

The final version of this paper was published in *Australian Health Review* 2012;36,437–442 [http:// dx.doi.org/10.1071/AH111106](http://dx.doi.org/10.1071/AH111106)

Multifetal pregnancies: preterm admissions and outcomes

Tim Badgery-Parker^{1,2} BSc(Hons), Biostatistician

*Antonia W. Shand*¹ MBChB, FRANZCOG, Obstetrician

*Jane B. Ford*¹ BA(Hons), PhD, Senior Research Fellow

*Mary G. Jenkins*¹ RN, CM, MScM, Research Midwife

Jonathan M. Morris^{1,3} MBChB, FRANZCOG, PhD, Professor

Christine L. Roberts^{1,3,4} MBBS, FAFPHM, DrPH, Research Director and NHMRC Senior Research Fellow

¹Clinical and Population Perinatal Health Research, Kolling Institute of Medical Research, University of Sydney, Building 52, University of Sydney at Royal North Shore Hospital, St Leonards, NSW 2065, Australia.

²Centre for Epidemiology and Research, NSW Department of Health, 73 Miller Street North Sydney, NSW 2060, Australia.

³Department of Obstetrics, Gynaecology and Neonatology, University of Sydney, University of Sydney, Building 52, Royal North Shore Hospital, St Leonards, NSW 2065, Australia.

Email: tbadg@doh.health.nsw.gov.au, antonia.shand@sydney.edu.au, jane.ford@sydney.edu.au, mary.jenkins@sydney.edu.au, jonathan.morris@sydney.edu.au

⁴Corresponding author. Email: clroberts@med.usyd.edu.au

Abstract

Objective

To describe the rates of hospital admission during twin or higher order multiple pregnancy, and the admission outcomes as discharge undelivered, transfer to higher care, or spontaneous or elective delivery.

Methods

Cohort study using the NSW Midwives Data Collection linked to the NSW Admitted Patients Data Collection. The cohort comprised women who gave birth to twins or higher order multiple infants of ≥ 24 weeks gestation in 2001–2008 and who were admitted to hospital in weeks 20–36 of the pregnancy.

Results

In 63.4% of 10,688 twin pregnancies and 99.5% of 197 triplet and quadruplet pregnancies, the women was admitted to hospital at least once in weeks 20–36 of the pregnancy, for a total 10,985 admissions. Almost half the admissions (46.3%) ended in discharge without delivery, 10.7% in transfer to higher care, 21.1% in spontaneous labour and 21.8% in elective delivery (induction or caesarean section). The reason for admission was threatened or actual preterm labour in 34.2% of admissions.

Conclusions

Hospital admission during pregnancy is very common for women with twin or higher order multiple pregnancies, with many of these admissions resulting in preterm birth. This is the first study to report the rate of pregnancy admissions for women with twin or higher order multiple pregnancies, and provides a baseline for future studies of hospital use in this population.

Key question summary

What is known about the topic?

Multi-fetal pregnancies are high risk and require greater care than singleton pregnancies. However, few studies specifically examine multi-fetal pregnancies, and many studies of pregnancy exclude them, so there is little known about the resource use of this group.

What does this paper add?

This is the first paper to report population rates of hospital admission during pregnancy for women with multi-fetal pregnancies. We report the admission rates, and the admission outcomes as discharge undelivered, transfer to higher care or spontaneous or elective delivery.

What are the implications for practitioners?

Most women with multi-fetal pregnancies are admitted to hospital at least once during the pregnancy, with a large proportion of these admissions resulting in preterm delivery. This has implications for resource use and for practitioners advising pregnant women.

Introduction

Multi-fetal pregnancies (twins, triplets and other higher order multiple pregnancies) are high risk pregnancies and require greater care than singleton pregnancies. It is well known that women with a twin pregnancy are at increased risk of hypertensive disorders, gestational diabetes, and antepartum and post partum haemorrhage, and are more likely to deliver by caesarean section and to have serious maternal morbidity.[Canada liston study?] Because of these differences, multi-fetal pregnancies should be assessed separately from singleton pregnancies. In practice, this has often meant that studies include only singleton pregnancies and are rarely repeated for multi-fetal pregnancies. Little research has specifically examined multi-fetal pregnancies.

