

# **Getting the First Birth Right**

A retrospective cohort study of birth outcomes for  
primiparous women receiving standard care in the Birth  
Suite versus continuity of midwifery care in the Birth Centre  
at  
The Canberra Hospital.

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## **Abstract**

### **Introduction**

The aim of this research is to compare outcomes for a cohort of primiparous women who have accessed the Canberra Midwifery Program (CMP) with those who received standard public care at The Canberra Hospital. This will inform our understanding of the clinical outcomes of primiparous women accessing varying maternity models of care at The Canberra Hospital in order to determine best practice and assist future planning.

### **Methods**

The study was conducted using data collected from records held by The Canberra Hospital for the period 1<sup>st</sup> January 2010 to 31<sup>st</sup> December 2011. A retrospective comparative cohort study design was implemented drawing on data from two databases.

### **Results**

The study found significantly increased rates of normal vaginal birth (57.5% vs. 48.9%  $p=0.002$ ) and spontaneous vaginal birth (38% vs. 22.4%  $p= <0.001$ ) and correspondingly decreased rates of assisted vaginal birth (23.5% vs. 28.5%  $p= 0.05$ ) and caesarean sections (18.8% vs. 22.5%  $p=0.115$ ) in the CMP cohort. There were also fewer interventions in the CMP group including: induction of labour, epidural anaesthesia and use of narcotics in labour. There were significantly increased rates of breast feeding initiation within an hour of birth and early transfer home (within 24 hours of birth) within the CMP cohort and no differences in neonatal outcomes.

### **Conclusion**

Continuity of midwifery care/carer with the Canberra Midwifery Program is associated with a statistically significant difference in some clinical outcomes for primiparous women at this site.

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Liz Sharpe (Director of Nursing & Midwifery at The Canberra Hospital during the study period) had a vision and a belief that 'continuity of care/carer' needed to be expanded at The Canberra Hospital. She was aware of the national and international literature supporting the safety, efficacy and cost effectiveness of this model of care for women of all parity so encouraged me to research local outcomes for a primiparous group.

But mostly the other amazing women who have been a major part of my life for over 40 years who provided an identity of which I'm very proud: 'Midwife'. I've known them in all phases of their pregnancy journey and have an enormous respect for each and every one of them, including my daughter-in-law Rebecca and our new granddaughter, Monique.

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# **1. Chapter 1 - Getting the First Birth Right**

## **1.1.Introduction**

Mode of birth, especially for primiparous women, has far-reaching implications not only for the woman and her family but also for the health care organisation as a whole. Women who have had a vaginal birth (rather than an operative one) recover from the experience, are independent much sooner and enjoy a better quality of life (Mousavi, Mortazavi, Chaman & Khosrav, 2013). Not only does a vaginal birth impact on the immediate experience of the woman and her family but if a woman is able to birth without intervention the first time, her child-bearing future is almost assured and this has physical, psychological, social and financial implications for her future (Swain et al., 2008). There is widespread national and international concern about the increase in rates of caesarean section and the impact on neonatal and maternal outcomes (MacDorman, Declercq, Menacker, & Malloy, 2006; Villar et al., 2006). This does not only include primiparous caesarean sections but women who plan a caesarean section for a subsequent birth. This prompted a recent study by Chen, Roberts, Ford, Ampt and Simpson (2013), to specifically examine why some women plan a caesarean section after birthing vaginally the first time. They concluded that there was an increased risk of planned caesarean section in the second birth for women who had obstetric interventions and adverse outcomes in the first birth. They emphasise the importance of “getting the first birth right” in an effort to reduce this increasing caesarean section rate.

Women who have had a vaginal birth are more autonomous in the postnatal period because they are not inhibited by a level of pain experienced by women who have had an assisted vaginal or caesarean birth. Although these interventions are sometimes required, the resulting discomfort may impact negatively on their ability to initiate breastfeeding (Prior et al., 2012) and may have longer-term effects on the neonate. Evans, Evans, Royal, Esterman and James (2003) found that infants born by caesarean section experienced a reduced volume of milk transfer on days 2 - 5 (but no difference by day 6) and that 40% of infants born vaginally regained their birth weight by day 6, whereas only 20% of babies born by caesarean section succeeded in doing this in the same period. The adverse effects of emergency caesarean section on mother–infant bonding are also well documented (Herishanu-Gilutz, Shahar, Schattner, Kofman, & Holcberg, 2009; Swain et al., 2008).

Women who have had a spontaneous vaginal birth (i.e. unassisted with no obstetric intervention) are able to ambulate much earlier which encourages early transfer home. This

also has cost saving implications for the organisation (Homer, Matha, Jordan, Wills, & Davis, 2001). The introduction of the first obstetric intervention which may lead to others during labour for low risk women, is costly to the health system (Tracy & Tracy, 2003). The financial cost of a caesarean or assisted birth to the organisation, compared to a spontaneous vaginal birth, is significant. The average cost of a two day postnatal stay following an uncomplicated vaginal birth of a single baby is \$3,828 compared to an uncomplicated assisted birth with a three day postnatal stay which may cost \$7,526. This may increase to \$10,061 for an uncomplicated caesarean section with a four day postnatal stay. All of these charges increase if there are complicating features to any mode of birth (National Hospital Cost Data Collection Australian Public Hospitals Cost Report 2011-2012) or if a baby requires transfer to a Neonatal Intensive Care Unit (NICU) or Special Care Nursery (SCN).

During an episode of care for birth and the postnatal period, the mother and baby are treated as a dyad and no charges are indicated for neonatal care unless referral to a neonatologist is required. However, it is well known that respiratory difficulties are more common in babies born by caesarean section, particularly if the woman has not laboured (Hansen, Wisborg, Uldbjerg, & Henriksen, 2008; Zanardo et al., 2004). Any baby born by caesarean section (elective or intrapartum), has an increased risk of respiratory difficulties and admission to a neonatal intensive care unit (Villar et al., 2007). Neonatal morbidity may also have a flow-on effect and ongoing financial impact for the organisation with extra postnatal visits necessary because of possible postnatal complications. Home visits by the Newborn and Parent Support Service (NAPSS), which provides home care to babies requiring extra support after discharge from hospital, may also be necessary.

Tracy and Tracy (2003) conducted a population-based study of 171,157 women to estimate the cost of obstetric interventions introduced during labour, for low risk women who gave birth in the public sector in 1996-1997 in NSW. They found that birth costs for primiparous women increased by up to 50% as labour interventions increased. Epidurals were associated with an increase of up to 32% in some low risk primiparous women in the public sector. A more recent review of studies examining midwife-led care compared to doctor-led care suggests that further research is needed to establish the cost-effectiveness of midwife-led care (Sutcliffe et al., 2012). In response to this need, a very recent randomised control trial (the M@NGO Trial) was published by Tracy et al. in 2013. They found that an 'all risk' woman receiving 'one on one' care by a caseloading midwife costs the organisation over \$500 less than one receiving standard care.

To reiterate, rates of caesarean section and other interventions in childbirth are rising every year in the western world. Sutcliffe et al., (2012) acknowledge that in the UK there are an increased number of complex births in their rising birth rate. The Australasian Council on Healthcare Standards reports a 23.0% selected primipara<sup>1</sup> caesarean section rate in the Australian public system in their 2003-2010 Clinical Indicator Report. A more recent (2004-2011) report indicates a 29.2% rate in 2011, an increase of 6.2%. Locally, The Canberra Hospital has always benchmarked favourably against other public hospitals, however there has also been a gradual but concerning rise in the caesarean section rate at this hospital. The Canberra Hospital's data has been collected by Birth Outcomes System (BOS) since its introduction in 2007: There was an overall 25.31% caesarean section at The Canberra Hospital in 2008, increasing to 28.92% in 2011, a rise of 3.61%.

Rates of caesarean sections and other interventions in childbirth are much higher in primiparous than multiparous women. For example Tracy, Sullivan, Wang, Black and Tracy, (2007) found that the levels of intervention were particularly high in the primiparous population and that there is a strong association between labour intervention, including epidural and pharmacological methods of induction and augmentation of labour, and operative birth in these women. This was a population-based study of over seven hundred and fifty thousand women over a three year period.

Given this global and local context it is becoming increasingly important to identify strategies that maximise the potential for vaginal birth in all women but particularly in primiparous women. Birth centres and midwifery led continuity of care are two strategies that are known to increase the chances of vaginal birth for low risk women (Hatem, Sandall, Devane, Soltani, & Gates, 2008; Hodnett, Downe, Walsh & Weston, 2010; Olsen & Jewell, 1998; Sandall, Soltani, Gates, Shennan & Devane, 2013). Recent studies internationally (Davis et al., 2011; Hatem, Sandall, Devane, Soltani, & Gates, 2008; McIntyre 2012; Sandall, Soltani, Gates, Shennan & Devane, 2013; Waldenstrom & Turnbull, 1998; and Walsh & Devane, 2012) and in the Australian context (McLachlan et al., 2012; Tracy et al., 2014) have demonstrated the safety and efficacy of birth centres and midwifery continuity of care (Hatem, Sandall, Devane, Soltani, & Gates, 2008; McLachlan

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<sup>1</sup> Selected Primipara is a woman who is:

- 20-34 years of age at the time of giving birth
- giving birth for the first time at >20 weeks gestation
- pregnant with a single fetus with a cephalic presentation
- 37 – 40.6 weeks gestation

Australian Council on Healthcare Standards (ACHS).

et al., 2012; Tracy et al., 2014) for decreasing intervention rates (Walsh & Devane, 2012) and promoting vaginal birth. However, much of the research on these strategies combine data for multiparous and primiparous women and it remains unclear whether these strategies are effective for primiparous women who experience higher rates of operative birth and obstetric interventions than multiparous women (Tracy et al., 2007).

The primary objective of this research is to describe and compare rates of obstetric intervention and clinical outcomes of low risk primiparous women who accessed two different maternity models of care at The Canberra Hospital (now the Centenary Hospital for Women and Children): the Canberra Midwifery Program (CMP) and Standard Public Care. A description of these programs will be provided in the paragraphs to follow.

## **1.2.Outline of this thesis**

The current chapter provides insight into the evolution of midwifery services in the Australian Capital Territory (ACT).

Chapter 2 examines literature related to continuity of midwifery care models that have been evolving for many years. The literature review confirms the crucial role midwives play in providing primary midwifery care in contemporary maternity services.

Chapter 3 describes the research model and the methodology guiding the development of the study that compares the clinical outcomes of primiparous women accessing various maternity models of care at The Canberra Hospital. It provides details of data collection and the databases utilised in this collection. It also describes ethical considerations, data analysis, study participants, their selection and exclusion and an explanation of sample numbers.

Chapter 4 presents analysis of results of the comparison between outcomes for women experiencing standard public maternity care and care provided in the continuity of care/carer model in the CMP. The sample groups compared were all low risk primiparous women who birthed after thirty seven weeks gestation in 2010 and 2011.

Chapter 5 discusses the findings presented in Chapter 4 and includes a conclusion and implications for future recommendations for change of practice to assist in future planning.

### **1.3. Background of the Researcher**

Since graduating from hospital-based midwifery training in Canberra in 1971 I have worked with birthing women almost continuously in various hospitals both in Australia and in low resource settings overseas. Immediately post-graduation, two years were spent in a small rural hospital where continuity was unavoidable due to workforce restrictions. This was an enlightening experience and influenced my midwifery philosophy. Two years in a midwifery education role at a large metropolitan hospital in Sydney followed. As spouse on posting to Vanuatu, an opportunity arose to again provide midwifery education, though in a very different environment at Vila Base Hospital. The majority of the following midwifery years were spent providing care in the public Delivery Suite at Woden Valley Hospital. Five years, from 1999-2004, were spent working in partnership with women and their families in The Canberra Hospital's Birth Centre, where the benefits of continuity of care/carer became more obvious to me, particularly for first time mothers.

Also during those years, the opportunity arose to visit a refugee camp on the Thai/Burmese border to teach Advanced Life Support in Obstetrics (ALSO). The following year a longer period was spent in the refugee camp, working with midwives to support them and assist in consolidation of their knowledge and skills. It was during that time that spontaneous vaginal births for primiparous women became crucial to my birthing philosophy. In Australia the maternal mortality rate is among the lowest in the developed world: 7 per 100,000 live births whereas in Burma in 2010 it was 240 women per 100,000 (United Nations Maternal Mortality Estimation Group et al., 2012).

In well-resourced countries such as Australia, contraception is readily accessible and technology is available to diagnose life-threatening complications following primiparous caesarean sections, for instance, placental implantation anomalies. There are also sophisticated blood transfusion facilities that are not available in a refugee camp. However, if women succeed in having a primiparous spontaneous vaginal birth, they are less likely to die in a subsequent birth from one of the many potential complications following caesarean section (Dodd, Crowther, Huertas, Guise & Horey, 2004; Hemminki & Merilainenb, 1996; MacDorman Declercq, Menacker & Malloy, 2006; Murphy, Stirrat & Heron 2002; and Villa et al., 2007).

#### **1.4. History of maternity services in the Australian Capital Territory (ACT)**

Maternity services have changed dramatically in Australia in the last century but none more so than in Canberra which didn't exist as we know it, until 100 years ago. The one similarity Canberra shares with other Australian cities, involves our Indigenous people. The Ngunnawal people occupied this land long before European settlement, hence Canberra is known as Ngunnawal country. Most Australian cities evolved with the early colonial settlements determining the location of the metropolitan areas. Trade and manufacturing consolidated the pattern and later, the rail networks reinforced their dominance in each state (Australian Government, 2010). However, Canberra is unique as it was a carefully planned purpose-built city, with the House of Representatives selecting Yass-Canberra as the site for the national capital on the 8<sup>th</sup> October 1908. Two and a half years later, on January 1<sup>st</sup> 1911, New South Wales ceded 2,360 square kilometres of land, (including the seaport of Jervis Bay), and the Federal Capital Territory, known as the Australian Capital Territory (ACT) came into being. The first peg in the construction of Canberra was driven in on the 20<sup>th</sup> February 1913 and a month later, on March 12<sup>th</sup> the foundation stones were laid and the new capital was named 'Canberra' (<http://www.nationalcapital.gov.au/index>).

The first eight-bed Canberra hospital in Balmain Crescent Acton opened in May 1914 but did not include maternity beds. Women home-birthing or travelled to Queanbeyan (New South Wales) for birth because there were no obstetric services. Continuity of midwifery care/carer and early transfer home after birth are not novel concepts in the ACT. After the first midwife was officially appointed in 1926, she was present for the birth, visited the woman at home twice a day for two days and daily for the next seven days for a fee of four guineas, which is probably equivalent to a contemporary midwife's salary today. The first six obstetric beds were opened in 1927, expanding quickly to eight (<http://www.health.act.gov.au/c/health>). General nursing training commenced in 1928 and continued in the new hospital that was built in Acton in 1943 (Newman & Warren, 1993).

The area of Canberra known as Acton became 'Acton Peninsular' when Scrivener Dam valves were closed and the Molonglo River waters formed Lake Burley Griffin in 1963. However, prior to the formation of the lake and afterwards from 1943-1992, Acton Peninsular was the site of the Royal Canberra Hospital which was demolished among much controversy in 1997 and replaced by the National Museum of Australia. Originally known as the Canberra Community Hospital, it became Royal Canberra Hospital in 1979.

Midwifery training was introduced after the Second World War in 1949 and in 1953 the obstetric block bed capacity was extended to 45 to cope with the post-war 'baby boom'.

Prior to a second public hospital opening in Woden Valley in 1973 (<http://www.images.act.gov.au/duslibrary/imagesact.nsf/search>), Canberra Community Hospital was the only hospital in the ACT with maternity services, providing care to both private and public patients. Because there was no private facility, the maternity unit was staffed by general practitioners and consultant obstetricians who cared for women with private insurance as well as public patients. Woden Valley Hospital did not have specialised paediatric/neonatal services, so all women with complicated pregnancies including prematurity, were admitted or transferred to Canberra Community Hospital where there was paediatric cover and a more sophisticated nursery. However, this changed after the amalgamation of both hospitals in November 1991 when all maternity and neonatal/paediatric services were transferred to Woden Valley Hospital, renamed The Canberra Hospital in 1996.

Midwives have played a pivotal role in birth in the ACT, both at Royal Canberra and Woden Valley Hospitals prior to amalgamation and at The Canberra Hospital afterwards. Woden Valley Hospital had their first intake of student midwives in 1976. It remained a hospital-based midwifery training program until 1997 when it became a graduate diploma course at the University of Canberra. The association with the University of Canberra was strengthened in 2009 when the three-year direct entry Bachelor of Midwifery was introduced. In 2012 ACT Health redeveloped the current campus and amalgamated maternity, gynaecology, neonatal and paediatric services into the Centenary Hospital for Women and Children. The chronological order of the history of maternity services at Canberra Hospital is illustrated in the following table:

**Table 1 - History of Maternity services at Canberra Hospital**

<b>Year</b>	<b>History of Maternity services at Canberra Hospital</b>
1914	First eight bed Canberra Hospital was opened in Acton
1926	First midwife was officially appointed
1927	First six obstetric beds opened
1928	General nursing training was introduced
1943	Canberra Community Hospital was built in Acton
1949	Midwifery training was introduced at Canberra Hospital
1953	Obstetric bed numbers expanded to forty five
1973	Woden Valley Hospital opened - including maternity services
1976	Hospital based midwifery training was introduced at Woden Valley Hospital
1979	Canberra Community Hospital renamed “Royal Canberra Hospital”
1991	Royal Canberra Hospital closed. All health services including maternity, neonatology and paediatrics amalgamated at the Woden Valley campus
1992	Birth Centre opened at Woden Valley Hospital
1996	Woden Valley Hospital was renamed ‘The Canberra Hospital’
1997	Graduate diploma midwifery course was introduced at the University of Canberra
1997	Royal Canberra Hospital in Acton demolished
2009	Bachelor of Midwifery was introduced at the University of Canberra
2012	The Canberra Hospital maternity unit was redeveloped and renamed Centenary Hospital for Women and Children. With the redevelopment the Birth Centre expanded from three to five birthing rooms and Birth Suite from ten to twelve birthing rooms.

