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Title:

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Date:

2021-08-01

Citation:

Gardiner, F. W., Richardson, A., Roxburgh, C., Gillam, M., Churilov, L., McCuaig, R., Carter, S., Arthur, C., Wong, C., Morton, A., Callaway, L., Lust, K., Davidson, S. J., Foxcroft, K., Oates, K., Zhang, L., Jayawardane, S., Coleman, M. & Peek, M. (2021). Characteristics and in-hospital outcomes of patients requiring aeromedical retrieval for pregnancy, compared to non-retrieved metropolitan cohorts. *Australian and New Zealand Journal of Obstetrics and Gynaecology*, 61 (4), pp.519-527. <https://doi.org/10.1111/ajo.13308>.

Persistent Link:

<https://hdl.handle.net/11343/298117>

Characteristics and in-hospital outcomes of patients requiring aeromedical retrieval for pregnancy, compared to non-retrieved metropolitan cohorts.

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This is the author manuscript accepted for publication and has undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the [Version of Record](#). Please cite this article as [doi: 10.1111/AJO.13308](https://doi.org/10.1111/AJO.13308)

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Author have no conflict of interest to declare.

There is no funding to declare.

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Article type : Original Article

Characteristics and in-hospital outcomes of patients requiring aeromedical retrieval for pregnancy, compared to non-retrieved metropolitan cohorts.

Short title: Patients requiring retrieval for pregnancy.

Total word count: 3964 (abstract=245; main= 2719).

Tables: 5

Figures: 0

Keywords: Pregnancy; Air Ambulance; Infant, Newborn; Australia; Obstetric Labor, Premature.

The authors have no conflict of interests to declare.

Abstract

Background

Limited access to obstetrics and gynaecology (O&G) services in rural and remote Australia is believed to contribute to suboptimal birth outcomes.

Aims

To describe the characteristics of pregnancy aeromedical transfers, in-hospital outcomes, and patient access to O&G services, as compared to whole of Australia data.

Materials and methods

We conducted a cohort study of women who required aeromedical retrieval for pregnancy related issues between the 1st January 2015 and 31st December 2017.

Results

Hospital outcome data were collected on 2171 (65.2%) mothers and 2438 (100.0%) babies. The leading retrieval reason was threatened preterm labour and delivery (n=883; 40.7%). Most patients were retrieved from rural and remote areas (n=2224; 93.0%). Retrieved patients were significantly younger (28.0 vs. 30.0 years, 95% CI 27.7-28.3), more likely to be overweight or obese (52.2% vs. 45.1%, 95% CI 47.5-56.9) and to have smoked during their pregnancy (14.0% vs. 9.9%, 95% CI 12.5-15.5) compared to Australian pregnant women overall. Over one-third of transferred women gave birth by Caesarean section (n=812; 37.4%); the median gestational age at birth was 33.0 (95% CI 32.7-33.3) weeks. Early gestation is associated with low birth weights (median =2579.5 grams; 95% CI 2536.1-2622.9), neonatal resuscitation (35.4%, 95% CI 33.5-37.3), and special care nursery admission (41.2%, 95% CI 39.3-43.2). There were 42 (1.7%, 95% CI 1.2-2.2) stillbirths, which was significantly higher than seen Australia-wide (n=6441; 0.7%).

Conclusion

This study found that pregnant women retrieved by RFDS were younger, with higher rates of obesity and smoking.

Introduction

Australian communities living in rural and remote setting have many health disadvantages compared to those in metropolitan areas, including higher disease prevalence and a lower life expectancy. The factors that contribute to lower levels of health in rural and remote populations include geographical isolation, reduced access to healthy food, reduced provision of, and access to, healthcare, and a shortage of culturally appropriate health workers.¹

Certain maternal behaviours, (e.g. smoking and higher alcohol intake) are associated with increased risk for adverse perinatal outcomes such as preterm birth and small for-gestational-age infants. The prevalence of these behaviours, and other factors such as late initiation of antenatal care and inaccurate assessment of gestational age, is often higher in rural and remote areas.^{2,3} Furthermore, poor pregnancy outcomes are more common in association with pre-existing hypertension, heart disease, type 2 diabetes mellitus, autoimmune thyroid disease and some forms of cancer.⁴ All of these conditions are significantly more common in rural and remote populations.¹

Even with the documented health disparity between the rural and urban population, there has been little attention given to identifying pregnancy outcomes following antenatal transfer to an inner-regional or metropolitan hospital for pregnancy-related care.⁵

This study aims to describe the outcomes of pregnancy-related aeromedical transfers to inner-regional and metropolitan hospitals throughout Australia. These include:

- Describing the characteristics of mothers and babies who required a pregnancy-related aeromedical transfer;
- Documenting maternal and fetal/neonatal transfer outcomes as compared to Australian averages; and
- Describing patient accessibility to obstetrics and gynaecology services.