We have previously reported rates of hospital admissions during weeks 20–36 for women with singleton pregnancies, and the outcomes of those admissions as discharge, transfer to higher care, or delivery of the infant.¹ This study extends that work to multi-fetal pregnancies.

Methods

The study population comprised women who were admitted to hospital during weeks 20–36 of a twin or multi-fetal (higher order multiple) pregnancy and who delivered at ≥ 24 weeks gestation in 2001–2008 in New South Wales.

Data were obtained from the NSW Midwives Data Collection (MDC) and linked to the NSW Admitted Patients Data Collection (APDC). Record linkage was conducted by the Centre for Health Record Linkage and was approved by the NSW Population and Health Services Research Ethics Committee. The MDC is a population-based surveillance system covering all livebirths and stillbirths ≥ 20 weeks gestation or ≥ 400 g birthweight, and includes demographic, medical and obstetric information, and information on the condition of the infant. The APDC is a census of all inpatient admissions (public and private) in NSW. It includes demographic, administrative and clinical information.

Except for selecting multi-fetal pregnancies rather than singletons, record selection and extraction was as described for our earlier study of singleton pregnancies.¹ For each birth, records of all the mother's hospital admissions (including hospital-to-hospital transfers) where the admission occurred at 20–36 weeks gestation were retained. Gestational age (in weeks) at admission was estimated from the baby's date of birth and gestational age in the MDC, and the admission date in the APDC.

The primary outcome was whether a preterm admission (defined as entering hospital from outside the hospital system, ie, excluding transfers) ended in discharge, maternal transfer to a hospital with a higher level of maternity care, or delivery of the infants.

Delivery was classified as spontaneous or elective (by planned caesarean section or induction of labour) according to the MDC record.

Maternal characteristics (age, number of previous pregnancies, smoking during pregnancy, Indigenous status and area of residence) were obtained from the MDC. Quintile of socioeconomic status was determined by the Index of Relative Disadvantage and remoteness category by the mean ARIA+ score for postcode of residence.^{2, 3} Reason for admission was based on the principal admission diagnosis on the APDC record. Hospitals were classified into 7 groups based on available neonatal care and number of deliveries, and urban or regional area.^{4, 5}

A descriptive analysis of the frequencies and percentages of each outcome by maternal and admission characteristics was conducted using SAS 9.1.3.

Results

From 2001 to 2008, women with 10,779 twin, 192 triplet and 5 quadruplet pregnancies delivered in hospitals in NSW at ≥ 24 weeks gestation. The mother was admitted to hospital at least once during weeks 20–36 of the pregnancy in 6830 (63.4%) of the twin pregnancies and 193 (99.5%) of the triplet and quadruplet pregnancies. Altogether there were 10,688 preterm admissions for women with twins (99 preterm admissions per 100 twin pregnancies), and 297 for triplet and quadruplet pregnancies (151 preterm admissions per 100 triplet and quadruplet pregnancies).

As the outcomes were similar for women with multi-fetal pregnancies, these were combined. Of the 7023 women admitted preterm, 4613 (65.7%) had only 1 preterm admission (with 1956 [42.4%] delivering in that admission), 1532 (21.8%) had 2, 522 (7.4%) had 3, and 353 (5.1%) had 4–15 admissions.

Of the 10,985 preterm admissions, 5089 (46.3%) resulted in discharge without delivery, 1175 (10.7%) resulted in transfer to a hospital with higher level of care, 2321 (21.1%) resulted in delivery after spontaneous onset of labour, and 2400 (21.8%) resulted in elective delivery. Most women who were transferred had only 1 transfer, but 121 had 2–4 transfers. The ultimate outcome of preterm admission (after all transfers) was discharge in 5430 (49.4%), spontaneous labour in 2894 (26.4%) and elective delivery in 2661 (24.2%).