### **1.5.Study setting**

During the period of this study public maternity services in the ACT were provided at two sites; The Canberra Hospital in Woden on the South side of Lake Burley Griffin and Calvary Health Care Hospital in Bruce, on the North side. Calvary Hospital provided

relatively low risk maternity services with all high risk women transferred to the tertiary centre (The Canberra Hospital). This included women with gestational diabetes who become insulin dependent and women who have pre-term (<34 weeks gestation) labour. The Canberra Hospital maternity service attended approximately 5,542 births in the study period (2,744 in 2010 and 2,798 in 2011).

The Canberra Hospital has approximately 500 beds, catering to a population of over 520,000 (<http://health.act.gov.au/c/health>). It is a major tertiary referral centre and the teaching hospital for the Australian National University (ANU) medical school and University of Canberra Schools of Nursing and Midwifery. It also has strong links with the John Curtin School of Medical Research. It is the local tertiary referral centre for the Calvary Health Care Hospitals in Bruce and Deakin in the ACT and regional hospitals in Southern NSW. Because of the close proximity to New South Wales, 15.9% of all women who birthed at The Canberra Hospital in 2010 (Li, Zeki, Hilder & Sullivan, 2012) and 14.6% in 2011 (Li, Zeki, Hilder & Sullivan, 2013) were non-ACT residents. This transfer rate impacts on perinatal outcome data, which may be inflated because it includes a high percentage of preterm births, multiple pregnancies, and high risk pregnancies which have been transferred to The Canberra Hospital from other centres or from interstate.

Over the past few years there has been growing consumer demand from women for access to greater choice in maternity care. In particular, the demand for access to midwifery models of care that promote continuity of both care and carer has grown significantly since the establishment of the early continuity of midwifery care models in the late 1990s. In 2010, 2.2% of all births ( $n=6,367$ ) in Australia were in Birth Centres, 6.2% in South Australia and 5.5% in the ACT (Li et al., 2012). This increased to 6.1% in the ACT in 2011 (Li et. al., 2013).

The Canberra Midwifery Program (CMP), which operates out of the Birth Centre attached to The Canberra Hospital, has provided local women with the option of varying degrees of continuity of care since 1992. The Birth Centre was the culmination of years of negotiation and lobbying which began in 1981 when the Capital Territory Health Commission wrote a paper titled 'A Birth Centre for Canberra'. The ACT Health Authority (ACTHA) arranged a working party to re-examine this paper in 1985 (Cameron, 1994). In 1989 the Alternative Birth Services Program (ABSP) distributed \$6.4 million nationally and at the same time each State was offered another \$50,000 which meant that planning of the new Birth Centre could be included in the amalgamated maternity unit at Woden Valley Hospital (Proust, 1998), due for completion in 1991. The Birth Centre became a reality in 1992 because of

sustained community pressure and government support, despite obstetrician reluctance. Initially there were nine midwives in the Birth Centre with backup from one Obstetrician and approximately ten local General Practitioner (GP) Obstetricians. At this stage in the evolution of the Birth Centre, midwives did not provide continuity of care but, rather, worked rostered shifts.

Also at this stage, homebirth was an option with care provided by a small number of independent midwives (Hambly, 1997). This was later rescinded and the option of homebirth removed because indemnity insurance for independent midwives expired on May 31<sup>st</sup> 2002. The ACT Minister for Health then announced a proposal to extend midwifery led care to include publicly funded homebirths through the CMP. However, in November of that year, the Minister received advice that they were unable to obtain insurance for a publicly funded homebirth service hence it was never implemented (Chiarella, Homer, Dahlen & Hickey, 2007).

Birth services in the Birth Centre began as a pilot program in 1995, the Community Midwives Pilot Program (CMPP) and the service was evaluated by the ACT Department of Health and Community Care. This evaluation included the appropriateness, accessibility, effectiveness and efficiency of the service. The report concluded that it provided value for money and viable women-centred maternity care and that all women should have a 'known' midwife providing continuity of care during the maternity period (Hambly, 1997).

The Birth Centre midwifery workforce has evolved over the years with various models of midwifery care being trialled in an effort to provide women with continuity of carer, but also provide midwives with a work/lifestyle balance. Prior to the commencement of the Canberra Midwifery Program, some Birth Centre midwives continued to work rostered shifts whilst others practised in a team, working remotely 'on-call' and only coming into the Birth Centre for a woman's labour and birth. In March 1999 these two models amalgamated and the Community Midwives Program became the Canberra Midwifery Program. After amalgamation, midwives self-selected into North and South teams and women were geographically allocated to the teams. Postnatal home care was then introduced for up to 14 days. The caseloading model was introduced in 2002.

Currently, (i.e. 2014), all midwives are caseloading, however, in the prescribed period of the study (2010 and 2011), there were two models of care in operation both of which supported low risk women to birth in the Birth Centre. Midwives provided holistic, midwifery led care

with continuity of care/carer in the form of a caseloading midwife or a team of midwives who provided care from first presentation, through to two weeks postnatally. In 2010 there were four teams of midwives within the Canberra Midwifery Program: three teams of four/five midwives (North, South and Central Teams) who worked as primary midwives (caseloading) and one (Tuggeranong) team of four midwives who worked in a small group practice, sharing the women allocated to the team. The two different models of care that practised in the prescribed period within the CMP provided different levels of continuity. The Tuggeranong team of four midwives shared the women allocated to the team whilst the caseloading midwives were primary carers, with a back-up midwife providing support when necessary.

The Birth Centre environment became very familiar to the woman and her family during pregnancy because a number of her antenatal visits were conducted in the assessment room and preparation for parenting classes were held in the lounge area. These classes were conducted by Birth Centre midwives on a rotational basis, giving the women an opportunity to meet all the midwives in their team in case their primary midwife was resting. The first or 'booking' visit was usually in the woman's home with some visits conducted in the community at designated clinics.

During the period of the study, the Birth Centre was located on the ground floor of the maternity building (Delivery Suite was on level three). It included three birth rooms, all with access to courtyards and all with en-suites, one with a shower and two with large corner baths. Midwives practised autonomously utilising Australian College of Midwives (ACM) Guidelines for Consultation and Referral (2008) to refer to and collaborate with, the medical team where appropriate. Caseloading midwives were 'on-call' for the women in their care unless resting or on leave. Team midwives working in the small group practice had one midwife 'on-call' for all the women in their care. All midwives were required to refer women to a supporting midwife or another team member after twelve hours.

Unlike Delivery Suite, which was fully staffed by midwives working three eight hour shifts, the Birth Centre was staffed only when there was a woman in labour and her 'on-call' midwife was in attendance. When the woman had birthed, there was a requirement to stay with the family until she had successfully breast fed and was postnatally stable. The midwife was then able to leave the family with support from the Delivery Suite staff should they need it. The family was then transferred home (usually within 24 hours) where continuity of

care continued into the postnatal period with daily visits by her midwife for up to two weeks.

Until recently, there was no continuity of care/carer in standard public maternity care at The Canberra Hospital. However, a new model offering continuity of care for women planning to birth in Delivery Suite was introduced toward the end of 2011. CatCH (Continuity at The Canberra Hospital) was developed within collaborative and continuity of care frameworks that ensured the woman retained 'her' midwife even when she developed medical/obstetric complications. It is a new option for maternity care that is available to any pregnant woman who resides in ACT, regardless of her health risks. It is different to the Canberra Midwifery Program (CMP), which accepts only low risk women planning to birth in the Birth Centre. CatCH accepts women of 'all risk' including those who may have pre-existing or emerging complexities, significant psychosocial risk factors or simply those requesting a known midwife for pregnancy, intrapartum and postnatal care who plan to birth in Delivery Suite. Because the CatCH team was introduced after the end of the study period, clinical outcome data were not affected by another continuity model. Prior to the introduction of the CatCH team, antenatal care was provided to women of 'all risk' by midwives and medical staff in community or hospital based midwifery antenatal clinics and shared care with specialist clinics, obstetricians or general practitioners (GPs). Their intrapartum and postnatal care was generally provided by midwives unknown to the women in the antenatal period.

Prior to amalgamation of both campuses in 1991, neither hospital provided antenatal care on-site. All care in the antenatal period was provided by obstetricians in their private consulting rooms with little or no midwifery input, except when student midwives were allocated to an obstetrician to gain antenatal experience. However since amalgamation, midwives have provided the majority of care for low risk women either in the antenatal clinic or in community outreach clinics utilising ACT Health Maternity Shared Care Guidelines (2008) to guide practice and refer to the obstetrician or obstetric registrar clinic when necessary. Maternity outpatients has expanded steadily since the appointment of Canberra's first academic specialist obstetrician as Professor of Obstetrics and Gynaecology in 1995 (Hambly, 1997).

Every woman is given pregnancy care options (explanation in previous paragraph), by a midwife at her first booking visit. Since 2006 low risk women have also been given a choice of locations if obstetric input was unnecessary. Community clinics were located on both the

south and north sides of Canberra to accommodate women's preferences and staffed by the same midwives which provided some continuity of antenatal care. During the prescribed period there were two clinics located on the north side and two on the south side of Canberra, offering antenatal care to approximately ninety women per week. There was also a clinic on-site at The Canberra Hospital where midwives reviewed approximately 60 – 75 women per week. These approximate numbers are only those receiving ongoing care but do not include women who were having their initial booking-in visit. Most Aboriginal and Torres Strait Islander women of the ACT and surrounding areas have continuity of antenatal and postnatal care provided by midwives who work with the Winnunga Nimmityjah Aboriginal Health Service, a primary health care service operated by the Aboriginal community of the ACT. Midwives support the women by providing antenatal support and education, transport to The Canberra Hospital for antenatal visits and collaboration with the obstetric team and postnatal and sometimes, labour support.

There are also five specialist midwives' clinics within the antenatal clinic where continuity of antenatal care is provided, in collaboration with the medical team when necessary:

- Substance Use in Pregnancy Support (SUPS) – women either self-refer or are referred if they disclose substance use issues at their first visit.
- Step Ahead Clinic – women are referred if they are less than 20 years of age and require extra physical/emotional/social/financial support.
- Culturally and Linguistically Diverse (CALD) – the midwife provides culturally sensitive care to these women and often works with an interpreter.
- Fetal Medicine Unit (FMU) – a designated midwife provides care to a vulnerable group of women who are currently experiencing complex pregnancies or have a history of previous complexities.
- Endocrine Clinic – all women with endocrine complexities including type 1 diabetes and gestational diabetes who develop insulin dependence, are referred for midwifery support in collaboration with the Obstetric and Endocrine teams.

There is also a sixth specialty clinic which came into operation June 2014. This clinic provides multidisciplinary care to women with a BMI >35. The team consists of an obstetrician, a midwife, a lactation consultant, a dietician, a physiotherapist and the anaesthetic team.

Women requiring extra support are referred to the Pregnancy Enhancement Program (PEP). This is an over-arching support team consisting of representatives from Perinatal

Mental Health, Drug and Alcohol, Social Work department, Maternal and Child Health and Care and Protection Services. The program is co-ordinated by the SUPS midwife and meets monthly to ensure postnatal supports are in place for vulnerable families. However, intrapartum and postnatal care are provided by midwives unknown to the women in the antenatal period. Continuity for any standard care woman did not extend beyond the antenatal period until the CatCH team was introduced in 2011.

During the prescribed period, women experiencing standard care were encouraged to transfer home early (from Delivery Suite) with a plan for a Midcall<sup>2</sup> midwife to support them with daily visits. If this was not possible they were transferred to the postnatal ward on level 2 of the maternity building where there were 15 beds (with the capacity to increase by another 6 if necessary) and the average length of stay was 2.63 nights or 3.63 days<sup>3</sup>.

### **1.6. Study aims**

The aim of the study is to compare clinical outcomes of low-risk, primiparous women accessing continuity of care with the CMP who plan to birth in the Birth Centre with a similar cohort receiving standard public care who plan to birth in Birth Suite.

### **1.7. Significance of the study**

Whilst there have been audits examining intervention rates and clinical outcomes of the women accessing care with the CMP who plan to birth in the Birth Centre (Chiarella et al., 2007), there has never been an inter-unit comparison of the two models of care at The Canberra Hospital. Neither have outcomes of specifically, primiparous women in the care of the CMP, ever been formally compared to those receiving standard care at The Canberra Hospital.

In 2003 the ACT Legislative Assembly Standing Committee on Health published “A Pregnant Pause: the future for maternity services in the ACT”. One of the recommendations (3.88) was that:

*The government undertake a needs analysis to determine the actual level of unmet demand for the Canberra Midwifery Program as a matter of urgency.*

In response to that recommendation, a formal evaluation of the CMP was conducted by KPMG (a professional auditing company), commissioned by ACT Health to conduct a

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<sup>2</sup> Midcall: an early discharge midwifery program that supports women with home visits when they have been transferred home within 24 hours of birth.

<sup>3</sup> Source: Birth Outcomes System (BOS)

demand analysis in 2006. They found that the service was not meeting demand at that time and there was evidence to indicate that the service's capacity would be inadequate for future demand, but there was no evaluation of outcomes.

With the expansion of continuity of care models, it is essential that the safety and reliability of this model of care is justified to the organisation (Centenary Hospital for Women & Children and ACT Health) and the governing body (the ACT Government) in order to provide the best possible outcomes for women and their families, particularly in their first pregnancies. As stated earlier, there is high level evidence to support the safety and efficacy of continuity of midwifery models of care in mixed parity (Davis et al., 2011; Hatem et al., 2008; McIntyre, 2012; McLachlan et al., 2012; Sandall et al., 2013; Waldenstrom & Turnbull, 1998 and Walsh & Devane, 2012) but very little published research about primiparous women as a separate group, the exception being the recent study by Tracy et al., (2014)

This study will contribute to national and international research in which there is this scarcity of literature specifically researching the effectiveness of continuity models of care for primiparous women. The title of this thesis is "Getting the first birth right" and the continued emphasis throughout, is on women who are having their first baby. If we succeed in maximising the chances of a primiparous woman having a normal vaginal birth, she remains at low risk of developing complications in her subsequent pregnancies.

## **1.8. Conclusion**

This chapter gives some insight into the history of and the evolution of maternity services and midwifery education in our national capital. It has also highlighted the importance of "getting the first birth right" by maximising a primiparous woman's chance of having a normal vaginal birth. The next chapter will focus on literature related to continuity of midwifery care models that have been evolving for many years and will illustrate Australia's valuable contribution to the evidence base.

## **2. Chapter 2 - Literature Review**

### **2.1.Introduction**

The search for current research surrounding the births of first time mothers exposed a scarcity in studies specifically examining the outcomes of this particular population. The bulk of the literature examining midwifery-led models and Birth Centre care includes women of all parity and includes studies that use quantitative, qualitative and mixed methodologies.

In my search for the most current literature, databases were accessed at both the University of Canberra (UC) library and The Canberra Hospital library (affiliated with the Australian National University (ANU). They were:

- Cochrane Database of Systematic Reviews;
- Maternity and Infant Care (MIDIRS);
- Medical Literature Analysis and Retrieval System Online (MEDLINE) (PubMed);  
and
- The Cumulative Index to Nursing and Allied Health Literature (CINAHL).

### **2.2.Getting the first birth right**

There is increasing concern about the escalation of caesarean section rates nationally and internationally. The rate is increasing exponentially with a contributing factor being repeat caesarean sections for women who have had a previous caesarean section. The most recent Australia's mothers and babies' reports (Li et al., 2012; Li et al., 2013) reveal an increase nationally with an overall caesarean section rate of 31.6 % in 2010 (a rise of 0.1% from 2009) increasing to 32.3% in 2011 (a rise of 0.7% from 2010). The first birth caesarean section rate was 32.6% in 2010, increasing to 33.2% in 2011. This is reflected in multiparous data with 28.1% women having repeat caesarean sections in 2010, increasing to 28.8% in 2011.

The Canberra Hospital (now Centenary Hospital for Women and Children) has always benchmarked favourably against other similar hospitals in the Women's Health Australasia (WHA) data but in recent years it has been following the national trend. In 2008 there was a 25.31% caesarean section rate with a rise to 28.92% in 2011 (a rise of 3.61%).

In response to the unease about increasing caesarean section rates, a cross-sectional analytic study was completed by Homer, Johnston and Foureur in 2009. Population-based data from 1998-2006 from hospital births in New South Wales (NSW) were extracted from Midwives' Data Collection (NSW Health Department). The 53,455 participants were term (>37 weeks gestation) women who had experienced one previous caesarean section with a singleton pregnancy and vertex presentation at birth. They found during this nine year period, the number of women who attempted a Vaginal Birth After Caesarean (VBAC) declined from 49% to 35% and the rate of successful VBAC dropped significantly from 31% to 19%. The vaginal birth rate dropped from 64% to 53% for those women who laboured. They conclude that midwives have a crucial role to play in 'getting the first birth right', in encouraging normal births for primiparous women.

This exponential rise in caesarean section rates is not only due to first birth caesarean sections but also adverse outcomes in a first vaginal birth. As already mentioned in the introductory chapter, in response to this concern and to emphasise the importance of 'getting the first birth right' Chen et al., (2012) examined how adverse outcomes in a first vaginal birth contribute to the decision to have a planned caesarean section for a second birth. Birth data for 114,287 women was collected from the Perinatal Data Collection and hospital data from the NSW Admitted Patient Data Collection from July 2000 to December 2009. They found an association between obstetric interventions including augmentation of labour with oxytocin, induction of labour and episiotomy, and adverse outcomes in the first birth.