Materials and Methods

Setting

This study includes patient in-flight information and hospital patient outcome data, throughout Australia.

The retrieving service provides essential aeromedical and primary healthcare to populations who are unable to access traditional services through the Medicare Benefits Schedule (MBS). Aeromedical retrievals comprise primary evacuations and inter-hospital transfers. A primary evacuation describes the provision of emergency medical services to people affected by illness or accident who are in a serious or potentially life-threatening condition, who are beyond the normal medical infrastructure. An inter-hospital transfer (or secondary evacuation) describes the transfer of patients between hospitals designated as normal medical infrastructure, often to access a higher level of care, such as specialist treatment or life-saving surgery. However, an inter-hospital transfer can also include the transfer of a patient from a large to a smaller community hospital, to receive ongoing care closer to the patient's home.

Patients

This study includes all patients who received a patient transfer for pregnancy, childbirth, and/or puerperium complications, that were transferred to hospitals within Western Australia,

Queensland, and New South Wales, for ongoing care between the 1st January 2015 and 31st December 2017 (3 years).

Aeromedical retrieval population data

Clinical databases were accessed for the length of the study period to provide patient information, including transfer category (primary evacuation or inter-hospital transfer), transfer date, transfer location, patient record number, patient's normal residential postcode, patient age and gender, and in-flight working diagnosis. All in-flight diagnoses were coded to the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10).

Patient hospital data

Following aeromedical retrieval, rural and metropolitan hospital outcome variables were collected from the receiving hospital which included patient's demographic information comprising age, gender, ethnicity, indigenous status, and residential information. Smoking status was also collected.

Pregnancy outcome variables were collected including, onset of labour, gestational age, maternal and baby date of birth, weight, mode of birth/ delivery, resuscitation required, birth outcome (livebirth, still birth, termination, miscarriage), and special care nursery/ NICU admission.

These variables were used to compare maternal and pregnancy outcomes between patients who received an aeromedical retrieval and Australian rates and averages.

Consistent with the Australian Government Department of Health, pre-term birth was defined as birth before 37 completed weeks of pregnancy.⁶

Australian mothers and babies' data

To determine whether the patient transfers and hospital outcomes differed to Australian births, we used patient data from the Australian Institute of Health and Welfare (AIHW),⁷ for the period from 1st January 2014 to 31st December 2016 (3 years). Data used included Australian demographics of mother and babies (including maternal age, and Accessibility and Remoteness Index of Australia (ARIA) remoteness category of-major city, inner-regional, outer-regional,

remote, and very remote), antenatal period (smoking status during pregnancy, and maternal medical conditions), labour and birth (place, onset, and method), baby outcomes (resuscitation, special care nursery admissions), and stillbirth rates.

For comparative baseline data on antenatal medical risk factors, gestational age, and baby birthweights, we used retrospectively collected data from 3 separate major city hospital pregnancy cohorts, for the time period 1st January 2014 to 31st December 2016 (3 years). These hospitals were selected as they mainly service a major city population and were not a transfer location for the present study.

Access to obstetrics and gynaecology services

To determine population access to obstetrics and gynaecology services, we used data from the Australian Bureau of Statistics (ABS) to derive 2018 geographical population estimates. The target population was women 18-44 years of age. This group was selected, as they are the most likely to require obstetrics and gynaecology services pertaining to pregnancy.

We defined “obstetrics and gynaecology services”, as those services registered under this category on Health Direct.⁸ We then used the Service Planning and Operational Tool (SPOT) to help determine coverage of obstetrics and gynaecology services across Australia. Working from a geographic distribution of population and a set of healthcare facilities that provide obstetrics and gynaecology services, SPOT calculates the proportion of the population covered by those facilities within a user-specified drive time.⁹

Statement of ethics

This project was deemed a low-risk quality assurance project by the Royal Flying Doctor Service (RFDS) Clinical and Health Services Research Committee (CHSRC). Subsequently to the CHSRC, this project was also deemed as a low-risk quality assurance project by Capital Territory HREC (Number: 2018/QAI/00168), the Royal Brisbane and Women’s Hospital HREC (Number: LNR/2019/QRBW/52095), and the Central Australia HREC (Number: 2020-3798).

