‘BIRTHPLACE – YOUR CHOICE’

A smartphone application designed to aid informed decision making on birthplaces for primigravida women in New Zealand

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I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Signed: Date: 3rd March 2017

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Intellectual Property Rights

The intellectual property rights of the 'Birthplace – Your Choice' App belong to the Auckland University of Technology, Auckland, New Zealand.

Confidential Material

The 'Birthplace – Your Choice' App has a three year embargo. See Application for Embargo Form (PGR16) (Appendix III). This is necessary as this App may continue to be developed with potential for ongoing research.

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Introduction

Has midwifery truly entered the 21st Century? Over the course of my masters degree project I sought to investigate, in a sustained and in-depth fashion, whether smartphone technology might provide the means by which women could easily access, comprehend and be assisted in making an individualized birthplace choice. Until relatively recent times women birthed naturally in the home but this is now the least popular birthplace. The shift to obstetric birthing units and greater medicalization of birth occurred primarily on the premises increasing availability of birth technology and safety. Yet this birth location has proven the opposite demonstrating adverse maternal and neonatal outcomes when healthy low-risk primigravida (first time mothers) choose this location as their planned place of birth. Could it be that technology, perhaps the very enemy of natural birth, could be used in assisting women to understand the benefits of other birthplace options and their innate childbearing capabilities?

This project involved development of an App called 'Birthplace – Your Choice'. This App provides information on potential outcomes for three birthplace locations available in New Zealand: the obstetric unit, a midwifery unit and homebirth. The following project report provides the background, literature and process of the project. In particular, the literature that supports the content section of the app is reviewed. Project outcomes and recommendations will complete the report. Subsequent to testing it appears that technology might indeed be useful in improving awareness of the benefits and improved outcomes when birth occurs in a maternity unit or at home.

Aim of the Project: 'Birthplace - Your Choice': a smartphone App

I am Sarah Ballard, a midwife and midwifery lecturer. I have been a midwife for thirteen years working in a variety of roles as both a case-

loading community and a hospital based midwife. During this time I have observed not only a decrease in low-risk healthy women choosing to birth out of obstetric units but also a steady increase in the use of interventions such as induction, epidurals, continuous electronic fetal monitoring or syntocinon augmentation to speed up these women's labours (Hersh, Megregian, & Emeis, 2014; Jansen, Gibson, Bowles, & Leach, 2013). While interventions can be necessary at times, what is concerning is that their use has become almost routine, specifically for low-risk primigravidas (first time mothers), when for this group use of interventions should be low (Hannah et al, 2014; Ministry of Health [MoH], 2016a). One intervention frequently leads to the use of another because they alter childbirth physiology (Buckley, 2015). This is called the 'cascade of intervention' and it often transforms a normal labour and birth into a medically managed procedure with potential to result in increased morbidity for mother and baby (Buckley, 2015; Jansen et al. 2013; Tracy, Sullivan, Wang, Black & Tracy, 2007).

In 2014 96.6% of all primigravidas in New Zealand opted to birth in hospital and one in every four of these women had at least one form of obstetric intervention during their labour and birth, with induction of labour and epidural anaesthesia most common (MoH, 2016a). Such high rates of intervention are alarming, and not surprisingly are associated with New Zealand's decreasing vaginal birth rate and increased caesarean section rate (MoH, 2016a). These findings are supported by a plethora of evidence, especially over the last five years, that demonstrates that for low-risk primigravidas birthing in an obstetric unit increases the risk of unnecessary interventions, reduces the likelihood of vaginal birth and increases detrimental outcomes for mothers and babies (Birthplace in England Collaborative Group, 2011; Blix, Huitfeldt, Øian, Straume, & Kumle, 2012; Bolten et al., 2016; Cheyney et al., 2014; Davis et al., 2012; Dixon, Prileszky, Guilliland, Miller & Anderson, 2014; de Jonge et al., 2015; Farry, 2015; Hodnett, Downe, & Walsh, 2012; Homer et al., 2014; National

Institute for Health and Care Excellence, 2014; Miller & Anderson, 2014; Sandall, Soltani, Gates, Shennan, & Devane, 2015).

The New Zealand MoH states on their website that 'Women who give birth at home or in a birthing centre or small maternity unit are more likely to have a normal birth' (MoH, n.d.). This message does not seem to be reaching New Zealand birthing mothers. Birthplace choices, and many others, made during the childbearing period are shaped by numerous, complex influences that are beyond the scope of this project. However, a large gap exists in accessible information designed to assist New Zealand families in making an informed decision about birthplace. Could it be that the provision of this information, in the form of an App, might be a way to improve knowledge of not only birthplace options and outcomes but also the effect of common interventions on labour and birth for low-risk primigravida in New Zealand?

The aim of this project is to provide low-risk primigravidas with easy-to-access, evidence-based information about likely outcomes for themselves and their babies in different birthplace locations, so as they can make an informed decision about where they choose to birth. This takes the form of an original smartphone App called 'Birthplace – Your Choice'. This App presents likely outcomes should a primigravida choose to birth in an obstetric unit where medical and paediatric services are available, in a community based midwife-led birthing unit (midwifery unit), or at home with care provided by midwives.

Although women have the right to choose their birthplace there is little information available that explains what each birthplace is like and the possible outcomes for themselves and their babies. Information is available online from District Health Boards, the Midwifery Maternity Providers Organisation (MMPO), and the New Zealand MoH. This information can be difficult to locate unless the woman knows where and what to search for and many sites use statistics that are difficult for a lay person to understand. To address this, 'Birthplace – Your Choice' provides accessible and objective information for low-risk primigravida on the

likelihood of eight specific outcomes occurring for each birthplace. These are:

1. Vaginal birth
2. Caesarean birth
3. Perineal trauma
4. Postpartum hemorrhage
5. Use of water for labour and birth
6. Neonatal wellbeing as determined by Apgar score and use of respiratory support
7. Use of specialist neonatal intensive care support services
8. Transfer rates from midwifery unit or homebirth to an obstetric unit.

An App was the obvious choice to disseminate information on birthplace options and outcomes to the widest possible audience because contemporary society readily seeks information from the internet that once downloaded, becomes portable and easily accessed (Boulous, Brewer, Karimkhani, Buller, & Dellavalle, 2014; Wac, 2012). The 'Birthplace – Your Choice' App was specifically developed as a patient decision aid tool (pDAT) because it is known that they improve decision-making quality when more than one option exists (Tucker Edmonds, 2014).

