

Original Research

Local birthing services for rural women: Adaptation of a rural New South Wales maternity service

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Abstract

Objective: To describe the outcomes of a public hospital maternity unit in rural New South Wales (NSW) following the adaptation of the service from an obstetrician and general practitioner-obstetrician (GPO)-led birthing service to a low-risk midwifery group practice (MGP) model of care with a planned caesarean section service (PCS).

Design: A retrospective descriptive study using quantitative methodology.

Setting: Maternity unit in a small public hospital in rural New South Wales, Australia.

Participants: Data were extracted from the ward-based birth register for 1172 births at the service between July 2007 and June 2012.

Main outcome measures: Birth numbers, maternal characteristics, labour, birthing and neonatal outcomes.

Results: There were 750 births over 29 months in GPO and 277 and 145 births over 31 months in MGP and PCS, respectively, totalling 422 births following the change in model of care. The GPO had 553 (73.7%) vaginal births and 197 (26.3%) caesarean section (CS) births (139 planned and 58 unplanned). There were almost universal normal vaginal births in MGP (>99% or 276). For normal vaginal births, more women in MGP had no analgesia (45.3% versus 25.1%) or non-invasive analgesia (47.9% versus 38.6%) and episiotomy was less common in MGP than GPO (1.9% versus 3.4%). Neonatal outcomes

were similar for both groups with no difference between Apgar scores at 5 min, neonatal resuscitations or transfer to high-level special care nurseries.

Conclusion: This study demonstrates how a rural maternity service maintained quality care outcomes for low-risk women following the adaptation from a GPO to an MGP service.

KEY WORDS: hospital birthing centre, midwifery, rural health service, sustainability.

Introduction

The delivery of healthcare services in rural and remote Australia is complex and challenging. Geographic spread, low population density, recruitment and retention difficulties and the high costs of service delivery create sustainability challenges for many services.¹ Despite policy attention to difficulties providing Australian rural and remote maternity care for over a decade, 41% ($n = 368$) of Australian maternity units closed over the 20 years from 1992 to 2011,² of which at least 130 were in rural and remote areas.³ Lack of maternity care close to home is associated with negative psychosocial impacts and less favourable clinical outcomes for women and babies.^{4–6} The adaptation of rural health services to innovative, flexible and networked models of care has been identified as a core strategy for rural health service sustainability.¹

One option for increasing the sustainability of rural birthing services is implementing alternative service models such as a midwifery caseload or group practice (MGP). This model promotes continuity of care through pregnancy, birth and the postnatal period by having one midwife present through the continuum of care. It can be offered as an alternative or complement to specialist or general practitioner (GP) obstetric

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What is already known on this subject:

- More than 130 rural maternity facilities have closed across Australia since 1995.
- Service adaptation and innovation is a core strategy of the Australian Government to promote rural health service sustainability.
- Midwifery group practice or caseload midwifery is a safe and cost-effective alternative to specialist or general practitioner-obstetric care for appropriately screened low-risk women.

care^{7,8} and operates for a lower cost than conventional services in both salaries and reduction in costly interventions.^{9,10} Clinical outcomes in midwife-led units compared with higher-level maternity units show no differences in perinatal mortality or morbidity^{6,11}; improved outcomes for maternal morbidity¹²; reduced birth interventions, including less caesarean section^{6,12–14} and improved neonatal outcomes.^{6,14}

This study describes the maternal characteristics, labour, birthing and neonatal outcomes of a maternity service at a small public district hospital in rural NSW ('the district hospital') following the adaptation of the service from an obstetrician and general practitioner-obstetrician (GPO)-led service to an MGP model with a planned caesarean section service (PCS). The results demonstrate that the service maintained quality care outcomes for a group of low-risk women and provide an example of the successful adaptation of a rural maternity service to meet sustainability challenges.