The literature review is divided into two main sections: continuity of midwifery models of care and place of birth. Both these topics are aligned and the literature reviewed reaffirms that both impact on clinical outcomes. The following appraisal of literature highlights the positive impact continuity of midwifery care has on women and the safety and cost effectiveness of this model of care. The literature will also illustrate that by providing continuity of care/carer and choice of birth place, unnecessary intervention and subsequently, unnecessary caesarean sections in first time births may be reduced which will ultimately increase the normal vaginal birth rate for first time mothers.

### **2.3.Continuity of midwifery models of care**

Over many years, Australia has made a strong contribution to the evidence base on continuity of midwifery care with a number of studies focusing on this area. One of the earliest Australian studies was a stratified randomised control trial conducted by Rowley,

Hensley, Brinsmead and Wlodarczyk in 1995. In this study eight hundred and fourteen women were randomised after booking into the antenatal clinic of a tertiary referral centre, 405 to midwifery team care and 409 to fragmented care. The authors not only examined quantitative outcomes including calculation of treatment cost but also included maternal satisfaction in a qualitative assessment. They found that women experiencing care from the midwifery team were more likely to birth with no intervention and less likely to use intrapartum narcotic analgesia. There were no differences in Apgar scores at five minutes though babies of midwifery team mothers required less resuscitation at birth. Neonatal and stillbirth rates were the same for both groups for those mothers with a singleton pregnancy however there were three deaths in multiple pregnancies in the team midwifery group. The qualitative aspect was reassuring with women allocated to team midwifery expressing greater satisfaction. There was also a 4.5% reduction in cost. The authors acknowledged in their conclusion that a much larger study would be beneficial to detect differences in outcomes that are rare, including mortality rates. However, they found that a small team of midwives encouraged maternal satisfaction at reduced cost and that team midwifery care is as safe as fragmented, routine care for 'mixed risk' women. This study is an integral part of national and international midwifery research history and was the forerunner of many more Australian studies that evaluated the effectiveness of continuity of midwifery care/carer.

In a later study exploring women's perceptions of pregnancy care at Royal Women's Hospital in Melbourne in 2000, Waldenstrom, Brown, McLachlan, Forster and Brennecke, evaluated a new team midwifery program which consisted of eight midwives providing continuity of care/carer to a group of low risk women. Following recruitment between February 1996 and November 1997, random allocation of women occurred at the booking visit, 495 to team midwifery and 505 to standard care. The study's aim was to evaluate perceptions of satisfaction with all aspects of pregnancy care, antenatal, intrapartum and postnatal. A postal questionnaire was distributed two months postnatally, except to those women who had serious unexpected outcomes e.g. perinatal death or serious medical complications. There was no statistically significant difference between the two group's responses to the Edinburgh Postnatal Depression Scale (EPDS) ( $p = 0.19$ ) but only sixty percent of the standard care group would choose the same model of care compared to eighty four percent of the midwifery team model.

Waldenstrom et al., (2000) found continuity of care/carer was associated with increased satisfaction with antenatal care but the satisfaction level with intrapartum and postnatal care was less. Because of ethical considerations, women accessing the Birth Centre were

included in the standard group because it was considered part of the standard care offered at this site, prompting the authors to admit that this may have diluted the effects of the team midwifery model. There is an assumption that women of all parity were included in the randomisation because there is no specific mention of primiparous women as a sub-group.

High level evidence which supports the safety and effectiveness of midwifery led, continuity of care models has been published by the Cochrane Collaboration. The original systematic review: “Midwife-led continuity models versus other models of care for childbearing women” (Hattem et al., 2008) has recently been updated by Sandall et al., (2013). The first review was conducted because they perceived a lack of a single source of synthesised information to ascertain differences in effectiveness, psychosocial outcomes and morbidity and mortality between continuity models of care provided by midwives and other models of care. It included 11 randomised control trials (RCTs) with 12,276 women. The 2013 update by Sandall et al., (2013) includes two more recent RCTs, by Begley (2011) and McLachlan (2012).

With the inclusion of these two recent RCTs, the number increased to 13 trials comparing midwife-led continuity models with other models of care with 16,242 low and all-risk women, of all parity. The models of care were defined by the lead professional in the antenatal and intrapartum periods:

- The midwife is the lead professional in midwife-led care.

Other models included:

- Obstetrician-led,
- General Practitioner (GP)-led and
- Shared care where different care providers take responsibility (care can shift from one to another, or is shared by a number of health professionals).

Models of care where licensed midwives provided in-hospital continuity of antenatal, intrapartum and postnatal care were included. Because it was a review of international literature from Australia, Canada, Ireland, New Zealand and the United Kingdom, there were many variations in practice settings, definitions of model of care and risk status of participating women. Consequently, subgroup analyses of the variations in levels of obstetric risk and different levels of continuity were conducted.

Sandall et al., (2013) found that the midwife-led model of care had no adverse effects on mothers and babies compared to shared care and medical-led models but conversely,

offered many benefits. These included an opportunity to be cared for by a 'known' midwife, reduced epidural, episiotomy and assisted vaginal birth rates, though no difference in caesarean births was identified. Women who were randomised to the midwife-led model of care were less likely to have anaesthesia or analgesia, more likely to have a longer labour (mean hours) but also more likely to have a spontaneous vaginal birth.

Most of the conclusions remained unchanged in the recent updated version. However there were some changes including evidence to indicate that women who received care in the midwife-led model were less likely to have preterm babies and that there was now no difference in antenatal hospitalisation and the initiation of breastfeeding between models of care. There was an increase in spontaneous vaginal birth rates and, as already stated, whilst women randomised to the midwife-led models were less likely to have a pre-term baby or lose a baby before 24 weeks gestation, other neonatal outcomes were similar. Due to heterogeneity in cost assessment of different models of care and qualitative data from different studies measuring women's satisfaction, these two outcomes were described narratively.

They concluded that a trend towards cost effectiveness was observed in the midwife-led models and that a higher rate of maternal satisfaction was reported in the majority of studies. Although it was a large review of 13 trials involving 16,242 women, they were a mixed demographic with women of all parity included, not specifically primiparous women. As stated earlier, there was sub-group analysis on levels of continuity provided by care-giver, level of risk (i.e. low versus mixed risk) and place of provision of care (community versus hospital) but no sub-group analysis of different parities. They did conclude that no adverse effects were identified but rather, there were several benefits for mothers and babies associated with midwife-led care and that most women should have the opportunity to embrace this model unless there were obstetric or medical complications which precluded them.

In the original review by Hatem et al., (2008) meta-analysis for the maternal satisfaction outcome was not conducted because it was thought to be inappropriate due to heterogeneity of scales, instruments and timing of implementation of these plus reduced response rates which were lower than 80%. Low risk women's experiences of midwifery-led care were explored by Walsh and Devane in a meta-synthesis of qualitative studies in 2012. Eleven studies met their inclusion criteria, the purpose of which was to determine why (whilst acknowledging the reality of improved outcomes and safety associated midwife-led care),

low risk women within this model of care experience fewer interventions. They suggested in summary, that the reasons for fewer labour and birth interventions experienced by women associated with midwife-led care may be two-fold: an increased sense of midwifery autonomy in midwife-led settings which benefits the relationship and increases the autonomy and empowerment of women. They noted that this depended to some extent on the relationship between midwife-led units and the host maternity unit. However, none of the eleven studies included in the meta-synthesis specifically examined the perceptions of primiparous women.

A number of the studies included in the updated systematic review by Sandall et al., in 2013 were conducted in Australia. One of those cited was a study by Biro, Waldenstrom and Pannifex (2000). Within this study, the objective was to compare a new model of care implemented in 1996 at Monash Medical Centre in Melbourne (characterised by continuity of midwifery care from early pregnancy through to the postpartum period), with standard maternity care, in a randomised control trial which included women of all parity. Women ( $n=1,000$ ) were randomised either to a team of seven midwives, working collaboratively with obstetric staff, or to standard care from a variety of midwives and obstetric staff. Of the 4,260 women seen in early pregnancy between March 1996 and January 1998, 3,049 were considered for the trial. There were various reasons why 2,049 were excluded including gestation over 24 weeks at booking, clinic time unsuitability, request for shared care, medical/fetal contraindications requiring fetal medicine unit input, or some culturally and linguistically diverse women, leaving 502 women who were allocated to the midwifery team and 498 randomised to standard care.

The only outcomes measured were clinical: procedures in labour, maternal outcomes, neonatal outcomes and length of hospital stay. The women randomised to the team of midwives experienced less continuous fetal monitoring, less augmentation of labour, less use of pharmacological analgesia, more unsutured perineal tears but fewer episiotomies. These women were also discharged 7 hours earlier than women allocated to standard care. Neonatal outcomes, including admission to the nursery, Apgar scores and perinatal mortality were similar in both the continuity and standard care group and the caesarean section rate was similar. They concluded that continuity of midwifery care was associated with a reduction in medical procedures in labour and a shorter length of stay with no compromise to maternal or perinatal safety and that this new model of care was realistically achievable in a tertiary setting. However, women's views and experiences of care during the antenatal, intrapartum and postnatal periods were not reported in this paper.

These perceptions were later reported by Biro, Waldenstrom, Brown and Pannifex (2003), in a study also cited in the Cochrane review. The same cohort of women who were randomised to the previous quantitative study completed a postal questionnaire four months postnatally. Because it was the same group of women, analysis included women of all parity not specifically primiparous women. The researchers concluded that this partnership is associated with increased satisfaction, particularly for antenatal care but less so for postnatal care. It is interesting to note that 77.9% ( $n=345$ ) of the team care group and only 67% ( $n=288$ ) of the women in standard care group responded to the 4-month follow-up questionnaires. Although the researchers don't form a hypothesis, the response rate may relate to the unique partnership formed during this period.

Another Australian paper by Homer, Davis, Cook and Barclay (2002) was also cited in the systematic review by Sandall et al., (2013). Their objective was to compare women's antenatal, labour, birth and postnatal experiences qualitatively. The comparison was between 1,089 women of all parity and 'all risk' randomly allocated to either standard hospital care or a "new model of continuity of care": the St. George Outreach Maternity Project (STOMP). The conceptual definition of continuity of 'carer' within this paper refers to a midwife whom the woman feels she knows. Continuity of 'care' refers to the organisational structure or consistent philosophy of continuity of care within that organisation (both these definitions have been employed in this thesis). The majority of women accessing the STOMP model (63%) knew their midwife compared to 21% of women in the control group. Women in the STOMP group also reported a more positive birth experience and felt they were more in control. Whilst the 'partnership' between women and midwives again, wasn't specifically stated in this paper, having a 'known' midwife may have had some impact on the results.

More recent research has found that continuity of care is beneficial for all women, regardless of level of risk (Tracy et al., 2013). The majority of the studies reviewed for this thesis concentrate on effects of continuity of midwifery care for women of low risk, however, this study examined the effects of continuity of care on women of 'all risk'. It was an un-blinded, randomised, controlled, parallel-group trial involving 1748 women, who were randomly allocated to either standard or caseload midwifery care at two Australian tertiary metropolitan hospitals. The exclusion criteria included women who expressed an interest in continuity (at site 1), were more than 24 weeks gestation, had already booked with another service provider, planned an elective caesarean section or had a multiple pregnancy. There were 871 allocated to caseload and 877 to standard care. Many

multiparous women expressed a preference for the caseloading model of care which excluded them from randomisation, leaving a higher proportion of primiparous women ( $n=619$ ; 70%) in the study.

The primary maternal outcome was the caesarean section rate with other outcomes including unassisted vaginal or assisted vaginal birth and intrapartum epidural. Primary neonatal outcomes included pre-term birth, Apgar scores and transfer to neonatal intensive care with all outcomes being analysed on an intention to treat basis. The primary maternal outcomes: caesarean section, unassisted vaginal or assisted vaginal birth and intrapartum epidural did not differ between groups, however a significantly greater proportion of women in the standard care group had a caesarean before onset of labour (elective). Primary neonatal outcomes were no different between groups however, total cost of maternity care was significantly less (\$566.74 per woman) for women who were cared for by caseloading midwives, prompting the authors to conclude that it is not only a safe model of care but it is also cost-effective. Other interesting findings were the fact that 87% of the caseload group had their 'known' midwife or back-up midwife in labour compared to only 14% of the standard care group, they were more likely to labour spontaneously but also more likely to have labour augmented, less likely to have an induction of labour and pharmacological analgesia was used significantly less often. They also had shorter median postnatal hospital stays and their early discharge (within two days) rate was significantly higher.

A recent two-arm randomised control trial was included in the updated Cochrane Collaboration review (Sandall et al., 2013). It was a comparison of standard maternity care and caseload midwifery care conducted by McLachlan et al., and published in 2012. Within the study there are various definitions of continuity of midwifery care described with a caseloading midwife being defined as one who provided care during the pregnancy, birthing, postnatal experience, with support from 'back-up' midwives only when necessary. Their definition of a midwife providing standard care is one who shared care with Obstetric registrars, Obstetricians and GPs with no expectation that the woman will know her midwife when she presents in labour. The aim of this study was to determine if 'one to one' (caseload) midwifery care for low risk women decreases the caesarean section rate when compared to women receiving fragmented (standard) care. Women were randomised to caseload ( $n=1158$ ) and standard care ( $n=1158$ ) and their outcomes measured over a period of three years from 2007 to 2010. They concluded that caseloading by a primary midwife impacted positively on the caesarean section rate (19.4% versus 24.9%  $p=0.001$ ) in a low risk cohort who birthed in a setting where the caesarean section rate was comparatively

high. Parity was mentioned in demographic data with 70% ( $n=804$ ) primiparous women randomised to caseload midwifery and 69.7% ( $n=806$ ) to standard care. The statistically significant difference in the caesarean section rates was most obvious in this subgroup (28.6% versus 21.6%  $p<0.001$ ). There was a corresponding increase in the spontaneous vaginal birth rate and decreased rates of epidural analgesia and episiotomy. Their babies also had lower rates of admission to Neonatal Intensive Care Unit (NICU) and Special Care Nursery (SCN). This trial included women of all parity but excluded a number of women because of their high-risk status including history of a previous caesarean section.

All the studies reviewed thus far have compared two models of care, usually women of mixed parity and often of mixed risk. However, very recently (2014), Tracy et al., compared three models, after introducing a caseload model to one third of the women booking into a tertiary hospital. They already had private obstetric care and standard hospital care. After introduction of the third model of care, they undertook a cross sectional study comparing the cost, risk profile and clinical outcomes of caseload midwifery compared to the two existing models of care. They limited their sample group to ‘standard primiparas’<sup>4</sup> to control for case mix or differences in population and examined this cohort of 1,379 women over an eighteen month period from July 1<sup>st</sup> 2009 to December 31<sup>st</sup> 2010.

Low risk first time mothers cared for by caseloading midwives were significantly more likely to have an unassisted vaginal birth (58.5% compared to 48.2% for standard care and 30.8% for private obstetric care:  $p<0.001$ ). They were also significantly less likely to have caesarean section (1.6% less likely compared to 5.3% for standard care and 17.2% for private care:  $p<0.001$ ). Preceding this, they were also significantly more likely to have spontaneous onset of labour. From the financial perspective, the cost for the ‘standard primipara’ in the caseload model was \$1375.45 less than those in the private model and \$1590.91 less than those receiving standard care ( $p<0.001$ ). This difference in cost was reflected for all women in the study in favour of caseload care.

All the literature reviewed thus far, has examined comparative studies of different models of care in hospital locations or birth centres attached to tertiary centres. The following literature also illustrates that, not only continuity of midwifery care/carer has an impact on birthing outcomes, but also ‘place of birth’.

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<sup>4</sup> ‘Standard Primipara’:

See: ‘Selected primipara’ (p.3)

Australian Council on Healthcare Standards (ACHS).

## 2.4. Impact of place of birth

In the summary of a review by Hodnett et al., 2010 (which was updated in 2012), they conclude that institutional birth environments that normalise labour and birth should be taken into account in the planning phase of policy makers and consumers. The review by Hodnett et. al., which was published by the Cochrane Collaboration specifically, reviewed literature from all randomised or quasi-randomised control trials which investigated place of birth and the impact this had on birth outcomes for women. This included 11,795 women in 10 trials comparing alternative institutional settings and conventional institutional settings but did not include free-standing birth centres. The one common intervention aspect of the trials chosen was that labour care was provided in an environment that was totally dissimilar to a hospital room. They also found that there was increased continuity of caregiver when the alternative birth setting was staffed by designated midwifery staff.

They also found that those birthing in an alternative setting, compared to a conventional one, had more positive perceptions about their birthing experience, were more likely to have a spontaneous vaginal birth and have no analgesia/anaesthesia in labour (including epidural). They were also less likely to have an episiotomy or require oxytocin augmentation and were more likely to be breastfeeding at six to eight weeks postpartum. There were no adverse effects on postpartum haemorrhage, serious maternal or perinatal morbidity/mortality or other adverse neonatal outcomes.

Because there were many differences in the organisation of the various models of care, it was difficult to conclude that the birth environment design, alone, was responsible for improved outcomes. The confounding factor in the alternative settings that needs to be taken into consideration is that designated staff were allocated, providing a greater level of continuity of carer which in itself has been shown to improve birth outcomes and satisfaction. There was no subgroup analyses for women of different parities included in this review.