Statistical analysis

Continuous variables were summarised as medians and interquartile ranges (IQR). Categorical variables were summarised as counts and proportions. The comparison between the

aeromedical retrieval sample and the Australian total sample were made by estimating 95% confidence intervals for medians and proportions of interest for the aeromedical retrieval sample and examining whether the population values belonged to these confidence intervals. The population value outside of the sample 95% confidence interval can be interpreted as indicative of a statistically significant difference between the sample and the Australian population at the significance threshold of 0.05. Statistical analyses were performed using the statistical software package R version 3.5.1.

Results

During the study period 1st January 2015 to the 31st December 2017, there were 3327 retrieved pregnancy patients, equating to 21 retrievals for pregnancy per week. Hospital outcome data was collected on 2171 (65.2%) mothers and 2438 (100.0%) babies, involving 152 primary evacuations and 2019 inter-hospital transfers, with the leading retrieval reasons being for threatened preterm labour and delivery (n= 883; 40.7%), premature rupture of membranes (n=344; 15.9%), and antepartum haemorrhage (n=172; 7.9%). Threatened preterm labour and delivery was defined as the onset of regular uterine contractions (at least 1 per 10minutes) which are associated with an effacement and / or dilatation of the cervix at under 37weeks gestation. See Table 1 for demographic and diagnostic information.

The majority of patients were retrieved from rural and remote areas (n=2224; 93.0%), with 658 (30.3%) being Aboriginal and/or Torres Strait Islander (hereafter referred to as Indigenous). The median maternal age of those requiring aeromedical retrieval was 28.0 years old (interquartile range 23.0-32.0), which was significantly (95% CI 27.7-28.3) younger than the Australian median maternal age of 30.0. Aeromedical retrieval patients were more likely than the general Australian population to be overweight or obese (52.2% vs. 45.1%, 95% CI 47.5-56.9) and have smoked during their pregnancy (14.0% vs. 9.9%, 95% CI 12.5-15.5).

Diabetes and hypertension comorbidity data was collected on 678 (31.2%) women who received an aeromedical retrieval, possibly reflecting only the cases with a documented history. As compared to 43751 non-retrieved pregnancies, these aeromedical patients were more likely to have pre-existing diabetes (4.0%, 95% CI 2.5-5.45), gestational diabetes (11.65%, 95% CI 9.2-14.1), chronic hypertension (4.1%, 95% CI 2.6-5.6), and gestational hypertension (7.7%, 95% CI 5.7-9.7). See Table 2 for data regarding medical disorders of pregnancy.

Women who had an aeromedical retrieval were more likely to have a caesarean section (n= 812; 37.4%, 95% CI 35.4-39.4) as compared to the general Australian population (33.9%), and less likely to have a spontaneous vaginal birth (n= 995; 45.8%, 95% CI 43.7-47.9) as compared to the general Australian population (53.5%).

Reflective of many of the aeromedical patients being transferred for threatened pre-term labour, the median gestational age was 33.0 (interquartile range 29.0-35.3) weeks. Expectedly the aeromedical patients as a result on average, also had a significantly (95% CI 2536.1-2622.9) lower birth weight of 2579.5 (interquartile range 1900-3130) grams, as compared to the general Australian median of 3428 grams, coupled with proportionately more babies requiring resuscitation (35.4% vs. 6.2%, 95% CI 33.5-37.3) and special care nursery admission (41.2 vs 9.7%, 95% CI 39.3-43.2). The proportion of stillbirths was higher in the retrieved population (n= 42; 1.7%, 95% CI 1.2-2.2) than the background Australian rate (0.7%).