Background

This study describes a maternity service at a 95-bed public district hospital in a rural town of 8500 in NSW, 30 km from a regional referral hospital. In 2008, the Local Health District announced a change in maternity services at the district hospital from a 24 hours per day moderate-risk obstetric service to a low-risk service offering birthing only within business hours.¹⁵ The rationale provided was that the service was operating inefficiently and was financially unsustainable.¹⁵ The proposal was opposed by community members and hospital clinicians¹⁵ and precipitated several public rallies in 2008 and 2009, one with an estimated 6000 participants.¹⁶ In early 2009, in response to ongoing service uncertainty, two staff obstetricians and four GP-obstetricians resigned from the unit.¹⁷ The reduction in medical workforce led to the implementation of a low-risk, midwifery-led model in December 2009.

What does this study add:

- This study describes the maternal characteristics, labour, birthing and neonatal outcomes of a rural maternity service following the adaptation of the service from an obstetrician and general practitioner-obstetrician (GPO)-led birthing service to a low-risk MGP model of care with a planned caesarean section service (PCS).
- This maternity service maintained quality care outcomes for low-risk women following the adaptation from a GPO to an MGP.
- The findings demonstrate that adapting maternity service models may increase the sustainability of rural maternity services and provide a local birthing option for women in rural communities.

The MGP employed six full-time equivalent midwives utilising a caseload model in which women were partnered with a primary midwife for their antenatal, birth and postnatal care. The planned caseload was 35–42 women per full-time equivalent midwife.¹⁸ The program was open to women in a restricted local catchment area referred by a GP and assessed as low-risk in accordance with the Australian College of Midwives National Midwifery Guidelines for Consultation and Referral. Obstetric support was provided by the regional hospital.¹⁹

Women from across the region with medical indications²⁰ requiring a low-risk planned caesarean section also gave birth at the district hospital during the period of the study. Women undergoing planned CS were not part of the MGP program and their antenatal care was provided by various care models. The PCS service contributed to the number of births at the unit and reduced the surgical load at the regional referral hospital. The district hospital operated an onsite Level 2 special care nursery supervised by local GPs.

Methods

This study used quantitative data to describe labour, birthing and neonatal outcomes for the period from July 2007 to June 2012. The time period represents an equal amount of time before and after the change in service model.

Data, with identifying information removed, were extracted from the ward-based handwritten birth register in 2014. The register included maternal characteristics, labour and birth details, neonatal outcomes and antenatal care before 20 weeks. The register did not include women who used the service for

TABLE 1: *Maternal characteristics*

Maternal Characteristic	GPO N = 750		MGP N = 277		PCS N = 145	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Maternal age						
16–19	35	4.6	9	3.2	0	0
20–24	146	19.4	46	16.6	10	6.8
25–29	205	27.3	80	28.8	45	31
30–34	209	27.8	88	31.7	40	27.5
35–39	125	16.6	46	16.6	40	27.5
>40	30	4	8	2.8	10	6.8
Parity	725	—	267	—	133	—
Primiparous	268	36.9	105	39.3	16	12
Multiparous	424	58.4	158	59.1	116	87.2
Grand-multiparous	33	4.5	4	1.4	1	<1
Missing	25	—	10	—	12	—
Antenatal visits Before	730	—	271	—	145	—
20 weeks						
Yes	715	97.9	267	98.5	144	>99
No	15	2	4	1.4	1	<1
Missing	20	—	6	—	0	—
Pregnancy complications						
Gestational diabetes	18	2.4	0	—	1	<1
Gestational hypertension	22	2.9	0	—	0	—
Other pregnancy complications	9	<1	0	—	1	<1

antenatal and/or postnatal care, but birthed elsewhere because of intrapartum risk. Instrumental delivery was defined as vaginal delivery with forceps or vacuum assistance.

Data from before the change in model of care are referred to as GPO. Data from after the change are referred to as MGP and PCS. Birth numbers, maternal characteristics, labour, birthing and neonatal outcomes are described for the three groups. Data analysis was performed using IBM SPSS Version 22 (IBM Corp, Armonk, NY). Pearson's χ^2 tests of association were used to compare demographic information. Omissions or inconsistencies in the register were addressed by interrogation of the data in collaboration with staff currently working at the service. Missing data are indicated in tables where applicable and are not included in any percentage calculations.

