD problems and diagnoses. Aeromedically transferred patients are often male, indigenous, unmarried and/or unemployed. Amphetamine use is common. They are an unwell subset of patients who, compared with similar metropolitan-based patients, have a longer length of stay and experience more restrictive practices. Regional inequities in service provision and accessibility are evident, suggesting the need to enhance AOD and mental health facilities in resource-poor regions.

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