It is hoped that after using 'Birthplace – Your Choice' women will have increased knowledge on available birthplaces and outcomes. Should women find this App beneficial it would be exciting if the New Zealand MoH or the New Zealand College of Midwives (NZCOM) endorsed its use to publicly promote the benefits of birthing at midwifery units or at home for low-risk primigravida. I believe such an initiative is overdue and that 'Birthplace – Your Choice' has potential to reduce New Zealand's increasing intervention rates, offset rising maternity health care costs associated with obstetric unit births and improve outcomes for this group of women (Midwifery Employee Representation and Advisory Service, 2014; MoH, 2016a; Schroeder et al., 2012; Sutcliff et al, 2012; Tracy & Tracy, 2003).

Overview of relevant background and contextual issues

The medicalisation of childbirth

In the last fifty years childbirth has become increasingly medicalised through political, cultural and societal influences that have redefined pregnancy, labour and birth as an illness needing to be treated and controlled, specifically by medicine (Davis-Floyd, 2001; DeVries & Buitendijk 2012; Wendland, 2007). For many, the belief that childbearing is a normal physiological process has been replaced by paradigms related to fear, pain, risk versus safety, choice and control (Coxon, Sandall, & Fulop, 2014; Chadwick & Foster, 2013; MacKenzie Bryers, & van Teijlingen, 2010; McAra-Couper, Jones & Smythe, 2010). These paradigms along with other factors including the media, and sociocultural elements such as ethnicity and culture, shape women's choices and knowledge during the childbearing period and also play a part in constructing childbirth expectations and beliefs (Dixon, Prileszky, Guilliland, Miller, & Anderson, 2014; Essex, Green, Baston, Pickett, 2013; Hine, 2013; Klein et al., 2011; Luce, Cash, Hundley, Cheyne, van Teijlingen & Angell, 2016; McIntyre, Francis & Chapman, 2011). These influences have contributed to elective caesarean section, epidural, induction of labour, application of birth technology (e.g. ultrasound or continuous electronic fetal heart rate monitoring) and other interventions being in such common usage nowadays that many consider them a 'normal' component of childbirth even though there is minimal supporting evidence of their benefit for well women (Alfirevic, Devane & Gyte, 2017; Fenwick, Staff, Gamble, Creedy, & Bayes, 2010; McAra-Couper et al., 2011). Most importantly though these influences have led women to believe that a maternity system dominated by an 'obstetric perspective that values technology, surveillance and intervention' ensures safety and improves outcomes when, in reality, it does not (Licqurish & Evan, 2016. p.87).

Which birthplace is safer for low-risk primigravidas?

Birth in midwifery units or at home under midwife-led care has shown to be as safe as birthing in an obstetric unit for maternal and neonatal mortality but importantly research shows that vaginal birth is more likely and commonly experienced morbidities are less likely especially for low-risk primigravidas (Birthplace in England Collaborative Group, 2011; Blix et al., 2012; Bolten et al., 2016; Cheyney et al., 2014; Davis et al., 2012; Dixon, Prileszky, Guilliland, Miller & Anderson, 2014; de Jonge et al., 2015; Farry, 2015; Hodnett, Downe, & Walsh, 2012; Homer et al., 2014; National Institute for Health and Care Excellence, 2014; Miller & Anderson, 2014; Sandall, Soltani, Gates, Shennan, & Devane, 2015). These environments offer 'individualised, low-technological care encouraging spontaneous, vaginal birth without routine intervention to low-risk women' (Christensen & Overgaard, 2017. p.15). Less exposure to medical interventions such as syntocinon augmentation or epidural results in higher rates of uncomplicated vaginal births compared to obstetric units (Coxon, Sandall & Fulop, 2014).

In a study of nearly 65,000 English women with low-risk pregnancies who planned at the beginning of their pregnancy to birth in a midwifery unit, and did so, it was found they experienced "fewer interventions than those planning birth in an obstetric unit with no impact on perinatal outcomes" (Birthplace in England Collaborative Group, 2011, p.1). This means these women whose elected to birth in an environment lacking technology, surveillance and obstetic interventions, and were under the care of midwives, had births that were as safe as those who birthed in an obstetric unit. For low-risk primigravida who chose to birth at home there appears to be a small increased risk from 5 in 1000 to 9 in 1000 of an adverse outcome occuring compared with a baby born in an obstetic unit (Birthplace in England Collaborative Group, 2011; Dixon et al., 2014). Adverse perinatal outcomes include intrapartum stillbirth, early neonatal death, neonatal encephalopathy, meconium aspiration syndrome,

brachial plexus injury and fractured humerus or clavicle but as observed in these statistics overall the rates are low in all birthplaces, less than 1% (Birthplace in England Collaborative Group, 2011; Dixon et al., 2014).

New Zealand, Canada, Norway, Australia, United States of America, and other countries all report that obstetric units employ interventions on a routine basis rather than when clinically indicated, and therefore an obstetric unit may not be the best setting for uncomplicated primigravida to labour and birth (Bolton et al., 2016; Blix, Huitfeldt, Øian, Straume, & Kumle, 2012; Cheyney et al., 2014; Davis et al., 2011; Halfdansdottir, Smarason, Olafsdottir, Hildingsson, & Sveinsdottir, 2015; Homer et al., 2014; Hutton et al., 2015; Laws, Xu, Welsh, Tracy, & Sullivan, 2014).The New Zealand MoH state that the use of interventions should be minimal and consistent regardless of where low-risk primigravida choose to birth (MoH, 2016a). While this is reflected in the statistics when birth occurs in midwifery units or at home with midwifery care provision, it is not reflected in obstetric units (MMPO, 2011; MoH, 2016a). Instead outcomes and intervention rates vary within, and between, obstetric units of District Health Board areas (MoH, 2016a). For example, vaginal birth rates have remained over 98% at home and in midwifery units over the last 5 years but there is great variation between obstetric units for the same low-risk population (MoH, 2016a).

When comparing rates for low-risk primigravidas in Auckland, vaginal birth rates between two similar obstetric units in the same District Health Board, North Shore and Waitakere, were 60.7% and 71.3% respectively, a variation of 10.6 % (MoH, 2016a). If these figures are compared to another District Health Board with a similar obstetric unit such as Whakatane, the vaginal birth rate there is 84.5%, 23.8% higher than North Shore and 13.2% higher than Waitakere (MoH, 2016a). Such large discrepancies in vaginal birth rates are unexpected for low-risk primigravida so why is there a difference? It would appear that the policies or practices of an obstetric unit may have more influence in determining the care provided and any interventions used, rather than

the health needs of low-risk primigravida woman (MoH, 2016b).

Lead Maternity Carer

It is not only birthplace location that influences outcomes but choice of Lead Maternity Carer and the model of care provided (Farry, 2015). Healthy low-risk primigravida have better outcomes when they receive midwifery-led care compared to obstetrician or general practitioner-led care(Birthplace in England Collaborative Group, 2012; Begley, et al., 2011; Farry, 2015; Sandall, Soltani, Gates, Shennan, & Devane, 2016). When a low-risk primigravida receives midwifery based continuity of care throughout the childbearing continuum this model exceeds any others in its facilitation of 'high quality, safe and cost effective care with significant benefits for mothers and babies with no identified adverse effects' (Farry, 2015 p.41; Sandall et al., 2016).