In a retrospective cohort study conducted in New Zealand, Davis et al., (2011) also found that alternative place of birth had positive implications for outcomes for low risk women and babies if they planned to birth at home or in a primary unit compared to a secondary or tertiary hospital in New Zealand. Midwives provided continuity of care for all ( $n=16,453$ ) these women so there was no confusion about model of care/carer and place of birth. Rather than the actual place of birth, outcomes were attributed to planned place of birth where the majority did actually birth. These outcomes included mode of birth, intrapartum

interventions and neonatal outcomes. They found that compared to primary birth units, there was a higher risk of caesarean section, intrapartum interventions, assisted birth and neonatal transfer to an intensive care unit if planned place of birth was a secondary or tertiary hospital. Women of all parity were included and results were adjusted for a number of confounders including parity.

Another large, nationwide cohort study was conducted in the Netherlands by de Jong, et al., (2014) comparing perinatal outcomes of 466,112 women who planned to birth at home, to perinatal outcomes of 276,958 women who planned to birth in hospital at the onset of labour over a period of 10 years. Both cohorts were low risk women who were being cared for by midwifery-led models of care. The low risk criteria employed was identical to that chosen for my study: women had no obstetric or medical risk factor and birthed a single baby between 37 and 42 weeks after spontaneous onset of labour. Similar to the analysis in my study, their outcomes were analysed by 'planned place of birth' rather than 'actual place of birth'.

The outcomes compared included: death in the intrapartum period; Apgar scores below 4 and below 7 at 5 minutes; admission to a neonatal intensive care unit (NICU) by 7 and 28 days after birth; neonatal death up to 28 days postpartum and neonatal death up to 7 days postpartum. Some outcomes were combined: death in the intrapartum period with neonatal death within 28 days and death in the intrapartum period or in the neonatal period with admission to a neonatal intensive care unit within 28 days (the latter being defined as "severe adverse perinatal outcomes"). In this low risk cohort of women they found no significant differences in the rates of "severe perinatal adverse outcomes", or deaths in the intrapartum period (or within 28 days of birth) between planned hospital births and planned home births. The following study examines maternal and perinatal outcomes.

The objective of a prospective cohort study by the Birthplace in England Collaborative Group (2011) was to compare clinical outcomes, including interventions in labour and maternal and perinatal outcomes, for low risk women by 'planned place of birth' rather than 'actual place of birth'. They emphasise that analysis by 'planned place of birth' rather than 'actual place of birth' is important in evaluating outcomes based on an intention to treat basis. The planned places of birth where labour care commenced included obstetric units, midwifery units attached to obstetric units, free-standing midwifery units and home. The sample size of 64,538 women who received care during labour by a National Health Services midwife, in their 'planned place of birth', exceeded their target of a minimum of

57,000 women. They were women of all parity, at term (>37 weeks gestation) with a singleton pregnancy who had birthed in the two years from April 2008-2010. Data was collected on 79,774 women, however, after employing the exclusion criteria 15,136 women were excluded because of risk factors. Women were excluded if they experienced a caesarean section before labour, had an elective caesarean, had an unplanned home birth, had received no antenatal care or had a fetal-death-in-utero prior to labour.

The Collaborative Group were surprised to find that even after employing the exclusion criteria almost 20% of the women who planned to birth in the obstetric unit had some documented complication at the commencement of labour. This led them to believe that there was variation in the profile of 'risk' among the different groups and led to discussion and modification of the analysis plan. The main outcome measure was a composite primary outcome of intrapartum related neonatal morbidities and perinatal mortality including: early neonatal death, stillbirth (after commencement of labour), neonatal encephalopathy, meconium aspiration syndrome, brachial plexus injury, or fractured clavicle or humerus.

There were many differences in characteristics among the groups of women with the home birth cohort more likely to be white, older, not linguistically diverse and living in a more socioeconomically advantaged area. The two groups who planned to birth in the free-standing birthing unit and the unit attached to the obstetric unit were different, with women planning to birth in the unit attached to the obstetric unit similar to those planning to birth in the obstetric unit. The other obvious difference was in parity. Twenty seven percent of the planned home birth women were first time mothers compared with 54% of the obstetric unit women, 50% of the women planning to birth in an attached birthing unit and 46% who planned to birth in a free-standing unit.

They found that the odds of the primary outcome were greater for primiparous women who planned to home birth but not for either of the other two sites. Conversely, the incidence of the primary outcome for multiparous women showed no significant difference in any setting.

The Collaborative Group found that intrapartum interventions were less common in births planned outside obstetric units and that adverse perinatal clinical outcomes were not common in any setting. However, they acknowledge that there is some evidence that there could be a higher risk of adverse neonatal outcomes for babies of nulliparous women planning a home birth but that all low risk women should be given a choice of 'place of

birth'. They found that the chances of having a normal vaginal birth (i.e. without any intervention) were greater (88%) for those women planning a home birth compared to 58% for those women planning to birth in an obstetric unit. It is interesting to note that the closer the women were to the obstetric unit, the less chance they had of a normal vaginal birth: 76% for those birthing in a unit attached to the obstetric unit increasing to 83% in a free standing unit. Breastfeeding rates (i.e. at least one breastfeed) were greater for those women planning to birth in a freestanding birth unit or at home. Other maternal outcomes including extensive perineal trauma, blood transfusion or transfer to a medical unit, were mostly lowest for those women planning to birth in freestanding midwifery units. They did find a significantly higher intrapartum transfer rate to an obstetric unit with 36-45% primiparous women being transferred compared to 9-13% multiparous women.

A systematic review of international literature by McIntyre was published by the Australian Health Review in 2012, examining the safety of midwifery-led models of care. This included three systematic reviews published by the Cochrane Collaboration and 22 national and international studies. The emphasis in the conclusion is on outcomes for low risk women and confirms the benefits and the safety of non-medically led maternity care, providing midwives are vigilant in recognising unforeseen complications and act promptly to transfer before the woman or her baby are compromised. She found that the intrapartum transfer rate for primiparous women was much higher than for multiparous women, confirmed by international studies cited in the review. The Canadian study by Hutton, Reitsma and Kaufman (2009) found primiparous women had higher rates of ambulance transfer from home to hospital. Also cited was a Swedish study by Gottvall, Grunewald and Waldenstrom (2004) who found that primiparous women were more likely to require intrapartum transfer due to fetal complications. A more recent United Kingdom (UK) study by Rogers, Pickersgill, Palmer and Broadbent (2010) found primiparous transfers were eight times higher than multiparas because of a growing demand for analgesia. This was confirmed in my study and will be discussed at length in the discussion chapter.

## **2.5.Summary**

The studies reviewed indicate that midwife-led continuity of care and Birth Centre care are associated with less intervention and better birth outcomes without compromising neonatal outcomes.

The majority of the studies reviewed included women of all parity with few offering a sub analysis of primiparous women (McLachlan et al., 2012; Birthplace in England

Collaborative Group 2011). The more recent study by Tracy et al., (2014) compared three models of care with a 'standard primipara' cohort. The purpose of my study is to compare clinical outcomes for two groups of similar women accessing two different maternity care models at The Canberra Hospital, but unlike the majority of the studies cited within the literature review this will only include low risk primiparous women.

Chapter 3 will discuss ethical considerations, the methodology and research design guiding the development of this study. It will also discuss the selection of participants and their inclusion/exclusion criteria, the method of data collection and the tools employed for data analysis.

### **3. Chapter 3 - Research Methods**

#### **3.1.Introduction**

This chapter presents the research methods used to achieve the study aim. The aim of the study was to describe and compare rates of obstetric intervention and clinical outcomes for a comparable group of low risk, primiparous women planning to give birth in the Birth Centre with the Canberra Midwifery Program and those receiving Standard Public Care and planning to give birth in Delivery Suite of The Canberra Hospital. The main outcome of interest was mode of birth.

In practice, not all primiparous women are able to labour and birth without intervention. Some will have pre-existing medical complexities which will preclude them from attempting a normal labour and birth. Some will develop obstetric complications during their pregnancies which will require referral to specialist clinics with medical support. In determining the selection criteria for this study, to ensure the two sample groups were as low risk and homogenous as possible, it was decided to exclude those with risk markers including women with pre-existing medical conditions and those who developed obstetric or medical complications. Consequently both sample groups comprise low risk women with uncomplicated pregnancies up to onset of labour.

#### **3.2.Research design**

A retrospective comparative cohort study design was implemented drawing on data from two databases. This is a well-developed research design having been used effectively and extensively in research (Fain, 2009), particularly in areas that may interest midwives and nurses (Healy & Devane, 2011). One of the main advantages in the choice of this design is that it meets the aims and objectives of this particular study: to compare rates of obstetric intervention and clinical outcomes of two very similar groups of primiparous women who accessed two very different maternity models of care at The Canberra Hospital (now the Centenary Hospital for Women and Children).

Findings from a cohort study provide information about risks of outcomes occurring because of the association between variables. (Healy & Devane, 2011). Another advantage acknowledged by Polit and Beck (2008) and by Clark (2008), is reduced cost. Because a follow-up period is unnecessary in a retrospective design, it is less costly and with rigorous

data collection (which was undertaken in this study), this method provides very accurate, easily interpretable data.

Whilst there are advantages to this study design there are also some limitations including the risk of selection bias and measurement bias. These limitations will be fully addressed in the discussion chapter of the thesis.

The rationale for choosing this select group of low risk women (which will be described in section 3.4) was guided by Cleary et al., (1996) who suggested that by maintaining a strict selection criterion for the sample to be assessed, it increases the validity of the comparison in an inter-unit environment.

### **3.3.Ethical considerations**

An application for a Low Risk Study was submitted to ACT Health Human Research Ethics Committee (ACTH-HREC). Approval was granted by the Ethics Committee (reference number: ETHLR.11.097). An application for twelve months extension was sought and granted and a further extension was granted to May 2015.

An important issue when accessing personal health records for research purposes is confidentiality. After accessing Birth Outcomes System (BOS) in order to define this select group of women, all data was transferred to a spread sheet which was saved on a password protected ACT Health computer. Sample participants were de-identified on spread-sheets and analysis programs and confidentiality of data has been and continues to be maintained at all times.

One of the initial variables of interest was the postnatal Edinburgh Depression Score which was recorded in Maternal and Child Health (MACH) files in the community. Further ethical approval was unnecessary for access to MACH clinical records because the Women's & Babies Maternity Unit at The Canberra Hospital and MACH both sit within the same governance structure of the Division of Women Youth & Children within The Canberra Hospital and Health Services. Access to these clinical records entailed liaising with the manager of MACH.

### 3.4. Sample

The sample included low risk primiparous women who gave birth at The Canberra Hospital between January 1<sup>st</sup> 2010 and December 31<sup>st</sup> 2011. For the purposes of this study a low risk, primiparous woman was defined as one whom:

- was giving birth for the first time;
- had a singleton pregnancy;
- had a fetus with a cephalic presentation;
- had a gestation of >37 weeks;
- was not planning an elective caesarean section;
- had no pre-existing medical conditions (including substance use and morbid obesity);
- had no emerging medical conditions;
- had no emerging obstetric complications; and
- was not transferred into either model of care > 30 weeks.

It was decided to exclude women with a BMI equal to or greater than 40 (the World Health Organisation [WHO] defines these women as 'morbidly obese') but include women with a BMI between 35 and 39.9 providing they had no other risk factors. According to the Centre for Maternal and Child Enquiries (CMACE)/Royal College of Obstetricians and Gynaecologists (RCOG) Guidelines, these women do not require induction of labour, but benefit from a spontaneous onset of labour. Neither do they require continuous electronic fetal monitoring in labour (The Royal Australian and New Zealand College of Obstetricians and Gynaecologists [RANZCOG]), unless they have other risk factors or there is an identified problem with intermittent auscultation.

There were no maternal age or end-gestation limitations included in these criteria. The birth centre did not (in the study period) place age restrictions on women accepted into the program and all women in both models of care are governed by the Standard Operating Procedure (SOP) that recommends induction of labour by 41+3 weeks gestation.

Because CMP provides care to a low risk group of women, adherence to the inclusion criteria for both cohorts needed to be rigorous, ensuring both sample groups were as homogenous as possible. Women with pre-existing medical conditions were not accepted into the CMP, consequently those with pre-existing medical conditions were precluded from the standard care group to further increase homogeneity. Those who developed

obstetric complications that would preclude their ongoing care by CMP midwives were also excluded from both cohorts. During the study period, CMP midwives were able to continue care for women who developed gestational diabetes (unless they became insulin dependent) and gestational hypertension but to ensure it was categorically a low risk cohort, these women were also excluded. Other exclusions included women who were booked for elective caesarean sections, women who used substances in pregnancy (those on opiate replacement), and those who transferred to either model of care after thirty weeks gestation. The rationale for the latter exclusion is to ensure that there was compliance with the model of care experienced. “Continuity of care” is a defining feature of the CMP model and the philosophy of this model of care is to promote a partnership relationship between woman and midwife. Engagement after thirty weeks gestation potentially negates the formation of the partnership that is integral to continuity and this may subsequently impact on clinical outcomes. Therefore, the decision was made to exclude these women from both cohorts.

Due to the inclusion and exclusion criteria, there were no cross-overs in the study. All women who formed part of the CMP cohort remained in this group and no women transferred to the standard care group after thirty weeks gestation

### **3.5. Models of care**

#### **3.5.1. *Canberra Midwifery Program (CMP)***

The Canberra Midwifery Program is based in the Birth Centre at The Canberra Hospital. During the prescribed period, CMP midwives in the Birth Centre either carried a caseload or practised team midwifery, providing holistic care from first antenatal visit through to labour, birth and postnatally for up to two weeks. These midwives practised across the antenatal, intrapartum and postnatal spectrum of midwifery care.

In 2010 there were four teams of midwives within the Canberra Midwifery Program: three teams of four/five midwives (North, South and Central Teams) who worked as primary midwives (caseloading) and one team of four midwives who worked in a small group practice in the Tuggeranong team, sharing the women allocated to the team. Both caseloading and team midwives cared for women who lived within a geographical area defined by the midwives’ place of residence. CMP midwives provide continuity of both care and carer by accompanying women wherever they birth: The Canberra Hospital Birth Centre, Delivery Suite or Operating Rooms, or Calvary Hospital Birth Suite or Theatres.

The Canberra Hospital Obstetric and Neonatal Registrars and Consultants provide medical support. It is rare for women to birth at Calvary but in certain unusual circumstances they are able to, with Calvary Hospital medical staff providing support. Whilst most women cared for by CMP plan to labour and birth in the Birth Centre, there may be some circumstances where women need to be in Delivery Suite. If this occurs or if they are transferred to operating theatres for a caesarean section, the CMP midwife will continue their care.

The first visit with a CMP midwife is at 14-16 weeks and is usually completed at home. Subsequent antenatal visits are with midwives, occasionally in the Birth Centre, but more often at local outreach clinics. The 40-week visit may also be done at home and there are opportunities to meet the other midwives at some of these visits. The postnatal stay in the Birth Centre is for up to 24 hours but if transfer to the postnatal ward is medically necessary, the CMP midwife will visit daily. If transferred home within 24 hours, the CMP midwife provides postnatal support for between 7 and 14 days. She also provides this support for women transferred home from the postnatal ward. After discharge from the CMP, women and their families are referred to the community Maternal and Child Health Nurses and/or General Practitioner (GP) for ongoing postnatal support.

### ***3.5.2. Standard public maternity care***

Women choosing standard public maternity care at The Canberra Hospital have a number of pregnancy care options available besides the CMP. Those with uncomplicated pregnancies may choose to share their pregnancy care between their General Practitioner (GP) and the Antenatal Clinic or be seen by a midwife for all pregnancy care.

The first visit is always with a Canberra Hospital midwife, optimally at 14-16 weeks. However, due to workforce restrictions this is not always possible and they may not be seen until after their twenty week morphology scan. Some women need to have full pregnancy care through The Canberra Hospital's Antenatal Clinic with collaboration between a midwife and medical staff. Medical support is provided by Obstetric and Neonatal Registrars and Consultants. The Fetal Medicine Unit (FMU) offers care to women with a 'high risk' pregnancy for fetal and/or maternal reasons and is supported by a midwife who provides antenatal care but not intrapartum support. There is however, limited postnatal support and counselling by the FMU midwife tailored to the woman's specific needs and the outcome of her pregnancy.

'Midwife only' pregnancy care is available in the hospital Antenatal Clinic, and in several community locations. These clinics aim to provide increased continuity of pregnancy care and are sometimes staffed by midwives who also work a roster system in Delivery Suite, but there is no guarantee of continuity. Alternatively, the woman will see a different midwife at each antenatal visit and again, not know her ongoing carers. The midwives these women meet in the antenatal period may not be practising across the whole spectrum of childbirth but, in some cases, may be specialising in antenatal care. Some midwives work across two areas, Antenatal Clinics and Delivery Suite but do not provide postnatal follow-up. Following birth, well women may go home after six hours from Delivery Suite, or may be admitted to the postnatal ward for up to three days if unwell, then transferred home to be cared for by Midcall midwives.

### **3.5.3. *Midcall***

Midcall is an early discharge midwifery program which commenced in 1989 (Hambly, 1997) and encourages women to go home within 24 hours of birth. The Midcall midwife provides postnatal care, feeding and parenting support and education in the home setting but he/she is not previously known to the woman. Again, unlike the CMP midwives, they may not be practising across the whole spectrum of childbirth but, in some cases, may be specialising in postnatal care. On discharge from Midcall, women and their families are referred to ACT Health's community Maternal and Child Health Nurses for ongoing postnatal support.

### **3.5.4. *Conceptual definitions***

The following definitions are included to encourage a better understanding of different aspects of antenatal, birth and postnatal care within the different models of midwifery care at The Canberra Hospital.

### **3.5.5. *Place of birth***

Place of birth refers to the 'planned place of birth' (documented in the woman's maternity clinical record and entered into Birth Outcomes System [BOS]) rather than the 'actual place of birth'. Women in the care of CMP plan to birth in the Birth Centre but for a variety of reasons which will be detailed later, may be transferred to Delivery Suite and either birth there or in Operating Theatres.