This project received ethical approval from the University of Wollongong Human Research Ethics Committee (HREC: GSM13/007) and North Coast New South Wales Human Research Ethics Committee (HREC: LNR 021).

Results

Birth numbers

There were 750 births over 29 months in GPO, 277 and 145 births in MGP and PCS, respectively, totalling 422 births over 31 months following the change in service model.

For the GPO model, there were 553 (73.7%) vaginal births and 197 (26.3%) CS births. Of the CS births, 139 were planned CS and 58 were unplanned CS. The induction rate in the GPO service was 16.4% ($n = 123$) and breech presentation was 2.4% ($n = 18$).

The MGP service did not offer CS or instrumental births. Mothers in this group almost universally had a normal vaginal birth ($n = 276$), with the exception of one CS performed by a visiting obstetrician ($n = 1$). There were no inductions for this group and only one breech presentation. The PCS group had a 5.5% breech presentation rate ($n = 8$).

TABLE 2: Labour outcomes for normal vaginal births† for GPO and MGP

Labour outcome	GPO N = 504		MGP N = 275	
	n	%	n	%
Analgesia for labour	497		267	
None	125	25.1	121	45.3
Non-invasive‡	192	38.6	128	47.9
Invasive only§	39	7.8	5	1.9
Both invasive and non-invasive	133	26.7	13	4.9
Missing	7		8	
Perineal status	474		208	
First-degree tear	73	15.4	47	22.6
Second- and third-degree tear	117	24.7	47	22.6
Episiotomy	16	3.4	4	1.9
Intact	268	56.5	110	52.9
Missing	30		67	

†Excludes all C-Section, instrumental births and births to women with previous CS; ‡non-invasive analgesia included: nitrous gas, heat, bath/shower, active labour, TENS, aromatherapy; §invasive analgesia included: IM opioids, epidural, spinal, combined epidural and spinal.

Maternal characteristics

Maternal characteristics are described in Table 1. The age and parity of the mothers did not differ significantly between the GPO and the MGP groups ($P = 0.59$). However, the PCS group contained proportionally fewer teenage mothers and more mothers over 35 years as well as more multiparous (second-to-fifth birth) women than the other groups. Antenatal care was accessed equally among groups, with all three groups having high rates (>97%) of antenatal visits before 20 weeks. Virtually no pregnancy complications were evident in the MGP and PCS groups, where in the GPO model there were larger but still low numbers of gestational diabetes ($n = 18$, 2.4%) and gestational hypertension ($n = 22$, 2.9%).

Labour outcomes

Table 2 presents labour outcomes from normal vaginal births for the GPO and MGP groups. More women in MGP had no analgesia (45.3% versus 25.1%) compared with women in GPO. More women in GPO had both invasive and non-invasive analgesia than MGP (26.7% versus 4.9%). The MGP group had higher rates of first-degree tears than the GPO group (22.6% versus 15.4%) and lower rates of episiotomy (1.9% versus 3.4%), but no increase in higher-level tears.

TABLE 3: Neonatal outcomes

Neonatal outcomes	GPO N = 750		MGP N = 277		PCS N = 145	
	n	%	n	%	n	%
Weeks of gestation	747		277		144	
<37 weeks	26	3.4	0		1	<1
37–41 weeks	716	95.9	276	>99	143	>99
>41 weeks	5	<1	1	<1	0	
Missing	3		0		1	
Birth weight (g)	749		277		145	
<1500	1	<1	0		0	
1500–2499	20	2.6	3	1.1	0	
2500–4499	720	96.1	268	96.7	140	96.5
>4500	8	1.1	6	2.1	5	3.4
Missing	1		0		0	
Apgar score at 5 min	742		270		141	
<7	8	<1	1	<1	0	0
7–10	734	98.9	269	>99	141	100
Resuscitation	12	1.6	8	2.8	1	1
Missing	8		7		4	
Recorded admission to special care nursery						
Level 3 + †	6	<1	1	<1	2	1.4
Level 2†	1	<1	5	1.8	0	

†Of the 1–6 levels of neonatal care identified in NSW: 1 being bedside care with mother up to level 6 Supraregional Neonatal Intensive Care facilities.