New Zealand maternity services are unique in that the majority of women (85%) choose midwifery care and our midwifery model is held in high regard worldwide (MoH, 2016b). Yet with such a great system why are New Zealand intervention rates similar to other countries whose maternity services do not offer continuity of midwifery care and/or are obstetrically governed? On further examination this question highlights two issues. Firstly, similarly to other countries, the majority of first time New Zealand mothers birth in obstetric units. Secondly, this environment appears to be unconducive to supporting the normal birth philosophy and practice style of midwives (Everly, 2012; Healy, Humphreys & Kennedy, 2016; Surtees, 2010). Midwives strive to provide individualised women-centred care and this can be difficult in obstetric units where birth is viewed as pathological and risk-management strategies and practice policies dominate (Healy et al., 2016). Within this risk averse environment midwives struggle to protect normalcy during the birth process, and may practice defensively (Carolan-Olah, Kruger, & Garvey-Graham, 2015; O'Connell & Downe, 2009; Scamell & Alaszewski, 2012). It

is noteworthy that this occurs to a lesser degree when midwives are able to practice in environments that support physiological birth and this may explain the statistical difference in outcomes observed between birthplaces. Given the fact that midwives serve the majority of New Zealand's birthing population it seems an abberation that their practice philosophy is not the dominant childbearing paradigm in New Zealand. That it is not, may be partly explained by how 'normal' birth is defined.

What is normal birth and why is it important?

There are various views on what constitutes a 'normal' birth. Government agencies, health practitioners, professional bodies and women all differ in their views on what constitutes 'normal' birth. Some state that labour and births that have high levels of intervention are acceptable and can be considered a 'normal' birth, some claim only intervention free births should be called 'normal' and others fall in a grey area in-between (Darra & Murphy, 2016; Edwards & Conduit, 2011, Downe, McCormick, & Beech, 2001; NZCOM, 2009; Royal College of Obstetricians & Gynaecologists, 2007; Royal College of Midwives, 2016; Society of Obstetricians and Gynaecologists of Canada, Association of Women's Health, Obstetric and Neonatal Nurses of Canada, the Canadian Association of Midwives, the College of Family Physicians of Canada, the Society of Rural Physicians of Canada, 2008).

The New Zealand MoH definition of 'normal' birth includes women who have had an epidural, induction of labour, augmentation of labour or an episiotomy, and the baby is born vaginally without the use of forceps or ventouse (MoH, 2016b). In 2014 64.8% of New Zealand women had a 'normal' birth as defined by the MoH but when the interventions allowed in their definition were excluded the 'normal' birth rate dropped to 33.2% (MoH, 2016b). These births could also include other interventions though, such as artificial rupture of membranes, fetal blood sampling, or continuous electronic fetal heart rate monitoring which if excluded would

reduce this number even further (Royal College of Midwives, 2016). Dixon (2016) describes 'the variation between what is considered a physiologically normal birth and what is defined as normal birth as disturbing' (p.9). In 2014 the then Director of Midwifery at Auckland City Obstetric unit, New Zealand's largest tertiary obstetric unit, reported the 'true' intervention free vaginal birth rate as a stunningly low 12% (M. O'Brien, personal communication, August 2014). The true number of intervention free births remains elusive – the MoH do not report it alongside their birthplace statistics for primigravida instead providing an overall number for all New Zealand mothers (MoH, 2016b).

Not collating these statistics seems anomalous because mode of birth has far reaching consequences for the mother, baby, her family and the state of New Zealand's maternity system (Midwifery Employee Representation and Advisory Service, 2014; Wong, Browne, Ferguson, Taylor, & Davis, 2015). Our rates of interventions and birth by caesarean section increase almost yearly for low-risk primigravidas (MoH, 2016a). It is known that the outcome of a first birth strongly correlates with a woman's physical and psychological postnatal wellbeing (American College of Obstetricians and Gynecologists [ACOG], 2014; Lobel & DeLuca, 2007; Pang, Leung, Lau, Hang, & Chung, 2008; Rowlands & Redshaw, 2012). A birth with as little intervention as possible is important because it avoids the risks associated with a medicated, instrumental or caesarean section birth for both mother and baby (Buckley, 2014; Sakala, Romano & Buckley, 2016; Wong, Browne, Ferguson, Taylor, & Davis, 2015). If the first birth is a caesarean section a women carries the burden of this surgery into her future pregnancies (Chen, Ford, Ampt, Simpson, & Roberts, 2013). Subsequent birth mode choice is strongly influenced by the first birth (Lobel & DeLuca, 2007; Chen et al., 2013; Wong et al., 2015). If a woman's first birth is a caesarean section she is more likely to request this mode for subsequent births even if she is suitable for a vaginal birth after caserean (ACOG, 2014). One way to avoid the risks of caesarean section is for low-risk primigravida to avoid the birthplace where they occur – the obstetric unit.

In the United Kingdom physiological normal birth rates are recognised as an indicator of quality maternity services (Dodwell & Newburn, 2010). If the same were applied in New Zealand it would demonstrate that we have a long way to go in lowering caesarean and instrumental birth rates (ventouse and forceps), reducing interventions and supporting physiological normal birth for low-risk primigravida. Currently New Zealand's obstetric unit system is struggling with low staffing and a lack of funding so it is timely to educate primigravida about the safety of alternative birthplaces (Midwifery Employee Representation and Advisory Service, 2014).

The challenge lies in how to disseminate evidence-based information on how various birthplace settings influence childbirth outcomes to assist women in making an informed choice. For the purpose of this project it is hoped that this might be achieved through the use of a Patient Decision Aid tool (pDAT) in the form of an App called 'Birthplace – Your Choice'.

Patient Decision Aid Tools (pDATs)

What is a pDAT?

A patient Decision Aid Tool, or pDAT, is a tool such as a pamphlet, video or internet-based programme designed to provide evidence-based information, typically regarding a healthcare choice or treatment to improve decision making (Stacey et al, 2014). They have been developed for a variety of screening, diagnostic, medical, therapeutic and end of life decisions (Stacey, et al., 2014). pDATs differ from standard healthcare educational materials because their aim is to prepare an individual to make an informed decision by providing detailed but accessible information on the risks and benefits when more than one option exists (Sheehan & Sherman, 2012; Tucker Edmonds, 2014). pDATs should help an individual recognise the decision that needs to be made and to feel

informed about options and their risks, benefits and consequences (Stacey et al, 2014). pDATS should assist a person to be clear about what matters to them and to enable discussion to be facilitated with their health professional about their goals, concerns and preferences so that they are involved in decision making (Sepucha, et al., 2013).