### **3.5.6. Primary midwife**

Primary midwife refers to the CMP midwife who did the booking visit as recorded in BOS and the woman's maternity clinical record.

### **3.5.7. Caseloading midwife**

A caseloading midwife is a midwife who is in one of three teams of four/five midwives (North, South and Central Teams) who worked as primary midwives providing 'one on one' care with an associate midwife to support only when necessary.

### **3.5.8. Team midwife**

A Team midwife is one of a team of four midwives who worked in a small group practice in the Tuggeranong (South) team, sharing the women allocated to the team.

### **3.5.9. Known midwife**

Unlike a qualitative study where the woman may decide for herself if her midwife is 'known', this is a quantitative study with no direct contact with the woman by the researcher. For the purposes of this study, the 'known' midwife in labour will be defined as a midwife the woman has met in the antenatal period as documented in the woman's clinical record and entered on the BOS data base by the attending midwife.

### **3.5.10. Unknown midwife**

An 'Unknown' midwife will be defined as a midwife the woman has not met in the antenatal period as documented in the woman's clinical record and entered on the BOS data base by the attending midwives.

## **3.6.Databases**

### **3.6.1. Birth Outcomes System (BOS)**

Birth Outcomes System v6 (BOS) is a Clinical Information Management System designed to capture obstetric information and medical and obstetric history. This includes information from the antenatal and intrapartum periods and birth and neonatal data, to provide a complete pregnancy episode in the data base. The database does not include data from the postnatal period. It is the latest version created by the Management Consultants and Technology Services (MCATS) development team in conjunction with the BOS User Group. BOSv6 has been developed using current Microsoft tools and uses

standard Microsoft Office features. It was introduced at The Canberra Hospital in 2007 and updated in 2012.

Birth Outcomes System interfaces with various Patient Registration systems including the patient booking system: ACT Patient Administration System (ACTPAS) and records a comprehensive set of data to satisfy clinical documentation needs, clinical indicator and obstetric audit. However, BOS's greatest limitation at The Canberra Hospital is the number of 'users' who have access for data entry. The use of existing databases brings its own limitations. For example the researcher is limited to the data available and in the case of this research, data was not reliably collected on socioeconomic status, educational level, marital status or ethnicity of the women. These are important variables that may impact on the dependent variable under consideration.

Birth Outcomes System includes the following functional areas:

- Booking, Antenatal and Risk Assessment
- Antenatal Events
- Birthing Process
- Birth Registration
- Baby Details
- Special Care Nursery
- Postnatal, Discharge and Follow-up
- Periodic and Per-Birth Reporting
- Clinical Indicator Reporting
- Statutory Reporting
- Adhoc Reporting

Birth Outcomes System provides many standard and statutory reports: the clinical reports (per birth) are generated as a standard MS Word document and periodic reports are generated as a standard MS Excel spreadsheet. Reports are generated from a pre-formatted template and these may be copied and changed on a site specific basis as required.

Reports can be output to:

- Any windows/local/networked printer
- A fax server
- Saved to a file
- As an email attachment

Computerised output from BOSv6 replaces manual documentation and has been approved by all receiving agencies. The midwife providing the episode of care, whether that be face-to-face or a telephone enquiry, is responsible for data entry into the system, commencing at the initial antenatal visit when the woman is booking into The Canberra Hospital for care. Accuracy is checked by printing Batch error reports. These errors are then corrected either by the user or BOS administrator.

### **3.6.2. *Clinical Records Information System (CRIS)***

Clinical Records Information System (CRIS) is not an electronic patient record but rather, a computerised patient record which replaced the Patient Record System (PRS) in 2003. Paper records are converted to a digital format using scanning technology which allows records to be scanned in full colour. Patient Record System (PRS) was operational since 1994 and also scanned documents but it was a less robust system and only scanned in black and white. Once scanned, the record is permanently retained in CRIS and can be accessed by staff members who attend a training session and are issued with CRIS User ID and password. These authorised users may access CRIS at any geographic location which has a secure connection to The Canberra Hospital's network. In order to protect the integrity of the original record, so that it cannot be altered in any way, the document cannot be released or be made accessible to staff after scanning. Deletion of documents can only be undertaken by authorised medical record department staff with an appropriate security clearance. Paper and electronic sources (e.g. diagnostic results) are able to be integrated in one system by transferring the documentation from electronic sources via electronic interfaces (Spyropolous, n.d.).

### **3.6.3. *Maternal and Child Health (MACH) clinical records***

Because the postnatal Edinburgh Depression Score (EDS) wasn't offered to women until their six week postnatal check, it was always understood that the recorded result would have to be accessed manually in the various (MACH) community clinics. Maternal and Child Health (MACH) services are divided into North and South by Lake Burley Griffin with eight clinics on the North side of Canberra and six on the South side. Collection of these scores entailed accessing the ACT Patient Administration System (ACTPAS) which records appointments at community clinics, determining whether the women had accessed MACH, which clinic they had attended, whether they had had an EDS and at what postnatal date. The ACTPAS search involved using the baby's surname, followed by a search of paper records which were filed at individual clinics. This had to be planned in

advance and the information collected when the clinics were unoccupied as the filing cabinets are located in the clinic rooms.

### **3.7.Clinical Outcomes**

The outcomes of interest in this study included all labour and birth interventions and outcomes that were collected reliably within the two databases. The primary outcome of interest was spontaneous vaginal birth. While a normal vaginal birth includes any vaginal birth that is not assisted by forceps or vacuum, a spontaneous vaginal birth takes into consideration additional factors including obstetric intervention. 'Spontaneous vaginal birth' (for the purposes of this study) excludes women who underwent ANY of the following:

- Augmentation (with either artificial rupture of membranes [ARM] or oxytocic)
- Epidural anaesthesia
- Episiotomy
- Induction of labour (with prostaglandins, oxytocics or ARM)
- Assisted birth (forceps or vacuum)

(Source: NSW Health – Towards Normal Birth policy.)

The secondary outcomes of interest were;

- Mode of birth
- Onset of labour
- Augmentation of labour
- Analgesia and epidural use
- Postpartum haemorrhage (PPH)
- Perineal status
- Apgar score < 7 at 5 minutes
- Stillbirth/neonatal death
- Admission to Nursery
- Breastfeeding within an hour of birth
- Length of postnatal hospital stay

During data collection process it was found that a number of variables were not recorded reliably or would not provide the information required for this study. Similar methodological challenges were acknowledged in a study by Flood and Small in 2007 when they did a retrospective review of labour and birth records in 32 hospitals, principally in Victoria Australia. They also found that a number of variables were not reliably recorded

but acknowledged that if the individual collecting data was aware of the challenges, the probability of obtaining reliable data is increased. This awareness certainly influenced the reliability of data collection in this study.

I had originally planned to use postcodes as a proxy for socioeconomic status since no other data collected within BOS or CRIS related to this important variable. However, as stated in the introduction, ACT is unique in many ways and the distribution of public (government built) housing within Canberra is another example of this uniqueness. Canberra's housing was entirely government-built in the early years for public servants coming to the national capital, not for the lower socio-economic group it later housed. It was not until 1972 that the number of privately built dwellings surpassed the number built by the government (Wright, 2000). As the city grew and private development increased, public housing, both single dwellings and multi-storey buildings, continued to be interspersed among private housing in most suburbs. There are still a number of government houses in almost every new suburb, therefore the postcode is not an indication of a specific socio-economic group.

One variable that was not recorded reliably was 'number of antenatal consultations'. In the standard care group, a large number of women were sharing care with the Antenatal Clinic midwives and their General Practitioners (GPs) who did not have access to BOS. The only complete antenatal record is their maternity card but, if not available, or (as often happened), GPs didn't document an antenatal visit, there was no record in either BOS or CRIS. This made it impossible to compare number of antenatal visits with the CMP group where primary midwives were reliably recording each visit and entering the data into BOS. The other planned variable that was not recorded reliably was 'number and type of health professionals seen'. Because data entry was sub-optimal it was evident that it was impossible to reliably report on this variable. The planned variable list was therefore amended and the amended list is provided in Table 2 below.

### **3.8.Data collection process**

Antenatal, birth and immediate postnatal data for both the standard care and CMP samples were accessible on site at The Canberra Hospital. Data was accessed from the BOS clinical database and as a cross-reference; the medical records of both cohorts from CRIS. The postnatal EDS had to be accessed at community MACH clinics.

The first step in the data collection process was to access BOS database to identify those women meeting the inclusion criteria described in section 3.4. A report was generated that

included the woman's unit record number (URNs) and selected variables of interest. Clinical outcome data were extracted from BOS and cross-checked with the CRIS database. The following fields were reliably entered into BOS and were readily available for extraction:

**Table 2- Clinical data reliably recorded in BOS**

Maternal age	Augmentation of labour
BMI	Analgesia
Mode of birth	Apgar score < 7 at 5 minutes
Gestational age of baby	Admission to NICU/SCN
Onset of labour	Stillbirth/neonatal death

Table 3 illustrates some of those fields neglected in BOS that were well reported in CRIS.

**Table 3- Reliable clinical data scanned to CRIS**

Smoking status @ booking	Breastfeeding within an hour of birth
Antenatal EDS	Postpartum haemorrhage (PPH)
Perineal status	Length of postnatal hospital stay

Ethnicity was a non-mandatory field included in BOS and unfortunately this was not recorded reliably by staff attending booking-in antenatal visits. One of the original variables of interest (Postnatal EDS) was not recorded in either CRIS or BOS but could only be accessed in community clinics. The primary clinical outcome of interest was mode of birth (spontaneous vaginal, vaginal, assisted vaginal, operative) and the secondary outcomes were: antenatal EDS, augmentation of labour, induction of labour, intrapartum analgesia, postpartum haemorrhage, perineal status, 5 minute Apgar score <7, neonatal admission to the Neonatal Intensive Care Unit (NICU), stillbirth/neonatal death, length of hospital stay, breastfeeding within an hour of birth and postnatal EDS.

One of the original objectives of this retrospective study was to determine whether there was a lower incidence in antenatal and postnatal depression rates in those primiparous women who had continuity of midwifery care/carer compared to those who received standard public maternity care at this site. To determine this I utilised the Edinburgh Depression Score, an assessment tool to screen for postnatal depression which was validated by Cox, Holden and Sagovsky in 1987. Whilst the antenatal EDS was recorded more reliably in CRIS, there was poor compliance with the postnatal EDS with only 48% women in the

CMP group and 38% in the standard care group having it recorded in their clinical records in the community.

Whilst the compliance with this variable was disappointing, the reasons for non-compliance were not always documented. It became obvious that women who resided in New South Wales (NSW) (12%) did not access ACT Maternal and Child Health (MACH) services and there also appeared to be a correlation between non-Caucasian surnames and lack of data. In some instances, it was documented that the women had declined or were accessing their GP for their six week postnatal visit but often, no reason was documented. Data collection proved to be labour intensive and time consuming, because community midwives/nurses do not have access to databases utilised by midwives and medical staff within the hospital.

Both antenatal and postnatal EDSs were later removed as variables for analysis. Table 4 illustrates the final variable list.

**Table 4 - Variable list**

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Maternal age	Analgesia
Body Mass Index (BMI)	Perineal status
Smoking status @ booking	Postpartum Haemorrhage (PPH)
Onset of labour	Apgar score < 7 at 5 minutes
Gestational age of baby	Stillbirth/neonatal death
Augmentation of labour	Admission to Nursery
Mode of birth	Breastfeeding within an hour of birth
Epidural	Length of postnatal hospital stay

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### **3.9.Data accuracy**

In order to avoid measurement bias, the data collection method chosen must endeavour to mitigate this bias by being as thorough, objective and consistent as possible (Healy & Devane, 2011). Both databases accessed for this study have been in operation for some time, BOS since 2007 and Clinical Record Information System (CRIS) since 2003 when it replaced the Patient Record System (PRS), which had been operational since 1994.

In order to access medical records, a request for research and record access was submitted with an application for ethics approval. Both were granted by the Ethics Committee in May 2011. Collaboration with staff in the medical records department allowed identified Unit Record Numbers (URNs) to be placed in folders to facilitate access to clinical records. These records were then stored on a password-protected ACT Health computer.

During data collection, when BOS was found to be less than reliable, cross-checking with CRIS minimised the risk of error and increased the validity and reliability of data for this cohort study. Cox et al., (2009) state that the gold standard for outcome measures is the medical record or, alternatively, patient self-report. CRIS was an invaluable data source because of the initial reliability issues with BOS.

### **3.10. Data collection**

The records of all low risk primiparous women birthing between January 1<sup>st</sup> 2010 and December 31<sup>st</sup> 2011 were extracted from BOS data base. Women were excluded if they had any pre-existing medical condition including essential hypertension, renal, liver and cardiac diseases, osteogenesis imperfecta, Turner's syndrome, thrombophilia, type 1 diabetes mellitus, cerebral tumour, schizophrenia and epilepsy. Women with emerging obstetric or medical complications in both cohorts were also excluded. These included gestational diabetes, gestational hypertension, breech presentations, multiple pregnancy, development of antibodies, placenta praevia, pre-eclampsia, intra-uterine growth restriction (IUGR) and fetal abnormality. Women may have had more than one co-morbidity but were excluded on the first premise. The final participant sample included 1646 low risk primiparous women of any age who had a singleton pregnancy with cephalic presentation who birthed after 37 weeks gestation.

### **3.11. Data analysis**

Data were de-identified before being entered into a spread sheet and transferred into a statistical software package, Statistical Program for the Social Sciences (SPSS version number 21) for the purposes of analysis. Analysis was performed on an "intention to treat" basis (i.e. by planned place of birth rather than actual place of birth). Women's model of care is documented in the woman's maternity clinical record and entered into Birth Outcomes System (BOS) at booking visit. If there was cross-over from standard care to CMP before thirty weeks gestation this change was documented and women's data were analysed according to the new model of care. Categorical data were analysed using the chi-squared statistic and Fisher's exact test. Continuous data were analysed using Student's *t*-test. All tests were two-tailed and significance was set at  $p < 0.05$ . Comparisons are presented using unadjusted and adjusted odds ratios, with 95% confidence intervals (CIs) and *p*-values with significance set at 0.05. This study drew on a convenience sample therefore no sample size calculations were performed.

Logistic regression modelling was undertaken to examine the relationship between model of care and maternity outcomes. Factors known to confound maternity outcomes (including age, BMI and smoking) were added as covariates in the model to control for their effects. I did not control for labour interventions such as induction or augmentation of labour as this is part of the cascade of interventions that may ultimately impact on mode of birth.

### **3.12. Summary**

This study is a retrospective, non-experimental research design. There are limitations which are mentioned in the research design section (3.2) acknowledging that it is a weaker method than a Randomised Control Trial or a prospective study. However inclusion and exclusion criteria and rigorous data collection methods were employed to improve the reliability of the study.

Chapter 0 will present the results of data analysis after collection and transfer to SPSS. Firstly demographic data will be presented, then primary outcomes and secondary outcomes analysis followed by incidental findings of interest.

## 4. Chapter 4 - Results

### 4.1. Introduction

In this chapter, results of analysis of clinical outcomes comparing primiparous women in the care of CMP who fit the inclusion criteria for 2010 and 2011, to the standard care group, will be presented. Initially, comparative data is presented: proportions, percentages, and results of significance testing (student's *t*-test for continuous data and chi square for categorical data where appropriate).

There were 5,542 births at The Canberra Hospital in the two calendar years 2010 and 2011. Almost 45% of those were primiparous births ( $n=2,479$ ) with 1,983 receiving standard care and birthing in Delivery Suite and 496 being cared for by CMP midwives and planning to birth in the Birth Centre. The previously described exclusion criteria was employed which resulted in a total final sample number of 1646, comprising 1220 women receiving standard care who planned to birth in Delivery Suite and 426 women who planned to birth in the Birth Centre in the care of CMP midwives. Please see Figure 1 for a flow diagram illustrating this process.

**Figure 1: Flow diagram of sample selection**

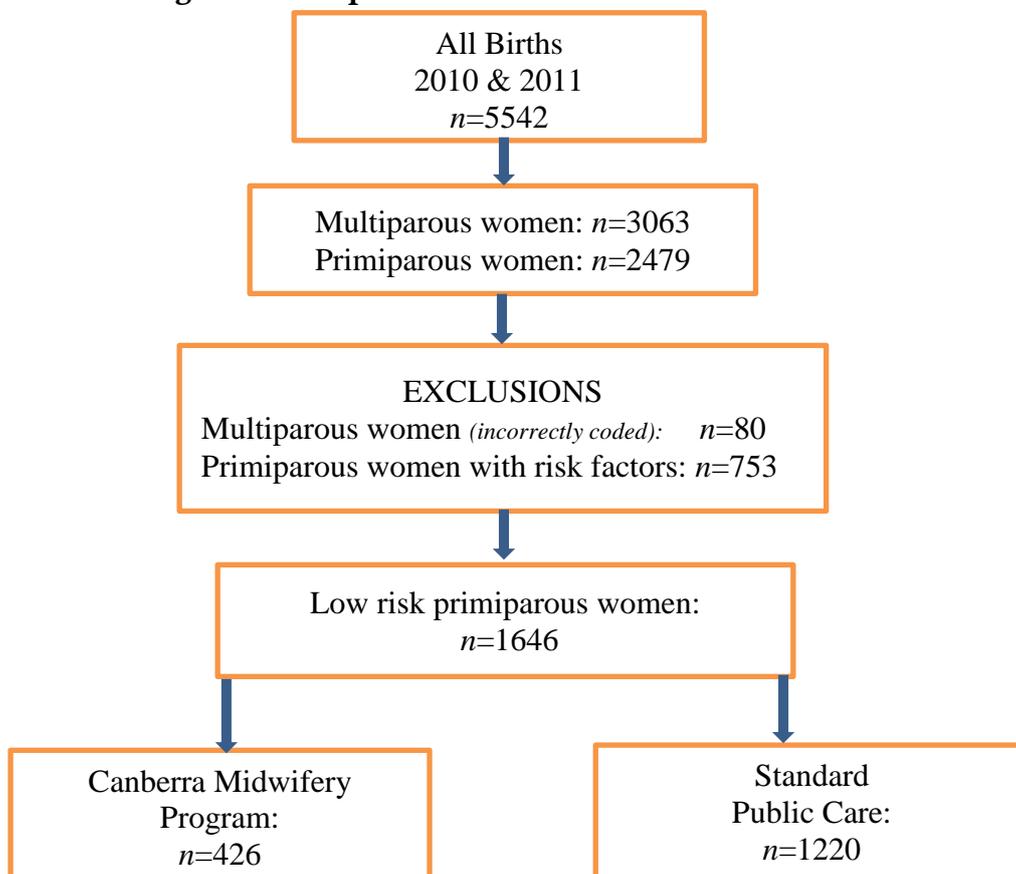


Table 5 presents the baseline maternal characteristics of each group. The mean age of women in the care of CMP is statistically significantly higher than that of the women receiving standard care. The smoking rate is significantly higher in the latter group.