Sub-group analysis of outcomes of women transferred for preterm births were compared to outcomes of preterm birth from Australian data (Table 3). There were 76 positive fetal Fibronectin (fFN) pathology test, indicating increased risk of premature birth within seven days. There was a higher proportion of indigenous women in the aeromedical group (30.5% vs. 7.0%, 95% CI 27.4-33.5). The women were more likely not to be overweight or obese (18.3% vs. 32.2%, 95% CI 14.7-22.0) but with similar smoking rates (14.2% vs 15.0%, 95% CI 11.9-16.5). Transferred women were more likely to have a vaginal birth (47.8% vs. 42.2%, 95% CI 44.5-51.1), although data was missing for 85 (9.6%) women. Preterm newborns in the aeromedical group were more likely to require special care nursery support than preterm newborns in the Australian national data (67.3% vs. 43.7%, 95% CI 64.2-70.4).

When considering women transferred for threatened preterm labour (n=883; 40.7%) and preterm premature rupture of membranes (n=344; 15.8%), we found that 954 (77.7%) of the women delivered at the receiving hospital during the admission following aeromedical retrieval, with 263 (22.3%) being initially discharge following aeromedical retrieval to later deliver in the receiving hospital. No threatened pre-term labour patients delivered during the flight. See Table 4.

When considering patient access to obstetrics and gynaecology services from their place of residence, it was found that of the 152 primary evacuations and 2019 inter-hospital transfer

patients, 134 (88.2%) and 1070 (53.0%) respectively, did not have reasonable access to services requiring at least 60 minutes of motor vehicle travel. The inter-hospital figures appeared to reflect the general rural and remote aspect of 44578 (55.9%) women aged 18-44 years old not having access to obstetrics and gynaecology within 60 minutes' motor vehicle travel. See Table 5.

Discussion

This study indicated that one out of every 420 women who gave birth Australia-wide during 2015-2017 received an aeromedical retrieval. Due to the centralised location of specialised obstetric and neonatal facilities, women with high risk pregnancies are often transferred electively to tertiary hospitals for antenatal care and delivery,¹⁰ with the aim of reducing perinatal mortality and morbidity.¹¹ Our data represent women who have unplanned urgent obstetric complications.

Threatened preterm labour was the most common reason for aeromedical transfer, accounting for 40.7% of transfers, while the background rate of preterm birth in Australia is 8.6%. Preterm birth is the single greatest cause of death and disability in children in the developed world. Preterm birth is associated with perinatal mortality, long-term neurological disability, admission to neonatal intensive care, severe morbidity in the first weeks of life, prolonged hospital stay after birth, readmission to hospital in the first year of life and increased risk of chronic lung disease.¹²

Preterm birth is associated with remoteness, indigenous status and medical comorbidities such as diabetes and obesity.^{13,14} Rural and remote Australia has high rates of diabetes, hypertension, and overweight and obesity,⁷ and these risk factors were over-represented in the aeromedical retrieval cohort, with a corresponding high rate of preterm birth, low birth weights, increased need for resuscitation, and special care nursery admission. Prevention of preterm labour and preterm birth in rural and regional populations would have an impact not only on retrievals but also health system costs of immediate and long-term care of the neonates. Strategies to reduce preterm birth include accurate measurement of the cervical length at the morphology scan, vaginal progesterone or cervical cerclage for those with a short cervix or previous history of preterm birth and smoking cessation, as well as dedicated preterm birth prevention antenatal clinics.¹²

Many of the aeromedical retrievals were for indigenous patients from remote areas. Indigenous Australians are at a higher risk of antenatal risk factors, such as diabetes and hypertension,⁵ as well as a higher risk of preterm labour and perinatal death.¹⁵ While preterm labour and still birth rates appear to be decreasing,¹⁵ there still appears to be Australian subgroups, such as rural and remote indigenous women, who continue to have higher rates of negative pregnancy outcomes.¹⁶ Indigenous women are more likely to experience infant death and infant preventable death, such as those caused by infections.¹⁷ The higher infant mortality could be due to several factors, such as reduced antenatal screening, poor identification of birth defects, and lower service provision in remote areas.¹⁸ Stillbirths may have been under-represented in the RFDS transferred cohort because there is little to gain by transfer to tertiary centres. Poorer access to services could also contribute to a lower likelihood of diagnosis and treatment, leading to increased urgent aeromedical retrieval. This is consistent with findings that more indigenous than non-indigenous (45% versus 29%) infant deaths took place out of hospital,¹⁷ with many linked to infections suggesting delayed management.