A key difference from traditional health education resources is that personal values and preferences are also able to be considered so that any decision arrived at best meets the needs of the individual, which is obviously important during pregnancy (Stevens, Thompson, Watson, & Miller, 2016; Vlemmix et al., 2012). This may be achieved through inclusion of sections which clarify what value an individual places on the benefit or drawbacks of each choice, records preferences, tests knowledge or assesses decisional conflict, for example (Stacey et al, 2014). Decisional conflict is a 'measure of uncertainty about making a particular choice' and should be low when an individual feels confident with the decision made (Say, Robson, & Thomson, 2011). By clarifying what is most important, an individual can be empowered to participate in the decision-making process and make a quality decision, which they may previously have struggled to do without the use of a pDAT (Munroe, Stacey, Lewis & Bansback, 2016). pDATs are recommended to be used within a shared decision-making partnership between the individual and their health professional when patient education on choices is necessary or when unfamiliar information is required to be shared, such as for prenatal screening (Dolan, Veazie, & Russ, 2013; Vlemmix et al., 2012; Yee et al, 2014).

Benefits of pDATs

Although over 200 healthcare pDATs have been developed to date for numerous disciplines, the number developed for pregnancy and birth topics is small yet rapidly increasing (Raynes-Greenow, Nassar, Torvaldsen, Trevena, & Roberts, 2010). Topics such as vaginal birth after

caesarean, breech birth, and labour analgesia have all been developed as pDATs (Stacey, et al., 2014). In the Cochrane review of 86 randomised controlled trials Stacey et al., reported that, compared to usual care, use of a pDAT increased knowledge of outcomes and options, reduced anxiety, reduced decisional conflict related to feeling uninformed, and facilitated realistic expectations of benefits and harms. The authors concluded that using a pDAT also improved engagement in, and overall satisfaction with, the decision-making process and improved patient-health professional communication. Moreover, greater knowledge gains are observed with more complex rather then simple pDATs (Stacey et al., 2014).

pDATS made specifically for maternity decisions such as vaginal birth after caesarean section, have reported similar positive findings to computer-based pDATs demonstrating improved anxiety and decisional conflict scores (Dugas et al., 2012; Eden, Perrin, Vesco, & Guise, 2014; Say et al., 2011; Vlemmix, et al., 2012). These two benefits indicate that during pregnancy pDATs assist women in making decisions that they are certain of (Dugas et al., 2012). When final choice and final outcome are examined, maternity pDATs offer very real potential in effecting change, which is essential if choosing alternative birthplaces is to be encouraged (Nassar, Roberts, Raynes-Greenow, Barrat, & Peat, 2007; Shorten, Shorten, Kleogh, West & Morris, 2005). Vlemmix et al, (2012) suggest that maternity pDATs are unique because decisions made during pregnancy and birth potentially affect two people, the mother and the fetus. This may make these decisions more fraught as some choices will not have an obvious 'best' option but instead are influenced by a woman's preference (Vlemmix, et al., 2012). These decisions may also be called 'preference sensitive' as there is more than one appropriate choice but the decision requires a trade-off between known benefits and harms (Syrowathka, Krömker, Meguerditchian, & Tamblyn, 2016). Choice of birthplace fits into this preference sensitive criteria. Therefore providing information on the risk and benefits of all birthplace options in the form

of a pDAT may assist women in making an informed decision about where they choose to give birth.

Meta-analysis and systematic reviews show that computer and internet-based pDATs appear to perform better than traditional paper-based pDATs (Hoffman et al., 2013; Kuppermann et al., 2009; Lupton, 2016; Sheehan & Sherman, 2011; Stacey et al, 2014; Skjøth, et al., 2015; Syrowathka, et al., 2016). For all types of pDATs improved knowledge and reduced decisional conflict are also reported by users whose preference of choice did not change after exposure to a pDAT (Stacey et al., 2014). This finding indicates that for both decided and undecided individuals a pDAT can be helpful and places the onus on developers to use credible information.

Limitations of pDATs

Research is still establishing which unique features of computer and internet-based pDATs, such as interactivity and content control, make them perform better than traditional pDATs (Hoffman et al., 2013; Syrowathka et al., 2016). Similarly, best practices for computer and internet based pDAT development, evaluation, regulation, and dissemination are still evolving (Hoffman et al., 2013; Syrowathka et al., 2016). The difficulty in confirming research findings on the effectiveness of pDAT features is due to the use of small sample sizes, limited randomized control trials, heterogeneity of the pDAT topics, racial and cultural differences, and the variety of decision aid formats which all limit comparison (Say et al., 2011; Vlemmix et al., 2012). Despite this, evidence of their effectiveness is strong and increasing and, as more is discovered, pDATs have much potential to enable users to participate in high-quality decision making (Sepucha et al., 2013).

pDAT development

Academics, clinicians, universities, voluntary organizations, private individuals and commercial companies are all involved in pDAT development (Coulter et al., 2013). For any pDAT the features incorporated, the testing methods used and how it is developed are ultimately decided upon by the developer (Coulter et al., 2013). This freedom has led to concerns expressed by researchers about issues such as validity, reliability and accuracy of content, unregulated development, lack of testing in clinical settings, exclusion of racially diverse and socio-economically deprived populations, and varied methods of evaluation and implementation (Frosch, Légare, & Mangioine, 2008; Hoffman et al., 2013; Volk, Llewellyn-Thomas, Stacey, & Elwyn, 2013; Stacey et al, 2014).

To overcome this, developers wishing to produce a high quality pDAT would be advised to refer to the online Ottawa Patient Decision Aid Development eTraining Framework which outlines the components required, and supporting theoretical literature (Ottawa Hospital Research Institute, 2015). Another option is to assess the quality of a pDAT (developed or in development) using the criteria outlined in the International Patient Decision Aid Standards [IPDAS] (Elwyn, et al, 2009). Twelve core dimensions related to the content, development and evaluation of pDAT effectiveness can be used by developers and users alike to assess pDAT quality using a checklist (Elwyn et al., 2006). Two optional criteria guide the use of internet-based pDATs and narratives (Hoffman, et al., 2013. Table 1).

For each of these twelve criteria, literature exists to further guide developers. For example, the risk communication primer by Trevena et al., (2013), the GRADE approach for identification of the quality of the evidence presented (Montori, LeBlanc, Buchholz, Stilwell, & Tsapas, 2013) or WebQual: An Instrument for Consumer Evaluation of Websites (Loiacono, Watson & Goodhue, (2007). Moreover, Hoffman et al., (2013)

and others encourage developers to utilize decision-making, information processing and communication theories that 'describe, explain and predict how individuals make complex decisions' (Durand, Stiel, Boivin, & Elwyn, 2008. p.134; Sepucha et al., 2013).