**Table 5 - Baseline maternal characteristics by model of care**

<i>Characteristics</i>	<b>Standard Care</b>		<b>CMP</b>		<i>p value</i>
	<i>n</i> =1220	Range	<i>n</i> =426	Range	
	Number %		Number %		
Mean age (years)	27.99	15 - 49	30.11	18 - 42	<b>0.001</b>
Mean BMI	23.15	10 - 39	23.00	15 - 39	0.651
Mean booking gestation	15.30		15.52		0.458
Smoking	151 (12.4)		6 (1.4)		<b>0.001</b>

#### **4.2.Comparing outcomes**

The primary outcome variable was mode of birth. Table 6 shows a statistically significant difference between sample groups in normal vaginal births (i.e. unassisted) including water births and a significant difference in sub-group analysis of spontaneous vaginal birth: 38.0% (*n*=162) women who were cared for by CMP had spontaneous vaginal births compared to 22.4% (*n*=273) women who received standard care (*p*=0.001).

The proportion of women having a caesarean section in the CMP and Standard Care cohorts is not statistically significant (22.5% for the women receiving standard care versus 18.8% for women cared for by CMP: *p*=0.115). However, after adjusting for smoking, maternal age and BMI in regression analysis the odds ratio was statistically significantly different. This latter result is presented in Table 7.

The difference in assisted vaginal births was significant (*p*=0.050) with 23.5% (*n*=100) women cared for by CMP compared to 28.5% (*n*=348) women receiving standard care having an assisted vaginal birth. Again, after adjusting for smoking, maternal age and BMI in regression analysis the odds ratio was significantly different.

**Table 6 - Mode of birth**

<i>Mode of birth</i>	<b>Standard care</b> <i>n</i> =1220 Number (%)	<b>CMP</b> <i>n</i> = 426 Number (%)	<i>p value</i>
Normal vaginal births (*including water birth)	597 (48.9)	246 (57.7)	<b>0.003</b>
Water births*	12 (1.0)	47 (11.0)	<b>0.001</b>
Assisted vaginal births	348 (28.5)	100 (23.5)	<b>0.050</b>
Caesarean section	275 (22.5)	80 (18.8)	<i>0.115</i>
Spontaneous vaginal birth	273 (22.4)	162 (38.0)	<b>0.001</b>

Table 7 presents the odds ratios of primary outcomes including the crude and odds ratios (adjusting for smoking, maternal age and BMI). Women in the care of CMP and planning to give birth in the Birth Centre had a statistically significant increased chance of normal vaginal birth, spontaneous vaginal birth and water birth and less risk of an assisted vaginal birth and caesarean section than their counterparts receiving standard care and planning to give birth in the Delivery Suite.

**Table 7 - Regression analysis of primary outcomes**

Primary outcomes	Numbers (%)	Crude OR (95% CI)	p value	*Adj OR (95% CI)	p value
Normal vaginal births (including water births)					
Standard care	597 (48.9)	(Ref)			
CMP	246 (57.7)	1.42 (1.14-1.78)	<b>0.002</b>	1.66 (1.31-2.09)	<b>&lt;0.001</b>
Water births					
Standard care	12 (1.0)	(Ref)			
CMP	47 (11.0)	12.50 (6.55-23.78)	<b>&lt;0.001</b>	12.79 (6.57-24.88)	<b>&lt;0.001</b>
Assisted vaginal births					
Standard care	348 (28.5)	(Ref)			
CMP	100 (23.5)	0.77 (0.59-0.99)	0.050	0.73 (0.56-0.94)	<b>0.017</b>
Caesarean sections					
Standard care	275 (22.5)	(Ref)			
CMP	80 (18.8)	0.79 (0.60-1.05)	0.115	0.70 (0.53-0.93)	<b>0.015</b>
Spontaneous vaginal births					
Standard care	273 (22.4)	(Ref)			
CMP	162 (38.0)	2.13 (1.68-2.70)	<b>&lt;0.001</b>	2.37 (1.85-3.05)	<b>&lt;0.001</b>

\*Adjusted for smoking, maternal age and BMI

Table 8 demonstrates a significant difference in the rates of induction of labour with 28.2% ( $n=344$ ) of the women receiving standard care undergoing induction of labour compared with 19.5% ( $n=83$ ) of the women receiving care from CMP ( $p=0.001$ ). Within the latter group who planned to birth in the Birth Centre, 16.86% ( $n=14$  of 83) women who were induced were 42 weeks or greater, whereas only 6.10% ( $n=21$  of 344) of the women receiving standard care who planned to birth in Delivery Suite were induced for postdate gestations greater than 42 weeks. There was also a significant difference in epidural anaesthesia rates. Almost 52% ( $n=628$ ) of the women receiving standard care had epidurals compared to 39.2% ( $n=167$ ) of women in the care of CMP.

The differences in the other secondary outcomes were on the whole, unremarkable. Thirty percent ( $n=130$ ) of the women in the care of CMP and a similar percentage: 31.6% ( $n=386$ ) of the women receiving standard care had their labours augmented ( $p=0.716$ ) with both groups having very similar episiotomy rates (12.2% versus 13.6%).

**Table 8 - Interventions**

<i>Interventions</i>	<b>Standard Care</b>	<b>CMP</b>	<i>p value</i>
	<i>n</i> = 1220 Number (%)	<i>n</i> = 426 Number (%)	
Augmentation	386 (31.6)	130 (30.5)	0.716
Induction of labour	344 (28.2)	83 (19.5)	<b>0.001</b>
Episiotomy	166 (13.6)	52 (12.2)	0.507
Epidural	628 (51.5)	167 (39.2)	<b>0.001</b>

Table 9 shows analysis of obstetric interventions providing the crude odds ratio and odds ratio after adjusting for smoking, maternal age and BMI. These include augmentation and induction of labour, episiotomy and epidural anaesthesia. There was little difference in rates of augmentation of labour and whilst there were fewer episiotomies for the women in the care of CMP, it did not reach statistical significance. However these women had statistically significant reduced risk of induction of labour and epidural anaesthesia than their counterparts receiving standard care.

**Table 9 - Regression analysis of obstetric interventions**

Interventions	Numbers (%)	Crude OR (95% CI)	p value	*Adj OR (95% CI)	p value
Augmentation of labour					
Standard care	386 (31.6)	(Ref)			
CMP	130 (30.5)	0.95 (0.75-1.20)	0.667	0.99 (0.78-1.27)	0.985
Induction of labour					
Standard care	344 (28.2)	(Ref)			
CMP	83 (19.5)	0.62 (0.47-0.81)	<b>&lt;0.001</b>	0.56 (0.42-0.73)	<b>&lt;0.001</b>
Episiotomy					
Standard care	166 (13.6)	(Ref)			
CMP	52 (12.2)	0.88 (0.63-1.23)	0.463	0.85 (0.60-1.19)	0.347
Epidural					
Standard care	628 (51.5)	(Ref)			
CMP	167 (39.2)	0.61 (0.49-0.76)	<b>&lt;0.001</b>	0.59 (0.47-0.75)	<b>&lt;0.001</b>

\*Adjusted for smoking, maternal age and BMI

As indicated in Table 8, the episiotomy rate was very similar. Table 10 illustrates the similarity in outcomes for other perineal trauma associated with vaginal birth including first and second degree tears and severe perineal trauma which includes third and fourth degree tears and episiotomies which extend to third and fourth degree tears. There was however, a significant difference in the number of women with an intact perineum following vaginal birth. The women receiving standard care had a higher 'intact perineum' rate: 33.9% ( $n=413$ ) compared to the women in the care of CMP: 27% ( $n=115$ ;  $p=0.010$ ). This was statistically significant in regression analysis after adjusting for confounders with an odds ratio of 0.75.

**Table 10 - Perineal status following vaginal birth**

<i>Perineal Status</i>	<b>Standard care</b>	<b>CMP</b>	<i>p value</i>
	<i>n</i> = 1220 Number (%)	<i>n</i> = 426 Number (%)	
Intact perineum	413 (33.9)	115 (27.0)	<b>0.010</b>
1 <sup>st</sup> degree tear	8 (6.6)	37 (8.7)	0.158
2 <sup>nd</sup> degree tear	401 (32.9)	154 (36.2)	0.234
Severe perineal trauma*	87 (7.1)	40 (9.4)	0.140

\*'Severe perineal trauma' includes 3<sup>rd</sup> and 4<sup>th</sup> degree tears and episiotomies that extended to 3<sup>rd</sup> and 4<sup>th</sup> degree tears.

Table 11 indicates a difference in intrapartum analgesic use between the two cohorts with almost 40% of women in the care of CMP (*n*=170) having no analgesia at all compared to 14.6% of the women receiving standard care (*n*=178). The use of nitrous oxide 'only' is very similar but there is a statistically significant difference in narcotic use. The statistically significant difference in epidural rates is not shown in this table but is included in 'interventions' in Table 8: CMP: 39.2% vs. standard care 51.5%.

**Table 11 - Analgesic use**

<i>Analgesia</i>	<b>Standard care</b>	<b>CMP</b>	<i>p value</i>
	<i>n</i> =1220 Number (%)	<i>n</i> =426 Number (%)	
No analgesia	178 (14.6)	170 (39.9)	<b>&lt;0.001</b>
Nitrous oxide only	210 (17.2)	70 (16.4)	0.765
Narcotic	429 (35.2)	45 (10.6)	<b>&lt;0.001</b>

There were no statistically significant differences in total rates of postpartum haemorrhage (PPH) with women receiving standard care having a rate of 23.7% (*n*=289) compared to a rate of 21.6% (*n*=92) for women in the care of CMP. For further analysis, they were subset into blood loss volume: 500-1000 millilitres and blood loss greater than 1000 millilitres. Again, results were very similar. Women receiving standard care had a slightly higher rate of lower volume 500-1000 millilitres PPHs (16.6% versus 14.8%) but it was not statistically significant. Greater volume PPHs (>1000 millilitres) were very similar in both cohorts: 7.1% for standard care women compared to 6.8% for CMP women.

**Table 12 - Postpartum haemorrhage (PPH)**

	<b>Standard care</b>	<b>CMP</b>	
<i>Postpartum Haemorrhage</i>	<i>n=1220</i>	<i>n=426</i>	<i>p value</i>
	Number (%)	Number (%)	
500-1000 mls	202 (16.6)	63 (14.8)	0.444
>1000 mls	87 (7.1)	29 (6.8)	0.913
Total	289 (23.7)	92 (21.6)	0.387

Table 13 shows the significant difference in length of postnatal hospital stay between the two cohorts. Women in the care of CMP had a mean of 2.19 days postnatal stay compared to 3.02 days for women experiencing standard care. On closer inspection, the majority, 53.8% (*n*=229) CMP women were transferred home in less than 24 hours compared to 16.9% (*n*=206) women receiving standard care. Women in the care of CMP are educated in the antenatal period to expect early transfer home (within 24 hours) and this is reflected in the mean length of stay which is significantly shorter in the CMP cohort.

**Table 13 - Length of postnatal hospital stay**

	<b>Standard care</b>	<b>CMP</b>	
<i>Length of hospital stay</i>	<i>n = 1220</i>	<i>n = 426</i>	<i>p value</i>
	Number (%)	Number (%)	
Home <24 hours	206 (16.9)	229 (53.8)	<b>&lt;0.001</b>
Length of stay ( <i>mean</i> )	3.02 days	2.19 days	<b>&lt;0.001</b>

It was not possible to determine significant differences in perinatal mortality because of the size of the study. The only significant differences found in neonatal outcomes in Table 14 were in artificial feeding rates and breastfeeding rates within an hour of birth. There were no other significant differences between groups: there were no fetal deaths in utero (FDIU), one neonatal death (NND) and one stillbirth in the CMP group and similarly, two stillbirths in the standard care group. The percentage of babies with 5 minute Apgar score <7 were very similar in both groups with 2.1% (*n*=9) babies in the CMP group and 2.0% (*n*=25) in the standard care group. Of the former group, 1.9% (*n*=8) babies were transferred to Special Care Nursery (SCN) and 7.0% (*n*=30) to Neonatal Intensive Care Nursery (NICU) whilst 2.6% (*n*=32) of the latter were transferred to SCN and 5.7% (*n*=70) to NICU. Breastfeeding rates within one hour were significantly better in the CMP group: 62.2% (*n*=265) compared to 50.7% (*n*=618). Almost three percent (*n*=35) of the standard care group chose to

artificially feed whilst 100% of the women in the care of CMP initiated breastfeeding. Table 14 shows neonatal outcomes.

**Table 14 - Neonatal outcomes**

<i>Outcomes</i>	<b>Standard care</b>	<b>CMP</b>	<i>p value</i>
	<i>n</i> = 1220 Number (%)	<i>n</i> = 426 Number (%)	
Stillbirths	2 (0.16)	1 (0.23)	
Neonatal deaths	0	1 (0.23)	
Apgar score <7 @ 5 minutes	25 (2.0)	9 (2.1)	1.000
Transfer to SCN	32 (2.6)	8 (1.9)	0.468
Transfer to NICU	70 (5.7)	30 (7.0)	0.346
Total nursery transfers	104 (8.5)	38 (8.9)	0.841
Breastfeeding within < 1 hour	618 (50.7)	265 (62.2)	<b>0.001</b>
Artificial feeding	35 (2.9)	0	<b>0.001</b>

**Table 15** shows analysis of secondary outcomes including perineal status, analgesic use, postpartum haemorrhage rate, neonatal outcomes and transfer home within 24 hours and provides the crude odds ratio and odds ratio after adjusting for smoking, maternal age and BMI.

**Table 15 - Secondary outcomes**

Secondary outcomes	Numbers (%)	Crude OR (95% CI)	<i>p value</i>	*Adj OR (95% CI)	<i>p value</i>
Intact perineum with VB	Standard care	413 (33.9)	(Ref)		
	CMP	115 (27.0)	0.72 (0.57-0.92)	0.009	0.75 (0.58-0.97) <b>0.026</b>
Severe perineal trauma with VB	Standard care	87 (7.1)	(Ref)		
	CMP	40 (9.4)	1.35 (0.91-1.10)	0.134	1.31 (0.88-1.95) 0.187
Narcotic administration	Standard care	429 (35.2)	(Ref)		
	CMP	45 (10.6)	0.22 (0.16-0.30)	<b>&lt;0.001</b>	0.25 (0.18-0.34) <b>&lt;0.001</b>
Nitrous oxide only	Standard care	210 (17.2)	(Ref)		
	CMP	70 (16.4)	0.95 (0.70-1.27)	0.712	0.95 (0.70-1.29) 0.756
No analgesia	Standard care	178 (14.6)	(Ref)		
	CMP	170 (39.9)	3.89 (3.02-4.99)	<b>&lt;0.001</b>	3.58 (2.77-4.63) <b>&lt;0.001</b>
Total Postpartum Haemorrhage	Standard care	289 (23.7)	(Ref)		
	CMP	92 (21.6)	0.89 (0.68-1.15)	0.378	0.84 (0.64-1.10) 0.214
500mls – 1000mls PPH	Standard care	202 (16.6)	(Ref)		
	CMP	63 (14.8)	0.87 (0.64-1.19)	0.393	0.82 (0.60-1.12) 0.222

Secondary outcomes	Numbers (%)	Crude OR (95% CI)	<i>p value</i>	*Adj OR (95% CI)	<i>p value</i>
Estimated blood loss >1000mL	Standard care	87 (7.1)	(Ref)		
	CMP	29 (6.8)	0.95 (0.61-1.47)	0.822	0.94 (0.60-1.46)
Breastfeeding within 1 hour after birth	Standard care	618 (50.7)	(Ref)		
	CMP	265 (62.2)	1.60 (1.28-2.01)	<b>&lt;0.001</b>	1.62 (1.29-2.04)
5 min Apgar score <7	Standard care	25 (2.0)	(Ref)		
	CMP	9 (2.1)	1.03 (0.48-2.23)	0.937	1.18 (0.53-2.63)
Admission to NICU or SCN	Standard care	104 (8.5)	(Ref)		
	CMP	38 (8.9)	1.05 (0.71-1.55)	0.802	0.98 (0.66-1.46)
Home <24 hours after birth	Standard care	206 (16.9)	(Ref)		
	CMP	229 (53.8)	5.72 (4.49-7.29)	<b>&lt;0.001</b>	6.18 (4.80-7.97)

\*Adjusted for smoking, maternal age and BMI

### 4.3. Transfer from Birth Centre

When sub-analysis of ‘actual place of birth’ compared to ‘planned place of birth’ was examined, it became obvious that the transfer rate out of the Birth Centre was a phenomenon worthy of scrutiny. Every woman who is accepted into the CMP plans to birth in the Birth Centre however, in 2010 and 2011, 220 (52%) of the women cared for by CMP who planned to birth in the Birth Centre actually birthed in Delivery Suite or Operating Theatres. Eighty three (19.4%) of the women cared for by CMP commenced their labour in Delivery Suite because of induction of labour and either birthed there or in Operating Theatres and another 137 (32.1%) were transferred after the commencement of labour to comply with the transfer policy. The women who were transferred during the intrapartum period either birthed in Delivery Suite ( $n=105$ ; 76.6%) or Operating Theatres ( $n=32$ ; 23.4%). Of those transferred to Operating Theatres, 23 proceeded to caesarean

section and 9 to assisted vaginal birth. Table 16 shows reasons for antenatal transfer for induction of labour and Table 17, reasons for intrapartum transfers.