Overall, the aeromedical retrieval group had higher rates of caesarean section (CS) than Australian rates but when the analysis was restricted to only preterm births the CS rate was lower in the RFDS cohort than in the Australian population. CS is a life-saving intervention for specific complications during pregnancy and childbirth and should be available to all women in need.¹⁹ Many rural and remote women with high risk pregnancies that are more likely to require CS (for example multiple pregnancies or placenta praevia) relocate closer to tertiary care electively so the aeromedical group is skewed towards women who had unexpected preterm labour. However, it is arguable that some of the indications for CS could have been modified with early intervention, such as access to quality antenatal care.²⁰ While not the focus of this paper, CSs have increased length of hospital stay, increased risk of hysterectomy for postpartum haemorrhage, and increased risk of cardiac arrest as compared to normal vaginal births.¹⁹ CSs when indicated can save infants' lives and prevent perinatal mortality and severe morbidity, including intrapartum asphyxia. However early births, as seen in the retrieved cohort, can increase the risk of respiratory problems and hypoglycaemia,^{21,22} in a population group with already high rates of respiratory disease in later life.²³

The majority of aeromedical patients did not have access to O&G services within 60 minutes of motor vehicle travel. This is consistent with previously published Australian data.²⁴ The limited access and closures of local maternity and O&G services in rural and remote Australia,

could in part help explain disparities in mortality for rural and remote women as compared to metropolitan women.⁵

This study included only one aeromedical retrieval service, however this limitation was minimised by this service being the largest and often the only service provider in many rural and remote areas. Data collection was limited in part, as only one third of the maternal disease history was recorded during aeromedical retrieval, however collected data was consistent with Australian-wide Governmental surveys. Specifically, perinatal mental health and behavioural disorders were not included in the study. Another limitation was that while AIHW data on outcomes for preterm birth represents the whole population, the aeromedical group were only those with emergency conditions causing preterm birth and under-represented iatrogenic planned preterm birth.

As such, a future prospective study could consider whether aeromedical pre-term labour characteristics differed to case matched metropolitan pre-term labour characteristics. Identification of specific modifiable risk factors is important to reduce morbidity related to pregnancy transfers.

Acknowledgments:

We would like to acknowledge the supporters and staff of the Royal Flying Doctor Service who made this research possible. We would also like to acknowledge the essential support we received from State, Territory, and Commonwealth Departments of Health during data collection. Special acknowledgement to Queensland Health, New South Wales Health, Australian Capital Territory Health, Northern Territory Health, and Western Australia Health. Without their support this study would not have been possible.

Table 1 Pregnancy maternal and baby characteristics and outcomes following aeromedical retrieval

Description	Aeromedical 2015-17	Australia total 2015-17
Number of pregnancies	2171	915610
Number of babies	2438	929368
Description	Aeromedical 2015-17	
Primary evacuation (%)	152 (7.0)	
Secondary evacuation (%)	2019 (93.0)	

Threatened preterm labour and delivery (%)	883 (40.7)		
Premature rupture of membranes (%)	344 (15.8)		
Antepartum haemorrhage (%)	172 (7.9)		
Pre-eclampsia (%)	143 (6.6)		
Ectopic pregnancy (%)	77 (3.5)		
all other (%)	552 (25.4)		
Description	Aeromedical 2015-17	95% CI*	Australia total 2015-17
Mother ethnicity			
Indigenous (%)	658 (30.3)	28.4-32.2	40755 (4.45)
Non-Indigenous (%)	1513 (69.7)	67.8-71.6	874855 (95.5)
Mother characteristics at delivery			
Median mother age (interquartile range)	28 (23.0-32.0)	27.7- 28.3	30.0 (26.0-34.0)
Maternity Body Mass Index (MBMI)- number and percentage overweight or obese (%)	225 of 431 collected (52.2)	47.5-56.9	277197 (45.1)
Smoked anytime during pregnancy (%)	304 (14.0)	12.5-15.5	90639 (9.9)
Birth characteristics and outcomes			
Mother			
Number of forceps-assisted deliveries (%)	82 (3.8)	3.0-4.6	47605 (5.2)
Number of vacuum deliveries (%)	77 (3.5)	2.8-4.3	67792 (7.4)
Number of c/s deliveries (%)	812 (37.4)	35.4-39.4	310446 (33.9)
Number of spontaneous vaginal deliveries (non-instrumental) (%)	995 (45.8)	43.7-47.9	489689 (53.5)
Other (%)	52 (2.4)	1.75-3.0	0 (0.0)
Unknown (%)	367 (16.9)	15.3-18.5	0 (0.0)
Baby			
Birth outcome			
Median gestational age at delivery (interquartile range)	33.0 (29.0-35.3)	32.7-33.3	39.4 (38.4-40.4)**
Special care nursery admission/ NICU (%)	1005 (41.2)	39.3-43.2	90131 (9.7)
Special care nursery admission of gestation/ NICU (36.0–42.1) (%)	204 (8.4)	7.3-9.5	54785 (5.9)
Median birth weight – grams (interquartile range)	2579.5 (1900-3130)	2536.1- 2622.9	3428 (3070-3760)**
Resus required (Incl: IPPV; intubation; cardiac massage/ventilation) (%)	864 (35.4)	33.5-37.3	57481 (6.2)
Stillbirths (gestational age range 24.0–39.5)	42 (1.7)	1.2-2.2	6441 (0.7)