Table 1: Twelve core dimensions for App development

1.	Providing information in sufficient detail
2.	Presenting probabilities in an unbiased manner,
3.	Including methods to clarify values and preferences
4.	Providing structured guidance for deliberation and communication
5.	Presenting information in a balanced manner
6.	Using a systematic development process
7.	Using up-to-date evidence
8.	Disclosing conflicts of interest,
9.	Using plain language
10.	Ensuring that the decision is informed and values-based
Optional	
11.	Internet based criteria
12.	Use of narrative criteria

This is important not only to ensure pDATs enhance decision-making quality but also because the instruments used to measure the effectiveness of a pDAT on outcomes such as knowledge, decisional conflict or satisfaction with decision-making, are founded on these theories (Sepucha, et al., 2013). Sheehan and Sherman (2012) felt that a lack of cohesion between the theories used to develop and measure the effectiveness of a pDAT explained their finding that neither atheoretical nor theoretical based pDATs were superior in improving value congruence or reducing decisional conflict. If a decision is value congruent the option chosen will match an individual's values (Fagerlin et al., 2013). Many instruments are currently in use to assess pDAT effectiveness with the validated Decisional Conflict Scale by O'Connor (1993) and deviations of it most popular. Developed from a decisional conflict theoretical framework this scale can be used to measure personal perceptions of decision uncertainty, feeling informed, one's values, degree of support in decision making, and effectiveness of a decision through five response categories ranging from "strongly agree" to "strongly disagree" (O'Connor, 1993). No one instrument can measure all

decision-making process attributes but ongoing research holds promise in developing more precise tools as patient participation and involvement in decision-making increases (Scholl, 2011; Sepucha et al., 2013).

It could be assumed that all these variables would hinder pDAT development but the process of pDAT development and testing appears to be done similarly by developers (Coulter et al., 2013). Many developers include similar aspects such as scoping and design, development of a prototype, 'alpha' or pilot testing, 'beta' or second prototype development, beta testing in clinical settings, production of the final version, and final testing. Development of 'Birthplace – Your Choice' involved scoping and design followed by alpha testing. Alpha testing involves checking usability and comprehensibility with the target group (Coutler et al., 2013). This process revealed that given the timeframe and the confines of an App format that adherence to the Ottawa Decision Support Framework was impossible although it remains a future goal. Instead 'Birthplace – Your Choice' was graded against eleven of the twelve core dimensions identified by the IPDAS (IPDAS, 2006) (Appendix VIII). The criteria for narratives was excluded as these were not used in 'Birthplace – Your Choice'.

Birthplace pDATs

To date two computer-based pDATs on place of birth have been developed, 'My Birthplace' by the Portsmouth Hospital National Health Service Trust in the United Kingdom and 'Birthplace' by the Queensland Centre for Mothers and Babies, Australia (Portsmouth Hospitals National Health Service Trust, 2016; Queensland Centre for Mothers and Babies, 2015). Both provide statistics on the likelihood of outcomes for mother and baby and how birthplaces differ regarding the type of care available. The latter is designed as a pDAT. 'Birthplace – Your Choice' is the first pDAT, known to the author, that specifically presents New Zealand

maternity statistics and birthplace options in the form of an App.

Features of computer-based pDATs

pDATs are increasingly being developed and tested for digital platforms to meet the demands of individuals accustomed to accessing information via digital technologies (Lupton, 2016). It appears that the unique features of computer based pDATs such as interactivity and advanced visual features, tailoring of personal information, enabling feedback to reinforce comprehension, ability to control content, use of navigation to suit personal preferences and a growing preference and acceptance of a computer format, make these pDATs more appealing to the user (Hoffman et al., 2013; Sawka et al., 2015; Sheenan & Sherman, 2012; Syrowathka et al., 2016; Yee et al., 2014).

Of the pDATs included in the 2014 Cochrane review only four computer based pDATs meet the inclusion criteria yet many more exist in the field (Ottawa Health Research Institute, n.d.; Stacey et al., 2014). Syrowathka, et al., (2016) conducted a meta-analysis which included 58 computer-based pDATs and identified six areas commonly incorporated within them: content control, tailoring, patient narratives, values clarification methods, feedback and social support. These six areas will be explored below because some perform better than others in their ability to improve decision-making and this has impacted upon their inclusion into 'Birthplace – Your Choice'.

Content control, where an individual can select the order, level of detail and type of information presented, is positively associated with improving the sense of individual autonomy and the quality of decision making (Hoffman et al., 2013). The user can then tailor the amount of information they wish to read and the level of detail provided thereby accommodating different levels of health literacy (Syrowathka et al.,

2016). Important consideration must also be given to ensuring safeguards exist so that all necessary information is reviewed (Syrowathka et al., 2016). These two features, content control and use of navigation safeguards, were accommodated during the development of 'Birthplace – Your Choice' through the use of a wireframe. A wireframe is a schematic representation used in App development that outlines not only how navigation will occur to ensured that necessary information is not bypassed but also allows the designer to determine how they wish content to be revealed (Hoffman et al., 2013). The wireframe for 'Birthplace – Your Choice' was designed by S. Ballard as a computer based flow diagram and is discussed further in the methods section 'Collaboration with Centre for Learning and Teaching'.

Tailoring information in a pDAT to reflect individual risk can be achieved using demographic information which is entered by the user or by presenting information based on an individual's preferences or clinical condition such as pregnancy (Syrowathka et al., 2016; Trevena et al, 2013). There is substantial evidence to guide developers in methods used to communicate risk which, when done well, improves the accuracy of risk perception in the user (Trevena et al, 2013; Zipkin et al., 2014). Trevena et al, (2013) identified eleven key components of risk communication which can help developers present risk in formats that increase comprehension and decrease bias and were referred to when developing 'Birthplace – Your Choice'. Risks are often presented as percentages, proportions, or rates but the use of variable denominators, inconsistent numerical formats, use of verbal terms (e.g. "a higher risk"), and use of probabilities, for example, all affect how people perceive risk (Oudhoff & Timmermans, 2015; Trevena et al, 2013; Zipkin et al., 2014).

The denominator neglect effect is well documented and occurs when an individual focuses on the numerator (the number of times an event might happen) and ignores the denominator (overall opportunities for an event to happen) (Garcia-Retamero, Galesic, & Gigerenzer, 2010). For example,

both ‘1 in 10’ and ‘10 in 100’ represent the same probability but the latter is more likely to be percieved to represent a higher risk (Garcia-Retamero, Galesic, & Gigerenzer, 2010). To avoid this misinterpretation it is recommended that the same denominator should be used throughout a pDAT and if possible be 100 rather than 10 000 or 100 000 because ‘x in 100’ is easier to understand and relate to the everyday world (Trevena et al, 2013) For pDATs that use percentage formats (e.g., x%) the addition of a simple frequency (e.g., 1 in 100) may aid comprehension in the likelihood of an event occurring to an individual and these frequencies are processed faster because they are easier to interpret (Oudhoff & Timmermans, 2015; Zipkin et al., 2014).