**Table 16 - Reasons for commencing labour in Delivery Suite**

<i>Reasons for induction of labour</i>	<i>Numbers (%)</i>	
Antepartum haemorrhage	1	(0.2)
HELLP syndrome	1	(0.2)
Premature rupture of membranes (pre-labour)	21	(4.9)
Suspected macrosomia	1	(0.2)
Post-dates (greater than 41 weeks gestation)	44	(10.3)
Reduced fetal movements	1	(0.2)
Gestational hypertension at term	8	(1.8)
Spurious labour	2	(0.4)
Pre-eclampsia at term	4	(0.9)
<b>TOTAL</b>	<b>83</b>	<b>(19.4)</b>

**Table 17 - Reasons for intrapartum transfers to Delivery Suite**

<i>Documented reasons for transfer</i>	<i>Numbers (%)</i>	
Antepartum haemorrhage	2	(0.4)
Augmentation	38	(8.9)
Epidural	60	(14.0)
Request for epidural	7	(1.6)
Fetal bradycardia	2	(0.4)
Hypertension in labour	1	(0.2)
Meconium liquor	5	(1.1)
Non-reassuring CTG	2	(0.4)
Pre-eclampsia	1	(0.2)
Prolonged second stage	18	(4.2)
Obstetric Registrar request	1	(0.2)
<b>TOTAL</b>	<b>137</b>	<b>(32.1)</b>

Almost half ( $n=67$ ; 48.9%) of the 137 transfers, were women requesting epidural. This included seven women who were transferred after requesting epidural but who birthed before receiving the anaesthesia. The transfer rate and the reasons for transfer will be discussed at greater length in the next chapter.

#### **4.4.Summary**

This is the first local study comparing outcomes of two different models of care and concentrates on low risk primiparous women in the ACT. The results shown in this chapter confirm the effectiveness, improved clinical outcomes and safety of this midwifery continuity of care model.

Chapter 5 will discuss the implications of the findings reported in this chapter, provide a conclusion, recommendations for future planning and implications for practice resulting from these findings.

## **5. Chapter 5 - Discussion and Conclusion**

### **5.1.Introduction**

As stated in the summary of Chapter 0, this is the first local study comparing clinical outcomes of different models of care. It concentrates on low risk primiparous women in the ACT from January 1<sup>st</sup> 2010 to December 31<sup>st</sup> 2011. Continuity of midwifery care/carer has been shown in this study to make a statistically significant difference to some clinical outcomes for low risk primiparous women at this site as summarised in the previous chapter. Some of the results illustrated have been widely reported in other studies relating to continuity of midwifery care/carer, but with a key difference. The major dissimilarities with this study, compared to the majority appraised in the literature review, is that this study specifically examined the outcomes of low risk primiparous women, not women of 'mixed risk' and all parity. The exception to this is the study of 'selected primiparous women' by Tracy et al., (2104) which was published during the writing of this thesis.

The primary outcome of interest was mode of birth: the study found a statistically significant reduced risk of caesarean section in low risk women planning to have their babies with CMP in the Birth Centre. There were also increased rates of normal vaginal birth and spontaneous vaginal birth and correspondingly decreased rates of assisted vaginal birth in the CMP cohort. Most secondary outcomes were unremarkable. However, there was a statistically significant higher rate of intact perineums in the standard care group but fewer interventions in the CMP group including: induction of labour, epidural anaesthesia and use of narcotics in labour. No differences were found in neonatal outcomes or transfers to nurseries but there were significantly increased rates of breastfeeding initiation within an hour of birth and early transfer home (within 24 hours of birth) within the CMP cohort.

### **5.2.Discussion of results**

#### **5.2.1. Demographics**

It was not possible to determine socioeconomic status, educational level, marital status or ethnicity of the women included in this study, however the smoking rate was reliably reported and it is interesting to note that it is significantly higher in the standard care group compared to the CMP group. Overall the proportion of women in the total cohort who smoked (9.5%) is lower than that of the Australian rate of 13.2% (Li et al., 2012). Smoking is strongly associated with low socioeconomic status and low educational attainment (Lumley et al., 2009).

Studies have demonstrated that women choosing birth centre care tend to be older and better educated than those choosing standard care (Waldenstrom & Nilsson, 1993). The average age in 2011 for primiparous women in Australia was 28.3 years with the average age steadily rising: in 2002, only 11.2% first time mothers were 35 years or older compared to 14.2% in 2011 (Li et al., 2012). The mean age for women planning to birth in the Birth Centre in 2010 and 2011 was 30 years compared to 28 years for the standard care cohort. Women over the age of 35 attending the Birth Centre accounted for 16.2% compared to 15.2% in the standard care group.

According to the study by Waldenstrom and Nilsson (1993), women accessing alternative maternity care in Sweden were similar to those accessing the CMP model. The purpose of the Swedish study was to describe the characteristics of women who prefer standard/conventional care ( $n=630$ ) and compare them with those who seek alternative pregnancy/birth care ( $n=1086$ ). It involved a questionnaire with 100% of the alternative group responding and 70% of the standard care group. They found that the alternative group of women were professionals, were less anxious about birth, better educated, older, in better health and had “a more critical attitude” to maternity care. They were interested in the psychological aspects of childbirth, were more positive about the impending birth and more interested in involving the whole family.

While this study was not able to include some relevant demographic factors it is reasonable to assume that the cohort of women attending CMP were probably different to those attending standard care on some key demographic factors. This assumption is supported by other research evidence that suggests women who choose midwifery continuity of care models are usually older and have higher levels of education (Waldenstrom & Nilsson 1993). This point will be raised again in the section dealing with study limitations.

### **5.2.2. *Length of postnatal hospital stay***

The comparatively high number of spontaneous vaginal births in the CMP cohort may also explain the significantly different early discharge statistic. If women are physically well following a normal vaginal birth, they are also able to transfer home much earlier: the mean length of stay for the CMP cohort was 2.19 days compared to 3.02 days for the standard care women. CMP women were encouraged to transfer home within 24 hours of birth knowing that a ‘known’ midwife would be providing daily visits for the following two weeks.

In studies by Brown, Small, Argus, Davis and Krastevis (2009) and Thompson, Roberts, Currie, & Ellwood (1997), early transfer home was found to have no adverse effects on maternal depression rates. It can be surmised that it is not only beneficial to women and their families but also has cost-saving implications (Tracy et al., 2013; Tracy et al., 2014) for the organisation. Women and their families cared for by the CMP receive education about early discharge in the antenatal period and assume, unless there are medical reasons for a longer hospital stay, they will leave within this time. Conversely, in this time period, there was little education in the antenatal period and no expectation that the standard care group would transfer home early (though some chose to), with the support of an unknown midwife working within the Midcall Program. The caesarean section and assisted birth rates may have influenced the 'early transfer home' rate. Both were significantly improved in the CMP cohort when smoking, BMI and maternal age were controlled for in regression analysis and this may have had some impact on this outcome.

A local prospective cohort study of early discharge and postnatal depression was reassuring around women's psychological ability to cope. The study by Thompson et al., (1997) found that early discharge (<72 hours after birth) which is a major component of CMP's philosophy, did not impact on the women's risk of developing postnatal depression in the six months after birth. The cohort included women from every birth site in the ACT and they found that women who elected early discharge, received midwifery home visits and had good social/family support were not more likely to develop depressive symptoms. This describes the CMP population who are encouraged to go home early with the support of their midwife. However, continuity of care/carer wasn't included specifically as a variable. Again, this was a mixed demographic and not focused specifically on primiparous women.

### **5.3.Secondary outcomes**

#### **5.3.1. *Labour interventions***

Because international research shows that induction of labour (IOL) may lead to caesarean section and assisted vaginal births in primiparous women (Bimbashi, Duley, Ndoni & Dokle, 2012) particularly if the cervix is unfavourable and cervical ripening is required (Vahratian, Zhang, Troendle, Sciscione & Hoffman, 2005), it is reassuring to have found a significant difference in the rates of IOL in this study. The rate of IOL was shown to be significantly higher in the standard care group with regression analysis indicating that women receiving care by CMP had a 44% reduced risk of IOL compared to women receiving standard care.

This is particularly interesting because both models of care are governed by the same maternity unit Standard Operating Procedures including the 'induction of labour for postdates pregnancies' procedure. All women, regardless of model of care, are referred for medical review at 41 weeks gestation and encouraged to have an IOL by the time they are 10 days postdates. The only difference in the two low risk primiparous groups of women being compared in this study was the model of care. Women experiencing standard care do not usually have midwifery support at medical review, whereas CMP midwives attend and advocate for their women when induction of labour becomes an option, as their pregnancies progress beyond this gestation. There is an expectation by women who select this model of care, that their midwife will provide skilled care, information, reassurance and continuity (including the provision of advocacy) when necessary to support them in their desire to have a normal birth. Also that they will collaborate respectfully with other care providers and, when necessary, work with them (Homer et al., 2009).

As illustrated in the previous chapter, a greater proportion of women in the care of CMP who had inductions of labour, chose to allow their pregnancies to extend to 42 weeks and beyond (16.86% compared to 6.10%). Women who choose to give birth in the Birth Centre with CMP midwives are more aligned to a normal birth philosophy and it can be surmised that they may be more resistant to the idea of IOL. It could also be surmised that the partnership CMP midwives have with the women in their care encourages advocacy (Homer et al., 2009) when collaborating with the medical team, who may encourage induction of labour after 41 weeks gestation. Although the study was too small to detect differences in rates of neonatal mortality, supporting women to continue their pregnancies with ongoing surveillance did not appear to impact on other neonatal outcomes described in this study. Other national and international studies comparing standard care and continuity of midwifery care also found lower IOL rates (Tracy et al., 2013; Tracy et al., 2014).

As already discussed in the introduction of Chapter 1, Tracy et al., (2007) found that when one intervention is introduced, a cascade of intervention begins which may ultimately reduce the spontaneous vaginal birth rate, particularly in our primiparous population. They found a strong association between each of the interventions (including IOL) and operative birth. Almost one third of their low risk primiparous women were likely to have augmentation or induction of labour combined with an epidural. In a reverse cascade, the reduced IOL rate may therefore have impacted on the epidural rate which was significantly lower in the CMP cohort. This, in turn, may have impacted on the reduced assisted vaginal

birth rate. Both Anim-Somuah, Smyth & Jones (2011) and Jones (2012) found that the assisted vaginal birth rate was increased after epidural.

### **5.3.2. *Pain relief in labour***

While this study found that there was no difference between cohorts in the use of nitrous oxide for pain relief in labour, there was a significant difference in the use of narcotics and epidurals. Women attending the CMP program were significantly less likely to use narcotics or have an epidural in labour and consequently significantly more likely to have “no analgesia” in labour. Women who are receiving care with the CMP and plan to birth in the Birth Centre make a conscious decision to access that model of continuity of care/carer for a variety of reasons. They are usually more motivated towards normal birth with few, if any, interventions and this includes the plan to birth without any pharmacological pain relief. When women are accepted into the CMP it is always understood that one element of the birthing philosophy is to utilise non-pharmacological methods of pain relief or nitrous oxide inhalation analgesia. Almost 40% did not receive analgesia at all compared with 14.6% of the standard care group. Narcotics were not stored in the Birth Centre but because of the geography during the prescribed period, could be obtained by accessing Delivery Suite on a different level of the same building and administered in the Birth Centre. Because The Canberra Hospital is a public tertiary hospital it has a very efficient anaesthetic service with consultants and registrars on site twenty four hours a day. Canberra Midwifery Program (CMP) midwives have equal access to this service, although for epidural, it necessitates transfer of the woman from the Birth Centre to Delivery Suite. Whilst request for epidural was the major reason for intrapartum transfer in this population, it is still significantly lower in the CMP cohort compared to those women receiving standard care. Other studies comparing models of care (Davis et al., 2011; Sandall et al., 2013) have also found significantly lower epidural rates in women experiencing continuity models.

### **5.3.3. *Intrapartum transfers***

The Birth Centre transfer policy within the period of this study was based on the Australian College of Midwives National Guidelines for Consultation and Referral (2008). The operating procedure governing transfer from the Birth Centre during this period stated that women were to be transferred if there was slow progress during any stage of labour, (defined by intrapartum operating procedures) if they requested epidural anaesthesia, for augmentation of labour with Syntocinon, hypertension (i.e. diastolic >100 for two subsequent readings half an hour apart), malpresentation, fetal distress or meconium liquor.

As already discussed in section 5.3.2, there was a relatively high intrapartum transfer rate from the Birth Centre to Delivery Suite (32.1%) with the main reason for transfer being 'request for epidural'. This group of women ostensibly access the CMP because they are philosophically opposed to intervention in labour, yet their epidural rate, whilst significantly lower, is still quite high when Birth Centre philosophy is taken into consideration. There is an expectation that women who seek the model of care provided by CMP are more committed and inherently more predisposed to normal birth (Homer et al., 2009) with no analgesia. However, the intrapartum transfer rate from the Birth Centre for epidural anaesthesia is significant enough to question this hypothesis.

This study is not unique: two of the most common reasons for intrapartum transfer found in this study were also found by Hodnett, Downe and Walsh (2012) in a Cochrane review of nine studies including 10,684 women. They found the most frequent reasons were request for pharmacologic analgesia, fetal distress and failure to progress in labour.

Fetal distress wasn't a recurrent theme in the reason for intrapartum transfer from the Birth Centre in this study. There were four urgent transfers for fetal bradycardia or non-reassuring CTG which may have been fetal distress but weren't documented as such. The majority of the transfers, as in the study cited above, were for epidural anaesthesia and augmentation of labour (with a presumption of no, or slow progress).

Although a comparison between the two cohorts for 'in-labour' transfer is not possible, it is of interest to note reasons for transfer in a low risk cohort of primiparous mothers. All birth centres in Australia mention a 'transfer rate' but it is difficult to find published data to compare. However, internationally the transfer rate was found to be similar in a prospective cohort study by the Birthplace in England Collaborative Group. They found that the rate for primiparous women was 36-45% compared to 9-13% for multiparous women but did not disclose reasons for transfer. There was, however, a secondary analysis by Rowe, Fitzpatrick, Hollowell and Kurinczuk (2012) who found the most common reasons for non-urgent transfer were 'failure to progress' in the first stage of labour and 'request for epidural'.

This primiparous transfer rate was similar to that reported by McIntyre (2012) in a critical review of literature surrounding non-medically led models of care. She suggested vigilance was necessary to detect unforeseen complications so that urgent intrapartum transfers with their associated risks of perinatal mortality could be avoided. The vast majority of the 137

intrapartum transfers in my study were non-urgent ( $n=131$ ): for epidural (or request for same), augmentation of labour, gestational hypertension in labour, pre-eclampsia, meconium liquor, prolonged second stage and one transfer at the obstetric registrar's request with no other reason documented. There were 6 urgent intrapartum transfers: antepartum haemorrhage ( $n=2$ ), fetal bradycardia ( $n=2$ ) and 2 transfers for non-reassuring CTG. It could possibly be surmised that midwives were vigilant, that they were timely transfers, because there were no statistically significant differences found in neonatal outcomes.

A relatively high number of women were relocated to Delivery Suite for augmentation of labour ( $n=38$  of 137) and for prolonged second stage of labour ( $n=18$  of 137). The operating procedure governing first stage of labour at The Canberra Hospital at that time stated:

*The rate of progress of labour must be considered in the context of the woman's total wellbeing. Slow progress should alert the midwife to the possibility of abnormal labour but should not automatically result in intervention.*

Again, we need to question the transfer rate in an uncomplicated cohort of women. Who is making the decision for transfer? The operating procedure governing second stage of labour was much more prescriptive stating that for primiparous women:

*Birth is expected to take place within 3 hours of the start of the active second stage in most women. A diagnosis of delay in the active second stage should be made after 2 hours and women should be referred to the obstetric registrar for review.*

This could explain the 'in-labour' transfer rate for prolonged 2<sup>nd</sup> stage. As stated earlier, vigilance is necessary to detect unforeseen complications and intrapartum transfers need to be done in a timely way to prevent poor neonatal outcomes (McIntyre, 2012). Intrapartum transfers may, however, be traumatic for the woman and her family when they are comfortable in the Birth Centre environment and are psychologically prepared to birth there. A recent review by Hodnett et al., (2012) concludes that there is a need for qualitative studies about women's perceptions when they have been transferred to a conventional birth unit, from an alternative setting and this may enlighten health professionals about the decision-making process when interventions are introduced.