Neonatal outcomes

Neonatal outcomes are described in Table 3. Nearly all babies (>99%) in the MGP model were born at full term (37–41 weeks) compared to 95.9% in the GPO. There was no difference in Apgar scores at 5 min and no difference in use of resuscitation or transfers to high-level (3 +) special care nurseries. There were more admissions to the onsite Level 2 nursery in the MGP group (GPO 1, MGP 5).

Discussion

This study described the maternal characteristics, labour, birthing and neonatal outcomes of a rural maternity unit following the change from a moderate-risk GPO service to a low-risk MGP service with a regional low-risk PCS. As would be expected, women birthing in the MGP program almost universally had normal vaginal births. The findings showed lower use of analgesia in the MGP than the GPO and neonatal outcomes remained similar across both models. Both the casemix and outcome data suggest that the screening applied was successful at identifying a group at low risk of poor outcomes.

Maternal characteristics

The change in model of care from a moderate-risk GPO to a low-risk MGP service resulted in differences in casemix. Groups considered to be higher risk, including teenagers, mothers over 40 and women with pregnancy complications, were likely to be excluded from the MGP service through risk screening.¹⁹ The PCS service had a higher proportion of multiparous mothers which is likely to reflect the fact that a previous CS is a common medical indication for planned CS.²¹

Birth numbers

The number of births was almost halved in the MGP service compared with the GPO. This is likely to reflect the low-risk nature of the new service and strict exclusion criteria applied to the MGP with an estimated 50% of women admitted to the MGP program reclassified as unacceptable risk based on consultation with the obstetrics and gynaecology team.²² This figure contrasts with a nearby service with a similar population where the number of women reclassified is only 8–14%²² and a high-risk Aboriginal population in Queensland that keeps 74% of residents birthing locally with excellent clinical outcomes.²³ It is also possible that the reduced number of births at the service reflects the climate of professional and community opposition in which the change in service model occurred.^{15,16}

Labour outcomes

Previous caseload midwifery studies have demonstrated fewer obstetric interventions such as induction of labour, epidurals, instrumental deliveries, episiotomies and CS.^{6,14,15} The results for the MGP in our study suggest a similar trend. Reduced casemix complexity and differing philosophies of practice may explain these trends.¹¹ There were more first-degree tears in the MGP group compared with GPO which may correlate with the lower rate of episiotomy for this group. An Australian randomised control trial found no difference in perineal status between MGP and GPO services.²⁴

Neonatal outcomes

Risk screening in the MGP group reduced the incidence of low-birth-weight infants and contributed to the absence of pregnancy complications and almost universal normal vaginal births for this group. Other than a reduction in the incidence of low birth-weight

infants in the MGP group, an increase in large for gestational age babies and a slight increase in local nursery observations, there was no difference in neonatal outcomes before and after the change in model of care. This is consistent with other MGP studies that have demonstrated comparable or improved neonatal outcomes.^{6,14,23}

Limitations

This study was unable to make comparisons between the GPO and MGP/PCS service due to the differences in the casemix of the services. In addition, transfer data were not available to explore outcomes for women from the MGP program transferred to the regional referral hospital to give birth. This study is too small to comment on less common neonatal and obstetric safety outcomes. State-wide and national reporting systems are in place to monitor these events and should continue to apply to all models of care.

Sustainability

This study described the adaptation of a rural maternity service to address challenges of sustainability. The MGP service aligns with national maternity guidelines that promote continuity of care, woman-centred care and the expansion of maternity service options close to home for rural women and families.²⁵ The introduction of a PCS for women across the region supplemented the number of births at this service. Innovations such as this can potentially contribute to the sustainability of surgical, as well as birthing, services at small rural hospitals.