When information is further supported by inclusion of visual formats such as bar or icon array charts, risk comprehension appears improved, with the latter reducing denominator neglect especially in those people with lower numeracy literacy (Garcia-Retamero & Cokely, 2013). Icon graphs present frequencies rather than probabilities which are easier to understand and more readily trusted (Hawley et al., 2008; Price, Cameron & Butow, 2007). Zikmund-Fisher et al., (2014) found that icon graphs that used anthropomorphic icons such as restroom figures or head outlines to display frequencies rather than blocks or ovals improved understanding of percieved versus actual risk. However they concluded that the optimal icon type depends on the numeracy and graph literacy of the individual. Visual formats enable both the number of people affected (numerator) and number of people at risk (denominator) to be displayed simultaneously requiring less effort to interpret and promoting more accurate risk assessment (Garcia-Retamero, Okan & Cokely, 2012). Other visual formats used may include interactive graphics such as uncovering a risk event by clicking on certain areas in a grid but these emerging methods have mixed effects on numeracy and risk perception (Ancker, Weber, & Kukafka, 2009; Zikmund-Fisher, Dickson, & Witteman, 2011).

Combining written and visual methods to present risk statistics may also overcome the general low level of graph and numeracy literacy in New Zealand. Only one in every five adults is operating at a highly effective level of literacy with women in particular found to have lower levels of quantitative literacy (Ministry of Education, n.d). Therefore by presenting the same risk information in various guises there is increased likelihood that one method will suit the literacy level of the user and aid their understanding. Gaismaier et al., (2012) suggests a better practice might be to allow the user to indicate how they wish to receive information to avoid overload, although this may not always be a feasible option to include in a pDAT.

The inclusion of patient narratives in decision aids is 'intended to provide insight into patient experiences and bring attention to important evidence to consider' (Syrowathka et al., 2016. p.11). The goal is to aid understanding of the issue and the impact of it on individual well being through the provision of emotional and social information yet current use indicates mixed results (Bekker et al, 2013). Some studies have demonstrated no effect on knowledge when a narrative was included while other studies have demonstrated improved recall of information (Kreuter, Holmes, & Alcaraz, 2010; Jibaja-Weiss, Volk, & Granchi, 2011). The potential exists for patient narratives to introduce unintentional bias due to the use of emotive terms or the inclusion of facts only of importance to the narrator. This can lead the user to make decisions based on others values and choices (Bekker et al., 2013; Elwyn et al., 2006). If narratives are to be included their purpose and role in aiding decision making has to be clearly defined by developers, the narrative content needs to be carefully sourced, and integration within the pDAT guided by use of a framework such as the taxonomy developed by Shaffer and Zikmund-Fisher (Bekker et al., 2013; Shaffer and Zikmund-Fisher, 2013).

Value clarification methods are intended to help individuals to identify personal values and preferences that will influence which benefits and harms are most important to them and therefore will impact on their decision (Dugas, et al., 2012; Fagerlin et al., 2013). Value clarification methods are usually used after the provision of information to ensure the decision is congruent with an individual's values (Fagerlin et al., 2013; Munroe, et al., 2015). Methods vary and can be implicit and non-interactive or explicit and interactive (IPDAS, 2012). Value clarification methods can include thinking about one's options, using a notebook to record areas where more information is needed, participating in trade-off exercises where the individual must consider risks and benefits, weighting exercises where outcomes are rated on a scale of 1-10, or using interactive shifting sliders to indicate a preference (IPDAS, 2012; Syrowathka, et al., 2016). Witteman et al., (2016) concluded that the most promising design feature of a value clarification method is one that explicitly demonstrates the implications of an individual's values, for example, by displaying the extent to which each of their decision options aligns with what matters to them. The effectiveness of value clarification methods needs to be further explored but overall their use has positive rather than negative consequences and consensus recommends inclusion in pDATs (IPDAS, 2012; Fagerlin et al., 2013; Witteman et al., 2016).

'Birthplace – Your Choice' included two value clarification methods, the four item SURE screening test, and Dolan's Decisional Conflict Scale based upon the work of O'Connor both of which require the user to consider how important each issue is to their individual situation using terms such as "not important", "important", or "very important" (Dolan et al., 2012; Parayre, Labrecque, Rousseau, Turcotte, & Légaré).

Feedback during pDAT use can improve decision-making quality. This could be feedback on progress through the pDAT itself or feedback on knowledge necessary to make a specific choice (Syrowathka et al., 2016). The latter was incorporated through the use of 'pop-ups' during the 'Birthplace -Your choice' quiz where answers were confirmed as correct, or if incorrect the correct answer was given. Feedback can also be

provided to the user through the use of decisional conflict scales, where through answering the questions an individual can comprehend how sure they are of their choice (O'Connor, 1993).

Social support is increasingly being enabled in computer/internet pDATs. media sites, offer online peer support or include narratives in engaging formats such as interactive icon graphs (Hoffman et al., 2013). Similarly, to narratives, the potential for unintentional bias exists if social support sections are incorporated into a pDAT and more theoretical work needs to uncover how people 'perceive, value and use the personal experiences of others' and use this to make decisions (Hoffman et al., 2013. p.6). Support from others faced with the same decision (community), those affected by the decision (family) and those who facilitate shared decision-making (health practitioner) all have a positive effect on a pDAT user (Syrowathka, et al., 2016). Despite the strong influence these social factors have in pregnancy the best manner to integrate these social aspects into pDAT development remains unclear so they were not included in 'Birthplace – Your Choice' (Coxon, 2014; Syrowathka, et al., 2016).

Hoffman et al., (2013) notes that computer and internet-based pDATs such as 'Birthplace – Your Choice' that are designed to inform and educate, may also have other features that reflect theories of active, discovery or social learning. A quiz can reinforce awareness and facilitate realistic expectations while interactive activities can reinforce comprehension and personalization of information for the individual (Hoffman et al., 2013). Both these components were included in 'Birthplace – Your Choice'. The authors note that complex navigation appears to complicate the delivery of information and should be kept to a minimum which was the focus of wireframe planning for 'Birthplace – Your Choice'. Providing feedback on choices made and how these might match with the values and preferences an individual initially entered may increase decisional conflict and should be avoided, while feedback on progress through a pDAT appears beneficial (Hoffman et al., 2013). Neither of these features were included in 'Birthplace – Your Choice'.