The median time in the initial admission from admission to discharge, transfer or delivery was 1 day, with interquartile ranges of 1–3 days for discharge, 1–1 days for transfer and spontaneous labour, and 1–4 days for elective delivery. For women transferred and ultimately discharged, the median time in hospital through all transfers was 4 days (IQR, 2–7 days). For women transferred who ultimately delivered during the hospital stay, the median time from initial admission to delivery was 1 day (IQR 1–3 for spontaneous labour and 1–6 for elective delivery), and the total time to discharge was 6

(IQR 4–9) days for women who had spontaneous labour, and 8 (IQR 6–13) days for women who had elective delivery.

Of the women who were discharged after admission, 32.5% of women with twins and 31% of women with triplet and quadruplet pregnancies were discharged the same day, 27.5% with twins and 18% with triplet and quadruplet pregnancies had an overnight admission and 40.1% with twins and 51% with triplet and quadruplet pregnancies stayed more than 1 night.

Younger women admitted preterm were more likely than older women to be discharged: 48.6% of women <30 were discharged, compared with 44.9% of women \geq 30 years. The proportion transferred to higher care decreased with increasing maternal age, from 12.0% of women <20 to 9.5% of women \geq 40 years. Elective delivery in the initial preterm admission was more common for women in their first pregnancy (24.9%) compared with women with \geq 1 previous pregnancies (19.3%). Women in their first pregnancy were also less likely to be discharged (44.1% compared with 48.1%) and more likely to be transferred (11.3% compared with 10.2%).

The outcome of preterm admission depended strongly on gestational age, with discharge being most common up to 36 weeks but declining as a proportion of admissions as the pregnancy progressed (Figure). Transfer was the next most common outcome until 32 weeks, when the proportion ending in delivery began to increase. Throughout most of the pregnancy there was little difference in proportions of spontaneous and elective delivery, although elective delivery was almost nonexistent very early in pregnancy, and increased rapidly at 36 weeks, while the proportion of spontaneous delivery levelled out.

The most common reasons for admission were threatened or actual preterm labour, together accounting for 34.1% of the preterm admissions. Hypertension was the admission reason for 13.0% of the preterm admissions.

Half the admissions at 33–35 weeks (53.1%) and three-quarters of the admissions at 36 weeks (75.5%) ended in delivery. At 33–35 weeks, 46.7% of deliveries were elective, compared with 59.2% at 36 weeks.

Discussion

Over an 8 year period in NSW, 7023 women with multi-fetal pregnancies were admitted to hospital. This is almost two-thirds of all women who gave birth to twins, triplets or higher order multiple infants in that period, and most of these women (79.1%) delivered in a preterm admission or subsequent transfer. These rates are much higher than in a previous study of singleton pregnancies,¹ which found 1 in 6 women had preterm admissions and 30.3% of women admitted preterm delivered in a preterm admission. It is not clear how these rates compare with admission rates for multi-fetal pregnancies

elsewhere, as most studies of pregnancy admissions either exclude multi-fetal pregnancies or do not report them separately.

One reason for the high admission rate in this cohort is the high rate of preterm delivery. In NSW, 49.4% of women with a twin pregnancy delivered at <37 weeks gestation in 2001–2008.[Shand et al] We found 43.0% of the preterm admissions ended in delivery, compared with 21.0% of preterm admission in singleton pregnancies,¹ and about half the deliveries followed spontaneous labour. Treatments for preventing preterm birth in multi-fetal pregnancy have been disappointing to date. Studies of hospitalisation and bed rest,⁶ prophylactic progesterone⁷ and cervical cerclage⁸ have shown no benefit in this situation. The only treatment that has proven benefit for neonatal outcomes is maternal antenatal steroids in cases of anticipated preterm birth for the reduction of neonatal mortality, prevention of respiratory distress and intraventricular haemorrhage in the preterm neonate.⁹ From 33 weeks gestation, the proportion of elective deliveries increased rapidly. This is consistent with studies from the United States which suggest rises in preterm delivery rates for twins are at least partly driven by obstetric intervention.^{10, 11}