Community engagement and consultation are important mechanisms to ensure that rural health services are relevant, appropriate and acceptable to communities.¹ The service in this study transitioned precipitously to a midwife-led model in an atmosphere of community opposition which contrasted significantly with another small town close by where a similar transition occurred with support over time (T. Tran, J. Longman, J. Kornelsen, L. Barclay, unpublished manuscript, 2015).²⁶ Despite this, the adaptation allowed the hospital to continue offering a choice of birthing services close to home for rural families. Birth numbers remained stable at approximately 100 per year following the change in model and, recent data show, the two subsequent years. Data from other MGP services suggest this number could increase with judicious, evidence-based use of exclusion criteria,^{22,23} although this would require ongoing monitoring for safety.

Conclusion

Midwife-led maternity services are a well-evidenced model that represent a cost-effective response to staffing and resourcing challenges in rural areas. This small study demonstrates that an MGP service can maintain quality care outcomes for low-risk women and may therefore provide a sustainable local birthing option for low-risk women in rural communities. These findings are relevant for other rural maternity services facing sustainability challenges.

Author contributions

MD contributed to project design, data entry, analysis and interpretation and drafted the original manuscript; MR designed and conducted the statistical analysis and substantially developed manuscript structure and content; JL contributed to project design, data interpretation, manuscript development and editing; SR contributed to data interpretation and substantially developed manuscript content; BD interpreted and entered the data and contributed to analysis; KM contributed to data collection and analysis; IW provided intellectual guidance, data interpretation and contributed to manuscript content; LB designed the project, provided intellectual guidance and contributed to manuscript content. All authors approved the final draft.

Disclosure statement

The authors declare that they have no competing interests.

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References

- 1 Australian Health Ministers' Advisory Council Rural Health Standing Committee. National Strategic Framework for Rural and Remote Health. Barton, ACT: Commonwealth of Australia, 2012.
- 2 Kildea S, McGhie AC, Gao Y, Rumbold A, Rolfe M. Babies born before arrival to hospital and maternity unit closures in Queensland and Australia. *Women and Birth* 2015; **28**: 236–245.
- 3 Rural Doctors Association of Australia. Maternity Services for Rural Australia 2006; January. [Cited 9 Jun 2016]. Available from URL: http://www.rdaa.com.au/Uploads/Documents/Maternity%20Services%20for%20Rural%20Australia_20101116031918.pdf.
- 4 Kornelsen J, Stoll K, Grzybowski S. Stress and anxiety associated with lack of access to maternity services for rural parturient women. *Australian Journal of Rural Health* 2001; **19**: 9–14.
- 5 Nesbitt TS, Connell FA, Hart LG, Rosenblatt RA. Access to obstetric care in rural areas: effect on birth outcomes. *American Journal of Public Health* 1990; **80**: 814–818.
- 6 Monk A, Tracy M, Foureur M, Grigg C, Tracy S. Evaluating Midwifery Units (EMU): a prospective cohort study of freestanding midwifery units in New South Wales, Australia. *BMJ Open* 2014; **4**: e006252.
- 7 Hartz D, Foureur M, Tracy S. Australian caseload midwifery: the exception or the rule. *Women and Birth* 2011; **25**: 39–46.
- 8 McLachlan HL, Forster DA, Davey MA *et al.* Effects of continuity of care by a primary midwife (caseload midwifery) on caesarean section rates in women of low obstetric risk: the COSMOS randomised controlled trial. *BJOG* 2012; **119**: 1483–1492.
- 9 Gao Y, Gold L, Josif C *et al.* A cost-consequences analysis of a Midwifery Group Practice for Aboriginal mothers and infants in the Top End of the Northern Territory, Australia. *Midwifery* 2014; **30**: 447–455.
- 10 Homer CS, Matha DV, Jordan LG, Wills J, Davis GK. Community-based continuity of midwifery care versus standard hospital care: a cost analysis. *Australian Health Review* 2001; **24**: 85–93.
- 11 Brocklehurst P, Hardy P, Hollowell J *et al.* Perinatal and maternal outcomes by planned place of birth for healthy women with low risk pregnancies: the Birthplace in England national prospective cohort study. *BMJ* 2011; **343**: 7400.
- 12 Overgaard C, Moller AM, Fenger-Gron M, Knudsen LB, Sandall J. Freestanding midwifery unit versus obstetric unit: a matched cohort study of outcomes in low-risk women. *BMJ Open* 2011; **1**: e000262.
- 13 Birthplace in England Collaborative Group. Perinatal and maternal outcomes by planned place of birth for healthy women with low risk pregnancies: the Birthplace in England national prospective cohort study. *BMJ* 2011; **343**: d7400.
- 14 Davis D, Baddock S, Pairman S *et al.* Planned place of birth in New Zealand: does it affect mode of birth and intervention rates among low-risk women?. *Birth* 2011; **38**: 111–119.
- 15 Parliament of New South Wales. Legislative Assembly, 26 June 2008, Murwillumbah Health Service. [Cited 9 Jun 2016]. Available from URL: <https://www.parliament.nsw.gov.au/la/papers/Documents/2008/26-june-2008-votes-and-proceedings/079-VAP-S.pdf>.
- 16 Tweed Daily News. 6000 can't be wrong – hospital protest. Tweed Daily News 14 July 2008. [Cited 16 Feb 2016]. Available from URL: <http://www.tweeddailynews.com.au/news/apn-6000-cant-be-wrong-hospital/144741/>