The identification of these six areas is helpful in aiding computer-based pDAT development and those that were included when developing 'Birthplace – Your Choice', will be discussed in more depth in the methods section.

Apps in healthcare

Apps vary greatly in their healthcare purposes. Some support the practice needs of target audiences such as drug guides for doctors; while others are purpose built for specific medical specialities, provide disease-specific information, or aid medical education and teaching (Boulous et al., 2014). Boulous et al., (2014) state that the majority of health Apps though, are aimed to aid lifestyle management, with health and fitness being the largest App category while the remainder assist with management of disease states or are used for self-diagnosis. Apps are being integrated into mobile health (mHealth) healthcare delivery systems – a rapidly growing field due to worldwide growth of mobile and innovative technologies (World Health Organisation, 2011). mHealth is defined as 'a medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants, and other wireless devices' (World health Organisation, 2011. p.6). Of the eight mHealth categories outlined by the World Health Organisation 'Birthplace – Your Choice' could fit into the minority group of Apps being used for "Awareness raising over health issues", the health issue being the over-medicalisation of low-risk births without maternal or neonatal benefit (World Health Organisation, 2011. p.12).

Pregnancy and Pregnancy Apps

Research shows that pregnant women, especially primigravidas, are high users of online electronic health media (eHealth), frequently using the internet, Facebook, Instagram, and other networking sites to gain and share information on pregnancy and parenting, obtain emotional support and make social connections (Derbyshire & Dancy, 2013; Lupton, 2016; Sayakhot & Carolan-Olah, 2016; Wallwiener et al, 2016; World health Organisation, 2011). eHealth access is greatest at the beginning of pregnancy when women are known to have the most questions despite the standard schedule of antenatal visits being less frequent at this time (Kraschnewski et al., 2014). An App offers pregnant women immediacy of information on demand from any location without having to wait to access a health professional, and women have been found to seek App information if they feel their pregnancy care is insufficient (Kraschnewski, et al., 2014; Lupton, 2016).

In her small focus group study of currently or recently pregnant Australian women Lupton (2016) found that of the variety of digital platforms available women found smartphone Apps to be the most useful means to obtain information regarding pregnancy (Lupton, 2016). That Apps are a preferred medium is supported by an online survey of 203 pregnant women conducted by Petrie who found that 65% had downloaded on average three pregnancy Apps (as cited in Derbyshire & Dancy, 2013). The most sought after topics are fetal development (57%), nutrition during pregnancy (56%) and pregnancy complications (26%). Use continues into the postnatal period with Apps available to support breastfeeding and newborn sleep (Lagan, Sinclair & Kernohan, 2010; Rodger et al., 2013; Thomas & Lupton, 2015).

Declercq, Sakala, Corry, Applebaum, and Herrlich (2013) found that 56% of primigravidas in their American study believed Apps provide valuable information. They also found that women were wary of the credibility of

the content, questioning its validity and observing when Apps were supported by commerical companies and noting how this could bias the information presented (Lupton, 2016; Thomas & Lupton, 2015). This observation by women highlights an issue with Apps where, similar to pDAT development, there is a lack of regulation and development guidelines (Scott, Richards, & Caldwell, 2014). Concerns around lack of health professional involvement, lack of evidence-based information, defective functionality, insufficient reliability and lack of security and privacy and their impact on the quality and trustworthiness of Apps have been raised by developers and consumers alike (Barton, 2012; Boulous et al., 2014; Thomas & Lupton, 2015). The American Federal Drug Administration (FDA) is the only professional body to have released guidelines for App developers (FDA, 2014) while Boulous et al., (2014) outlines four quality content criteria that address authorship, reporting of references, disclosure of sponsorship or conflicts of interest and non-biased current information.

Powell and Gordon (2015) report that the Apple App Store and Google Play currently offer 1915 and 302 pregnancy-related Apps respectively. The Apps generally fit into three categories depending upon whether they are used to provide entertainment, monitor a pregnancy or baby, or provide pregnancy information. They also appear to be more popular than fitness Apps with some pregnancy related Apps having download figures in the millions (Thomas & Lupton, 2015). It is suggested that due to their popularity and widespread use Apps could influence maternity care due to the potential to empower women to take responsibility for their own health (Tripp et al., 2014). It therefore, made sense to develop 'Birthplace - Your Choice' as a smartphone App to ensure it has potential to reach as many people as possible.

Smartphone use in New Zealand

Approximately 70% of New Zealanders own a smartphone and 59% prefer this to any other device (Research New Zealand, 2015). Moreover, over three quarters of New Zealanders use their smartphone to access Apps for information (Research New Zealand, 2015). Smartphone ownership is also highest in the 18-34 year old group – the target audience for 'Birthplace – Your Choice' primigravidas (Research New Zealand, 2015). Notably, this includes the 57%, from lower socioeconomic groups (earn less than $NZ40 000) thus enabling them to also obtain information that previously was only accessible via a personal computer which they were less likely to own (Hoffman et al., 2013; Research New Zealand, 2015). Preference for smartphones and high consumer use of Apps predicts that developing 'Birthplace – Your Choice' as a smartphone App will be widely acceptable and accessible to many women regardless of their socioeconomic status. It also means that there is potential for it to become easily integrated within midwives' practice when facilitating informed decision making as it could be loaded onto the midwife's or woman's phone thus becoming freely available for use in antenatal discussions. Such use in clinical practice supports the finding that the greatest benefits of pDATs occurs when they are combined within usual care (Vlemmix, et al, 2012).

How a pDAT is used

Ideally a pDAT is integrated within usual care provision where the decision needing to be made is explicit such as 'Where shall I give birth?' In usual care provision a health professional may discuss the benefits and risks of a treatment or choice but fail to understand what might matter most to a person or recognise the influence of personal values and beliefs (Munroe et al., 2016). This oversight can be avoided through incorporation of a pDAT where discussion of the benefits and risks occurs,

the person has time to reflect and clarify their personal values and preferences and together, with the health professional, make a decision (Ottawa Hospital Research Institute, n.d.; Stiggelbout, Peiterse, & De Haes, 2015). When this occurs both the health professional and individual have a better understanding of what matters and are able to decide on an option that best matches the values and needs of the individual facing the decision (Munroe et al., 2016).