Even with the large proportion being admitted for delivery preterm, this still leaves 4633 women (545 per year) who were admitted and discharged at least once (and up to 15 times, ie, weekly) in weeks 20–36 of the pregnancy. Pregnancy day stays have been advocated as an option for women to be assessed and treated as outpatients when pregnant to avoid overnight admission. In Australia, many women with hypertension of pregnancy or who require fetal monitoring are seen in the hospital pregnancy day stay. A Cochrane review found that women attending day care units were less likely to be admitted overnight than women in the ward/routine care group, and their average length of antenatal admission was shorter, although they had more outpatient attendances.¹²

Transfer rates for women with multi-fetal pregnancy (10.7%) were higher than the corresponding rate for singleton pregnancy (6.3%).¹ Just over half (50.6%) of the women who were transferred with a multi-fetal pregnancy delivered in the transfer admission, which was higher than for singleton pregnancies (46.0%). The most common reasons for transfer were preterm labour and premature rupture of membranes. Where risk to the infants is identified before birth, optimal care involves antenatal maternal transfer to a centre with appropriate facilities for neonatal care. Furthermore, multiple births may overwhelm nursery facilities in smaller centres, so there is a tendency for early transfer of women with multi-fetal pregnancies from these hospitals.

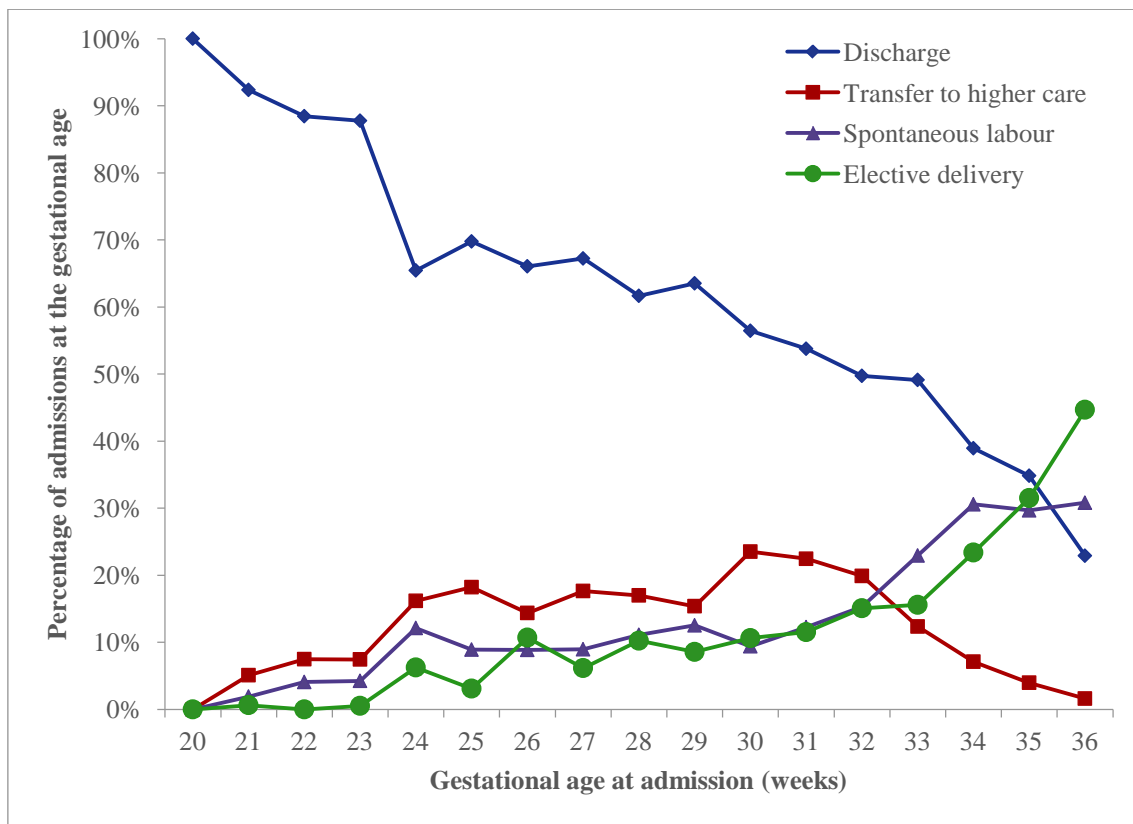
After 32 weeks gestation, the proportion of admissions leading to transfer decreased while the proportion ending in delivery increased. This probably reflects hospital role delineation—many hospitals may deliver infants at >32 weeks, but must transfer women to a higher level facility if they appear likely to deliver at earlier gestational ages.¹³

Most admissions were short. Even when women were transferred and ultimately discharged without delivery, three-quarters of them were in hospital for less than 5 days. For women who delivered, the delivery was typically within a day of admission and the total hospital stay was less than 2 weeks. These short stays should be reassuring to women who require transfer, especially those who must be transferred far from home.