*Total metropolitan population value outside of the sample 95% confidence interval can be interpreted as indicative of a statistically significant difference between the sample and the Australian population at the significance threshold of 0.05.

**These figures were obtained from separate major city tertiary hospitals (all pregnancies = 43751).

Table 2 Maternal medical disorders prior to and during pregnancy

Maternal disease history	Total aeromedical collected (%)	95% CI*	Total metropolitan hospital collected (%)
Total number collected	678 (31.2)	29.3-33.2	43751 (100.0)
Pre-existing diabetes	27 (4.0)	2.5-5.45	306 (0.7)
Gestational diabetes	79 (11.7)	9.2-14.1	3977 (9.1)
Chronic hypertension	28 (4.1)	2.6-5.6	187 (0.4)
Gestational hypertension (inc pre-eclampsia)	52 (7.7)	5.7-9.7	1062 (2.4)
Total with Diabetes and Hypertension prior to and during pregnancy	186 (27.4)	24.1-30.1	5532 (12.6)

* Total metropolitan population value outside of the sample 95% confidence interval can be interpreted as indicative of a statistically significant difference between the sample and the Australian population at the significance threshold of 0.05.

Table 3 Pre-term labour and delivery patient characteristics.

Description	Aeromedical 2015-17	95% CI*	Australia total 2015-17
Number of pre-term babies (<37 completed weeks) (%)	883 (36.9)	34.3-38.1	80317 (8.6)
Baby ethnicity			
Indigenous (%)	269 (30.5)	27.4-33.5	5633 (7.0)
Non-Indigenous (%)	614 (69.5)	66.5-72.6	74684 (93.0)
Mother characteristics at delivery			
Median mother age (interquartile range)	27.0 (22.0-31.0)	26.7-27.3	30.0 (26.0-34.0)
Maternity Body Mass Index (MBMI)- number and percentage overweight or obese (%)	79 (18.3)	14.7-22.0	25857 (32.2)
Smoked anytime during pregnancy (%)	125 (14.2)	11.9-16.5	12064 (15.0)
Fetal Fibronectin (fFN) positive (%) ** 102 with pathology	76 (8.6)	6.8-10.5	nil provided
Fetal Fibronectin (fFN) negative (%) ** 102 with pathology	26 (2.9)	1.8-4.1	nil provided
Birth characteristics and outcomes			
Delivered within flight	0 (0.0)	0.0-0.0	nil provided
Delivered \leq 24 hours of admission	346 (39.2)	36.0-42.4	nil provided
Delivered $>$ 24 hours of admission	537 (60.8)	57.6-64.0	nil provided
Delivery date unknown	0 (0.0)	0.0-0.0	nil provided
Mother			
Number of forceps-assisted deliveries (%)	43 (4.9)	3.45-6.3	2947 (3.7)
Number of vacuum deliveries (%)	14 (1.6)	0.8-2.4	2661 (3.3)
Number of c/s deliveries (%)	319 (36.1)	33.0-39.3	40783 (50.8)