- 17 ABC Online. NSW Hospital Suffers Mass Resignation. ABC Online 6 Feb 2009. [Cited 16 Feb 2016]. Available from URL: <http://www.abc.net.au/news/2009-02-06/nsw-hospital-suffers-mass-resignation/285154>
- 18 Nursing and Midwifery Unit. Midwifery Continuity of Carer Model Toolkit. North Sydney: NSW Ministry of Health 2012. [Cited 16 Feb 2016]. Available from URL: <http://www.health.nsw.gov.au/nursing/projects/Publications/midwifery-cont-carer-tk.pdf>
- 19 Australian College of Midwives. National Midwifery Guidelines for Consultation and Referral. Deakin West, ACT: Australian College of Midwives, 2013.
- 20 NSW Ministry of Health. Policy Directive – Maternity – Timing of Elective or Pre-Labour Caesarean Section, 2007. [Cited 16 Feb 2016]. Available from URL: http://www0.health.nsw.gov.au/policies/pd/2007/PD2007_024.html
- 21 Dodd JM, Crowther CA, Huertas E, Guise JM, Horey D. Planned elective repeat caesarean section versus planned vaginal birth for women with a previous caesarean birth. *Cochrane Database Systematic Reviews* 2013; Oct 18 (14): CD004224.
- 22 Northern New South Wales Local Health District. NNSWLHD births are declining. Northern Exposure: Northern New South Wales Local Health District Newsletter 2015: 13.
- 23 Kruske S, Schultz T, Eales S, Kildea S. A retrospective, descriptive study of maternal and neonatal transfers, and clinical outcomes of a Primary Maternity Unit in rural Queensland, 2009–2011. *Women and Birth* 2015; 28: 30–39.
- 24 Tracy SK, Hartz DL, Tracy MB *et al.* Caseload midwifery care versus standard maternity care for women of any risk: M@NGO, a randomised controlled trial. *The Lancet* 2013; 382: 1723–1732.
- 25 Australian Health Ministers' Advisory Council. National Maternity Services Plan Canberra: Commonwealth of Australia, 2011. [Cited 16 February 2016]. Available from URL: [https://www.health.gov.au/internet/main/publishing.nsf/content/8AF951CE492C799FCA257BF0001C1A4E/\\$File/maternityplan.pdf](https://www.health.gov.au/internet/main/publishing.nsf/content/8AF951CE492C799FCA257BF0001C1A4E/$File/maternityplan.pdf)
- 26 Unpublished manuscript, University Centre for Rural Health North Coast. 2015; Lismore, NSW.