The most common reasons for admission were threatened or actual preterm labour. A study investigating antenatal admissions of rural women (for pregnancy of any plurality) in NSW in 1997–1998 found proportions of admissions associated with threatened or actual preterm labour were 21% and 28% in audit and population data, compared with 34.2% in the current study.¹⁴ Studies of antenatal hospitalisation consistently find threatened preterm labour is the most common reason for admission.^{1, 15-17} Other common conditions leading to admission are haemorrhage, hypertension and preterm rupture of membranes.^{1, 16, 17} As other studies either exclude or do not separately report multi-fetal pregnancies, it is not possible to directly compare results to the findings presented here.

This study provides valuable information on resource use for multi-fetal pregnancies. By using linked population data, we were able to identify women with hospital admission during their pregnancy and identify transfers and readmissions. To our knowledge this is the first study in Australia to provide population rates of preterm admission for multi-fetal pregnancies. The data will be a useful baseline for future studies of hospital resource use by this group of women.

Outcome of maternal hospital admission for women with twin or multi-fetal pregnancy who delivered at ≥ 24 weeks gestation, by gestational age at admission*



* Outcomes of admissions before 24 weeks should be interpreted cautiously because of study selection criteria requiring delivery at ≥ 24 weeks.

	Discharge		Transfer		Spontaneous labour		Elective delivery		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Reason for admission										
Threatened or actual preterm labour	1301	25.5	536	45.6	1305	56.2	614	25.6	3756	34.2
<i>Preterm labour</i>	114	2.2	140	11.9	1296	55.8	611	25.5	2161	19.7
<i>Threatened preterm labour</i>	1187	23.3	396	33.7	9	0.4	3	0.1	1595	14.5
Care for multiple pregnancy	441	8.7	69	5.9	472	20.3	550	22.9	1532	14.0
Hypertension	827	16.3	99	8.4	55	2.4	448	18.7	1429	13.0
Premature rupture of membranes	90	1.8	233	19.8	271	11.7	119	5.0	713	6.5
Fetal anomalies	185	3.6	36	3.1	23	1.0	346	14.4	590	5.4
Haemorrhage	326	6.4	77	6.6	47	2.0	57	2.4	507	4.6
Antenatal screening	160	3.1	3	0.3	0		3	0.1	166	1.5
Placental disorders	51	1.0	12	1.0	14	0.6	50	2.1	127	1.2
Cervical incompetence	91	1.8	17	1.4	11	0.5	5	0.2	124	1.1
Digestive system, including vomiting and abdominal pain	506	9.9	22	1.9	0		22	0.9	550	5.0
Other pregnancy related	191	3.8	15	1.3	4	0.2	19	0.8	229	2.1
Other non-pregnancy conditions	920	18.1	56	4.8	119	5.1	167	7.0	1262	11.5
Gestational age (weeks)										
20–28	1554	30.5	312	26.6	185	8.0	131	5.5	2182	19.9
29–32	1432	28.1	539	45.9	334	14.4	316	13.2	2621	23.9
33–35	1619	31.8	290	24.7	1151	49.6	1009	42.0	4069	37.0
36	484	9.5	34	2.9	651	28.1	944	39.3	2113	19.2
Hospital group										
Tertiary	2399	47.1	142	12.1	986	42.5	1221	50.9	4748	43.2
CPAP†	668	13.1	204	17.4	261	11.3	249	10.4	1382	12.6
Large urban	1063	20.9	409	34.8	605	26.1	643	26.8	2720	24.8
Small urban	6	0.1	4	0.3	0		7	0.3	17	0.2
Large regional	639	12.6	230	19.6	353	15.2	233	9.7	1455	13.3
Small regional	282	5.5	159	15.3	116	5.0	47	2.0	604	5.5
Other	32	0.6	27	2.3	0		0		59	0.5
Admission										
First preterm admission	3187	62.6	856	72.8	1554	66.9	1426	59.4	7023	63.9
Subsequent preterm admission	1902	37.4	319	27.2	767	33.1	974	40.6	3962	36.1
Total	5089	46.3	1175	10.7	2321	21.1	2400	21.9	10985	100