Number of spontaneous vaginal deliveries (non-instrumental) (%)	422 (47.8)	44.5-51.1	33917 (42.2)
Unknown (%)	85 (9.6)	7.7-11.6	9 (0.0)
Baby			
Birth outcome			
Median gestational age at delivery (interquartile range)	33.4 (31.5-35.1)	33.0-33.7	35.0 (31.4-36.0)***
Special care nursery admission/ NICU (%)	594 (67.3)	64.2-70.4	35075 (43.7)
Median birth weight – grams (interquartile range)	2012.5 (1470.0-2497.5)	1969.1-2055.9	2240 (1600-2680)***
Resus required (Incl: IPPV; intubation; cardiac massage/ventilation) (%)	465 (52.7)	49.4-56.0	n.p
Stillbirths (%)	27 (3.1)	1.9-4.2	5486 (6.8)

* Aeromedical population value outside of the sample 95% confidence interval can be interpreted as indicative of a statistically significant difference between the sample and the Australian population at the significance threshold of 0.05.

** 102 patients had recorded fFN pathology. This may reflect limited local pathology services or the result not being recorded.

***These figures were obtained from separate major city tertiary hospitals (all pregnancies = 43751).

Table 4 Indication for and outcome of emergency transfers – previous studies

	Roberts et al ²⁵ *	Jony et al ²⁶	Akl et al ²⁷⁺	Hutchinson et al ^{28*}	Goh et al	Rigby et al ²⁹	Hollingworth et al ^{30**}	Current study
Geographic area	NSW/ ACT	Nova Scotia	WA	QLD	NSW/ACT	SA	WA	WA,QLD,NSW
Time Period	1997-1998	2003-2004	2007-2009	2009-2011	2010-2011	2010-2015	2015	2015-2017
Number	408	121	439	941	212	160	69	2171
Primary Indication for transfer (%)								
PTL/TPL	131 (32.1)	50 (41.7)	281 (64)	141 (17.1)	58 (27.6)	94 (58.7)	31 (44.9)	883 (40.7)
PPROM/ROM	129 (31.6)	26 (21.5)	158 (36)	175 (21.3)	47 (22.2)	22 (13.8)	38 (55.1)	334 (15.8)
PET	55 (13.5)	20 (16.7)		97 (11.8)	12 (5.7)	16 (10)		152 (7.0)
APH	51 (12.5)	16 (13.2)		75 (9.1)	17 (8)	11 (6.9)		174 (8.0)
FGR / anomaly	19 (4.7)			151 (18.3)		11 (6.9)		
Maternal medical condition	14 (3.4)			95 (11.5)		4 (2.5)		
All indications for transfer								
Delivered during admission related to transfer (%)	246 (60.3)	76 (62.8)	206 (46.9)	668 (71)	99 (46.7)	56 (35)	50 (72.5)	1840 (84.7)
Not delivered initial admission (%)	162 (39.7)	45 (37.2)	233 (53.1)	273 (29)	113 (53.3)	104 (65)	19 (27.5)	331 (15.3)
PTL/TPL without ROM								
Delivered during admission related to transfer (%)	48 (36.7) [#]	18 (36)	nil provided	nil provided	13 (16)	nil provided	25 (80.6)	651 (73.7)
Not delivered initial admission (%)	146 (53.3)	32 (64)	nil provided	nil provided	68 (84)	nil provided	6 (19.4)	232 (26.3)

PPROM / ROM								
Delivered during admission related transfer (%)	66 (51.2) [#]	24 (92.3)	nil provided	nil provided	34 (72.3)	nil provided	25 (65.8)	303 (90.7)
Not delivered initial admission (%)	63 (48.8)	2 (7.7)	nil provided	nil provided	13 (27.7)	nil provided	13 (34.2)	31 (9.3)
Subsequently delivered elsewhere (%)	nil provided	45 (37.2)	8 (6.7)	120 (12.8)	113 (53.3)	45 (28)	nil provided	0.0 (0.0)

* included road and aeromedical transfers ; + study included PTL/TPL and PPRM only; # delivered within 7 days transfer

Table 5 Patient accessibility to obstetric and gynaecological services within rural and remote Australia.

Description	Primary evacuation population	Secondary evacuation population	Rural and remote (RA4-RA5) 2018 women aged 18-44 years
Total women	152	2019	79802
Within 60 minutes of motor vehicle travel to an obstetrics and gynaecology service (%)	18 (11.8)	949 (47.0)	35224 (44.1)
Not within 60 minutes of motor vehicle travel to an obstetrics and gynaecology service (%)	134 (88.2)	1070 (53.0)	44578 (55.9)

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