#### **5.4.Primary outcomes**

One of the most important primary outcomes for primiparous women, emphasised continually in this study, is mode of birth. Analysis of primiparous primary outcomes

demonstrated statistically significant differences in the normal vaginal birth and spontaneous vaginal birth rates. Women in the care of CMP had a 62% greater chance of having a normal vaginal birth than those receiving standard care and more than twice the chance of having a spontaneous vaginal birth. The definition of spontaneous vaginal birth (SVB) employs more robust criteria than that applied to normal vaginal birth (NVB). Normal vaginal birth is any unassisted vaginal birth, whereas SVBs precludes a vaginal birth where there has been any intervention, including induction or augmentation of labour, epidural anaesthesia and episiotomy.

There may be other reasons to explain the significantly higher SVB rate in the CMP group which are more difficult to quantify. These include the special partnership women have formed in the antenatal period with their 'known' midwife and the fact that there is a one-on-one relationship during labour and birth. Hodnett, Gates, Hofmeyr and Sakala concluded in a review of 21 trials published by the Cochrane Collaboration in 2013 that continuous support in labour should be accepted as the norm. At this site, it is unusual for a CMP midwife to be caring for more than one woman in labour at any given time whereas midwives working with the standard care group may be caring for at least two and they are usually women unknown to them before admission in labour. There is no data available to indicate if the standard care women knew their support midwife but more than 80% of the CMP women had a 'known midwife' supporting them in labour and birth with their primary midwife being present for more than half their labours and births (58.45%).

Whilst this may have influenced some outcomes, it did not appear to have had a protective effect on perineal trauma, with the standard care cohort having a statistically significant higher 'intact perineum' rate. On reflection, this may be due to the skill of the midwives working in Delivery Suite at that time. There is no evidence to support this theory but anecdotally, there were a core group of midwives who had been birthing women for more than thirty years working in Delivery Suite during the study period, compared to less experienced midwives in the CMP.

The assisted vaginal birth rate was significantly lower in the CMP cohort, reaching significance ( $p > 0.05$ ). However, when the influence of smoking, BMI and maternal age as potential confounding variables were accounted for in regression analysis, the difference became more significant ( $p = 0.017$ ) giving CMP women a 27% less risk of having an assisted vaginal birth if they were planning to birth in the Birth Centre. This corresponds with the increased NVB and SVB rates in the CMP group which, as surmised previously, may also

be attributed to the significantly lower epidural rate. Anim-Somuah et al., (2011) and Jones et al., (2012) concur that epidural significantly increases assisted vaginal birth and caesarean section rates.

Low risk primiparous women who were receiving care from CMP and planned to birth in the Birth Centre had a 30% less risk of having a caesarean section when results were adjusted for smoking, BMI and maternal age. This finding is dissimilar to two large reviews, one by Sandall et al., (2013) and the other by Waldenstrom and Turnbull (1998) who found no statistically significant difference. However, both studies included women of all parity, with no subgroup analysis of primiparous women within either review. The study by Tracy et al., (2014) found that 'standard primiparas' were significantly less likely to have an elective caesarean section: 1.6% with the continuity model of care compared to 5.3% if women were receiving standard care rising to 17.2% if women were receiving private obstetric care. Sub-group analysis of primiparous women, was conducted in a recent study by McLachlan et al., (2012) who also found a statistically significant difference in the caesarean section rate: 51.8% versus 41.5%;  $p < 0.001$

### **5.5. Neonatal outcomes**

Intervention rates in the CMP group who planned to birth in the Birth Centre were lower (except for augmentation of labour) than those in the standard care group who planned to birth in Delivery Suite without any evidence of adverse infant outcomes. However, because of the size of the study it was not possible to detect significant differences in perinatal mortality. There were no fetal deaths in utero (FDIUs) in either cohort, two stillbirths in the standard care group compared to one in CMP and one neonatal death in the CMP group planning to birth in the Birth Centre. Five minute Apgar scores of less than 7 were almost identical and total transfers to Neonatal Intensive Care Unit (NICU) and Special Care Nursery (SCN) were very similar.

Reasons for intrapartum transfers from the Birth Centre to Delivery Suite have been discussed earlier in this chapter. It could be surmised that midwives were vigilant with timely transfers for fetal reasons as there were no statistically significant differences found in neonatal outcomes except for breastfeeding within an hour of birth which was significantly increased in the CMP cohort (62.2% versus 50.7%:  $p = 0.001$ ). The difference in early breastfeeding rates could ostensibly be related to the higher NVBs and SVBs in the Birth Centre cohort. The Canberra Hospital has been accredited as a Baby Friendly Hospital (BFHI) for many years and strongly promotes breastfeeding for every woman, both within

the CMP and standard care models. Although the documentation of breastfeeds within an hour of birth was sub-optimal in the clinical records of women who had caesarean sections for both cohorts, it is still worth reporting because there is no difference in The Canberra Hospital's protocol for women receiving standard care or women attending CMP. All women are encouraged to initiate breastfeeding either in Operating Theatres or in Recovery before being transported to the ward. Taking into consideration the sub-optimal recording, there was still a significant difference in early (less than one hour after birth) breastfeeding rates. As stated earlier, this could possibly be attributed to the higher NVB and SVB rates in the CMP cohort. When women have normal vaginal births with little or no intervention and are able to ambulate soon after birth, they are physically and psychologically more able to handle their newborn with confidence (Mousavi, et al., 2013).

## **5.6. Study limitations**

Whilst there are advantages to this study design there are also some limitations. One of the main disadvantages is that a cohort study is considerably weaker than a randomised controlled trial or a prospective study. However prospective studies, whilst considered stronger, are slow to yield results compared to a retrospective study because they often run for long periods and require a large sample size. This has funding and time commitment implications (Healy & Devane, 2011). In their discussion of retrospective designs, Polit and Beck (2008) indicate that two groups being compared are unlikely to be totally comparable with respect to all potential factors influencing the dependent variable. This is supported by Healy and Devane (2011) when they discuss strengths and weaknesses of retrospective and prospective designs.

Another potential problem arising from the chosen research design is selection bias in the CMP cohort, which needs to be acknowledged. However, whilst acknowledging the potential, every effort has been made to minimise the possibility of bias by adhering to the strict inclusion/exclusion criterion to ensure sample group homogeneity in order to increase validity. Healy and Devane (2011) agree that it can be minimised by employing these strict criteria and ensuring there are rigorous recruitment measures. The risk of 'selection bias' has previously been acknowledged in this thesis: the philosophy of women accessing continuity of care within the CMP may have had some impact on these results though that is difficult to substantiate. Women who actively seek continuity of midwifery care within the CMP are usually highly motivated towards normal birth.

Every effort has also been made to avoid measurement bias by being as thorough, objective and consistent as possible (Healy & Devane, 2011). One of the main limitations, already acknowledged, is the use of existing databases, for example, the researcher is limited to the data available and this is totally dependent on the professional entering the data. One of BOS's greatest limitations at The Canberra Hospital, already acknowledged, is the number of 'users' who have access for data entry. Ongoing education is improving data integrity but during the period of the study (January 1<sup>st</sup> 2010 to December 31<sup>st</sup> 2011) it was found to be unreliable in many fields. This meant that data on ethnicity and socioeconomic status could not be reliably collected. In an attempt to overcome this deficit and ensure accuracy, medical records were accessed through CRIS and all data cross-checked. Awareness and acknowledgement of the various biases should reduce potential threats to the reliability and validity of this study (Healy & Devane, 2011).

The study setting and participants involved in this study have been described in full so that readers of this thesis can determine the external validity of this study.

### **5.7.Key conclusions and implications for practice**

The purpose of this study was to compare clinical outcomes for two groups of similar women accessing different maternity care models at The Canberra Hospital. The statistically significant differences in outcomes include increased rates of normal vaginal birth and spontaneous vaginal birth, reduced rates of caesarean section and assisted vaginal birth, reduced rates of induction of labour and analgesic use (including epidural and narcotics) in labour, significantly higher rates of breastfeeding within an hour and transfer home within twenty four hours for the CMP group.

Maternal and neonatal morbidity and mortality rates have improved significantly in developed countries over the last 100 years. In Australia in 2010 the maternal mortality rate was among the lowest in the developed world with 7 per 100,000 live births (United Nations Maternal Mortality Estimation Group et al., 2012). Unfortunately in the process of improving maternal mortality by increasing knowledge and accepting new technology, birth has become medicalised. There is no longer confidence in healthy women with well babies to labour and birth without intervention.

However, if, by providing continuity of care/carer, women can be supported to birth with less intervention the first time, the confidence and self-esteem these women develop may encourage intervention-free, spontaneous vaginal births subsequently. Women have become

fearful of birth, dependent on caregivers and often willingly accept “help” whether it is in the form of an induction of labour, an augment of labour or an epidural. The reasons for this are multi-faceted with numerous social factors acknowledged, which may encourage this dependency, the analysis of which is beyond the scope of this paper.

Australia has been in the forefront of this research, attempting to break down barriers and support women and midwives in their desire to achieve continuity of midwifery care/carer since the first national study by Rowley et al., in 1995. In order to ‘get the first birth right’, we need to critically examine time limits imposed on primiparous women, decrease interventions, increase continuity of care/carer and support birth outside a tertiary setting.

As Hodnett et al., (2012) concluded: there is a need for evidence from both quantitative and qualitative sources to provide evidence and to give health professionals and governing bodies a full picture of the risks and benefits of midwifery-led care in a birth centre setting. They also suggested that health professionals may be enlightened by a qualitative study assessing women’s perceptions after they have been transferred to a conventional birthing unit from a birth centre setting.

Caroline Homer states in her thesis “Continuity of maternity care in a community setting: a randomised controlled trial using the Zelen design” (2001).

*The time for this research is running out because soon, as continuity of midwifery care/carer models of care become the norm for low-risk women, there will be no group to compare outcomes with.*

However, it’s not yet so much ‘the norm’ that we can afford to be complacent. Continuity of midwifery care/carer with the Canberra Midwifery Program is associated with a statistically significant difference to some clinical outcomes for primiparous women at this site. Primiparous women hoping for a normal vaginal birth should be encouraged to enter this model of care to maximise their chance of “getting the first birth right”.

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## 7. Acronyms

ABS	Australian Bureau of Statistics
ACHS	Australasian Council on Healthcare Standards
ACM	Australian College of Midwives
ACT	Australian Capital Territory
ACTH-HREC	ACT Health Human Research Ethics Committee
ACTPAS	ACT Patient Administration System
ANC	Antenatal Clinic
ANU	Australian National University
ARM	Artificial rupture of membranes
BC	Birth Centre
BF	Breastfeed
BFHI	Baby Friendly Hospital Initiative
BMI	Body Mass Index
BOS	Birth Outcomes System
CALD	Culturally and Linguistically Diverse
CaTCH	Continuity at The Canberra Hospital
CHW&C	Centenary Hospital for Women and Children
CMP	Canberra Midwifery Program
CMPP	Community Midwives Pilot Program
CRIS	Clinical Records Information System
CTG	Cardiotocography
DRG	Diagnosis Related Groups

DS	Delivery Suite
EDS	Edinburgh Depression Scale
EPDS	Edinburgh Postnatal Depression Scale
FDIU	Fetal death in-utero
FMU	Fetal Medicine Unit
GP	General Practitioner
IOL	Induction of labour
IUGR	Intra-uterine growth restriction
KPMG	Derived from company founders: <b>K</b> lijnveld, <b>P</b> eat, <b>M</b> arwick, and <b>G</b> oerdeler.
MACH	Maternal and Child Health
MMEIG	Maternal Mortality Estimation Group
NAPSS	Newborn and Parent Support Service
NHS	National Health Services in the United Kingdom
NICU	Neonatal Intensive Care Unit
NND	Neonatal death
NSW	New South Wales
NVB	Normal vaginal birth
PEP	Pregnancy Enhancement Program
PPH	Postpartum haemorrhage
PRS	Patient Record System
RCT	Randomised Control Trial
SCN	Special Care Nursery
SOP	Standard Operating Procedures
SPSS	Statistical Program for the Social Sciences

STOMP	St. George Outreach Maternity Project
SUPS	Substance Use in Pregnancy Support
SVB	Spontaneous vaginal birth
TCH	The Canberra Hospital
UC	University of Canberra
UN	United Nations
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
URN	Unit Record Number
VBAC	Vaginal Birth After Caesarean
WHA	Women's Health Australasia
WHO	World Health Organisation

## 8. Glossary

Amniotomy	Surgical rupture of the fetal membranes to induce or expedite labour.
Antenatal period	The period of time in a pregnancy before birth occurs.
Apgar score	A numerical set of criteria for assessing the wellbeing of the baby at one and five minutes after birth. Values are assigned to the status of skin colour, heart rate, respiratory effort, muscle tone, and reflex irritability. The score ranges from 0 to 10 (10 being perfect).
Assisted vaginal birth	One where an obstetrician uses a vacuum extractor or forceps to facilitate birth.
Augmentation	Accelerating labour progress by artificially rupturing the membranes and/or using oxytocic drugs.
Birth Centre	A midwife-led unit that creates a home-like environment while offering expert support for birth.
Canberra Midwifery Program	A continuity of care/carer model of midwifery care for low risk women who plan to birth in the Birth Centre.
Caseload midwifery	Primary carers who provide all antenatal, intrapartum and postnatal care for a defined group of women with a back-up midwife providing support when necessary.
Continuity of midwifery care	A consistent philosophy or organisational structure around which care is provided. This may be achieved through a model of team midwifery where a small number of midwives care for a group of women through the antenatal, intrapartum and postnatal periods.

Continuity of midwifery carer	Care provided by a midwife whom the woman has met previously and feels she knows.
Delivery Suite	An area of the hospital where all standard care women plan to birth and where CMP women are transferred, to comply with the transfer policy.
Elective caesarean section	A caesarean section performed before the onset of labour.
Emergency caesarean section	A caesarean section performed after the onset of labour.
Epidural	Regional anaesthesia resulting from injection of an anaesthetic into the epidural space of the spinal cord; sensation is lost in the abdominal, genital and pelvic areas.
Episiotomy	An incision into the perineum and vagina to enlarge the vulval orifice.
Fetal bradycardia	An abnormally slow fetal heart rate, usually below 110 beats per minute.
Fetal distress	Refers to the presence of signs in a pregnant woman before or during childbirth that suggest that the fetus may be compromised.
Forceps birth	A form of assisted delivery in which the baby is delivered vaginally with the aid of a surgical instrument applied to the baby's head at full dilatation.
Fourth degree tear	A perineal laceration or tear involving the vaginal fourchette, perineal skin, vaginal mucosa, muscles, anal sphincter, and rectal mucosa.

Gestational age	The duration of pregnancy in completed weeks from the first day of the last normal menstrual period.
Induction of labour	The artificial initiation of labour either by the use of drugs or by rupturing the membrane.
Intrapartum period	The period from the onset of labour to the end of the third stage of labour.
'Known' midwife	A 'known' midwife is one the woman has met in the antenatal period.
Labour dystocia	Abnormal labour characterised by a significant slowing or cessation of fetal descent and/or cervical dilatation during labour.
Malpresentation	Presentation of a part of a fetus other than the back of the head during labour and birth.
Meconium liquor	Liquor becomes stained when meconium is passed by the baby in-utero.
Midcall	An early discharge midwifery program that supports women with home visits when they have been transferred home within 24 hours of birth.
Multiparous woman	A woman having her second or subsequent baby. A woman who has already given birth.
Narcotic	A class of substances that blunt the senses such as Morphine or Pethidine that are used in medicine to relieve pain, cause sedation, and induce sleep.
Neonatal death	The death of a live born infant within 28 days of birth.

Neonatal Intensive Care Unit	One that is capable of caring for the smallest and sickest of newborn babies: where mechanical ventilation and high-frequency mechanical ventilation can be provided
Non-reassuring CTG	A CTG which does not have reassuring features.
Nulliparous	A woman who has never given birth.
Oxytocic	An agent that promotes rapid labour by stimulating uterine contractions.
Parity	A term that refers to the number of times a woman has given birth.
Place of birth	Place of birth in this study refers to the 'planned place of birth' rather than the 'actual place of birth'.
Placenta praevia	Implantation of the placenta close to the cervix or covering it, either partially or completely.
Postnatal period	Period of time beginning immediately after the birth of a child and extending for about six weeks.
Pre-admission visit	The first antenatal visit with a midwife either at home or at the hospital.
Premature labour	The spontaneous onset of labour before 37 completed weeks gestation.
Primary caesarean	A woman's first caesarean section.
Primary midwife	A caseloading midwife who is a woman's primary carer.
Primiparous woman	A woman in her first pregnancy or who has just given birth to her first baby.

Singleton pregnancy	A pregnancy where there is only one fetus as opposed to multiple.
Special Care Nursery	Level 2 neonatal unit which can give oxygen therapy, commence mechanical ventilation and has neonatal medical staff with a neonatologist on call. Any infants requiring sustained mechanical ventilation are transferred to a Level 3 neonatal intensive care unit.
Standard care	Fragmented care with midwives, obstetric registrars, obstetricians and GPs sharing a woman's care, with the woman having no expectation that she see the same midwife more than once and will not know her midwife in labour.
Standard Operating Procedures	A SOP is a detailed explanation of how a policy is to be implemented. The SOP may appear on the same form as a policy or it may appear in a different document.
Stillbirth	The complete expulsion or extraction from its mother of a product of conception of at least 20 weeks gestation or 400g birth weight who did not, at any time after birth, breathe or show any evidence of life such as a heartbeat.
Team midwifery	Team of midwives who work in a small group practice, sharing care for the women allocated to the team.
Third degree tear	A perineal laceration or tear involving the fourchette, perineal skin, vaginal mucosa, muscles, and anal sphincter.
'Unknown' midwife	A midwife the woman has not met in the antenatal period.
Vacuum extraction	A form of assisted delivery in which the baby is delivered vaginally with the aid of a shallow rubber cap fixed to the baby's head using suction.