* Numbers refer to admissions, not pregnancies or women. The 10,985 admissions occurred in 7023 pregnancies. The CPAP hospitals are 5 large non-tertiary hospitals with facilities and trained staff able to provide continuous positive airways pressure (CPAP) respiratory support to neonates.

References

1. Badgery-Parker T, Ford JB, Jenkins MG, Morris JM, Roberts CL. Patterns and outcomes of preterm pregnancy admissions. *Medical Journal of Australia*. 2011;submitted.
2. Australian Bureau of Statistics. *Australian standard geographical classification (ASGC), July 2010*. Canberra: ABS;2010. Cat. No. 1216.0.
3. Australian Bureau of Statistics. *Census of population and housing: socio-economic indexes for areas (SEIFA), Australia — Data only, 2006*. Canberra: ABS;2006. Cat. No. 2033.0.55.001.
4. Falster MO, Roberts CL, Ford JB, Morris JM, Nicholl M. Informing hospital role delineation: elective delivery of pregnant women before the due date. *Australian Epidemiologist*. 2010;17(2):48.
5. Falster MO, Roberts CL, Ford JB, Morris JM, Kinnear A, Nicholl M. Development of a maternity hospital classification for perinatal research. *Public Health Bulletin*. 2011;(submitted).
6. Crowther CA, Han S. Hospitalisation and bed rest for multiple pregnancy. *Cochrane Database of Systematic Reviews*. 2010(1):CD000110.
7. Combs CA, Garite T, Maurel K, Das A, Porto M. 17-Hydroxyprogesterone caproate for twin pregnancy: a double-blind, randomized clinical trial. *American Journal of Obstetrics and Gynecology*. 2007;114(12):1460-1476.
8. Jorgensen AL, Alfirevic Z, Tudur Smith C, Williamson PR. Cervical stitch (cerclage) for preventing pregnancy loss: individual patient data meta-analysis. *BJOG*. 2007;114(12):1460-1476.
9. Crowley P. Prophylactic corticosteroids for preterm birth. *Cochrane Database of Systematic Reviews*. 2009(1).
10. Hartley RS, Hitti J. Increasing rates of preterm twin births coincide with improving twin pair survival. *Journal of Perinatal Medicine*. 2010;38(3):297-303.
11. Kogan MD, Alexander GR, Kotelchuck M, MacDorman MF, Buekens P, Papiernik E. A comparison of risk factors for twin preterm birth in the United States between 1981–82 and 1996–97. *Maternal and Child Health Journal*. 2002;6(1):29-35.
12. Dowswell T, Middleton P, Weeks A. Antenatal day care units versus hospital admission for women with complicated pregnancy. *Cochrane Database of Systematic Reviews*. 2009:CD001803.
13. *Guide to role delineation for health services*. Sydney: NSW Health;2002.
14. Roberts CL, Algert CS. Antenatal transfer of rural women: how does the NSW Inpatient Statistics Collection compare with an audit of hospital records? *Australian Health Review*. 2000;23(3):78-82.
15. Bacak SJ, Callaghan WM, Dietz PM, Crouse C. Pregnancy-associated hospitalizations in the United States, 1999–2000. *American Journal of Obstetrics and Gynecology*. 2005;192(2):592-597.
16. Gazmararian JA, Petersen R, Jamieson DJ, et al. Hospitalizations during pregnancy among managed care enrollees. *Obstetrics and Gynecology*. 2002;100(1):94-100.
17. Liu S, Heaman M, Sauve R, et al. An analysis of antenatal hospitalization in Canada, 1991–2003. *Maternal and Child Health Journal*. 2007;11(2):181-187.