When discussing topics, health professional preference and practice philosophy may lead to misrepresentation of information (O'Cathain & Thomas, 2004; Tucker Edmonds, 2014). This could mean that a woman is not fully informed of her birthplace options despite many women expressing interest in birthing outside of an obstetric unit if other options are discussed (Henshall, Taylor & Kenyon, 2016). In their systematic review, Henshall, Taylor and Kenyon (2016) found that little is known about how birthplace discussions occur in practice between midwives and women. They found that midwives' knowledge and confidence of different birthplaces influenced the information shared with women as did for example, hospital policies, peer opinion and societal preference for hospital birth. These authors state that if birthplace discussions are to promote choice the information provided needs to be in a standard format that is 'relevant and comprehensible' (p.65). This can be achieved through the use of an App with pDAT components as the information provided is evidence-based and standardised. With regards to 'Birthplace – Your Choice' the use of New Zealand primigravida statistics means that the information is specific for the women using the App and relevant to New Zealand's maternity system so as they can make specific and relevant choices (O'Cathain & Thomas, 2004).

pDATs, shared decision making and Midwifery

Facilitating informed decision making is a legal requirement of maternity health care providers in New Zealand (Health and Disability

Commissioner, 2007). It is also a foundation of the midwifery philosophy and partnership model of care whereby decision making between the midwife and women is shared (Guilliland & Pairman 2010; New Zealand College of Midwives, 2011). This process is upheld as the ideal model of clinical decision making (Say, et al., 2011).

Midwives in New Zealand already have access to additional information sources to facilitate decision making. Paper booklets or information sheets are usually produced by hospitals to provide information on induction of labour, external cephalic version, vaginal birth after caesarean section and other topics. Some of these support the preferred protocol or practice of a hospital or may not discuss all options available despite the goal of their use being to facilitate informed decision making. For example, the option to decline is minimised in the 'Vitamin K for Newborn Babies' pamphlet produced by the Auckland District Health Board (Auckland District Health Board, n.d). Consumer groups such as Women's Health Action Trust and the Maternity Services Consumer Council (MSCC) produce more in depth information pamphlets but these have a cost to obtain for women and midwives. None of these nationally produced pamphlets are a pDAT and none state the likely outcomes at various Birthplaces although the MSCC 'Labour and Birth - Your Choice' pamphlet discusses the effect of the environment and interventions on labour (MSCC, n.d).

International pDATs for maternity topics can be found online through agencies such as The Ottawa Hospital Research Institute which acts as a repository, or the Queensland Centre for Mothers and Babies which produces Australian specific pDATs. Of these international sources, only the United Kingdom and Australia have produced Birthplace pDATs with the latter being the only pDAT in a computer format. Most pDATs can be downloaded and printed out for use but unfortunately, not only do New Zealand practitioners need to know where to find these, they also need to translate the information provided to suit the New Zealand context.

When a pDAT is implemented within usual care provision so that information can be shared, knowledge improved, options discussed and values clarified, there is a reduction in uncertainty and anxiety in a woman's decision making (O'Cathain & Thomas, 2004; Stacey et al., 2014; Vlemmix et al., 2012). These benefits are reduced when a pDAT is used independently by an individual without health professional interaction so integration of a pDAT within antenatal care provision appears essential to maximise its benefits (Stacey et al., 2014). Therefore, it is foreseeable that a pDAT in the form of an App could fit well within midwifery antenatal care provision where the content can be easily accessed and reviewed by the midwife and woman together over time.

Literature Review

Introduction

The literature review for 'Birthplace – Your Choice' was extensive due to the numerous information sections that were chosen to be incorporated. This section begins by exploring what birthplace options women have in New Zealand and how choice of birthplace and Lead Maternity Carer are important. The rationale for the choice of the seven main content sections used within 'Birthplace – Your Choice' is then explained and literature to support the information provided is reviewed. Other pertinent information mentioned in the App that can impact upon outcomes such as syntocinon augmentation, continuous electronic fetal heart rate monitoring and skin-to-skin contact will also be discussed.

Birthplace Options in New Zealand

New Zealand low-risk primigravida are able to choose to birth at home, in a midwifery unit or an obstetric unit and midwives can

provide care in all these locations. Some District Health Boards have closed their midwifery units leaving women in these areas with only two options – home or an obstetric unit. This is unfortunate especially as the MoH state on their website that women who birth at home or in a midwifery unit are more likely to have a normal birth (MoH, n.d).

Birthplace environments are chosen by women because of the way they differ. Women who opt for a home or midwifery unit birth typically have a strong belief in the capability of their body to give birth naturally without the need for pharmaceutical or medical assistance (Coxon et al., 2014). They wish to have a homely setting to birth in, where they can relax and are free to move, eat and drink, and control their birth experience. Support people and the needs of the whanau are more able to be accommodated in contrast to obstetric units where the number of support people is usually limited. There are limited pharmacological pain-relief options at a midifery unit and none at a homebirth so non-pharmacological pain relief options are frequently used such as water immersion. Women who birth in a midwifery unit are aware that transfer is required if specialist services or epidural anaesthesia is needed.

Obstetric units are recommended for women and babies with health conditions (MoH, n.d.). The design of the birthing rooms in obstetric units reflect the focus on providing the technology and surveillance needed to care for women with health conditions e.g. continuous fetal heart rate monitoring, although some now have pools available. The main reason noted by low-risk primigravida for choosing an obstetric unit is the availability of 24 hour medical, obstetric, neonatal and anaesthetic specialist care (Coxon et al., 2014; Grigg, Tracy, Daellenbach, Kensington, & Schmied, 2014).

As will be further investigated in the following literature, low-risk primigravida who birth at home or in a midwifery unit are more likely to have a normal birth, have less interventions, use less pain relief, and

experience lower rates of postpartum haemorrhage while outcomes for their babies are similar, or better than, those from planned hospital births (Birthplace in England Collaborative Group, 2011; Davis et al, 2011; Dixon et al., 2014; Farry, 2015; MoH, 2016a; National Institute for Health and Clinical Excellence, 2014; Sandall et al., 2016). Choice of birthplace is therefore important but outcomes are also influenced, as previously mentioned, by the choice of a Lead Maternity Carer.

Impact of Lead Maternity Carer on Birth Outcomes

Choice of Lead Maternity Carer is associated with differing rates of interventions with case-loading continuity of midwifery care demonstrating improved outcomes for low-risk women compared with standard care from an obstetrician, community midwife or general practitioner (Sandall et al., 2016; McLachlan et al., 2012). A Cochrane review that examined midwife-led care provided in hospital found lower rates of analgesia, episiotomy and instrumental vaginal delivery, an increase in the rates of spontaneous vaginal births but no reduction in caesarean section rates (Sandall et al., 2016). They also reported that initiation of breastfeeding, women's feeling of being in control and increased satisfaction with their maternity experience were higher while babies fared better, with lower rates of preterm birth or stillbirth (Sandall et al, 2016).

For primiparous women birthing in hospitals, both the Australian cross-sectional study by Tracy et al., (2013) and the randomized controlled trial by McLachlan et al., (2012) found similar effects when women who received case-loading continuity of midwifery care were compared to standard or private obstetric care. In contrast to these two studies which used sub-analysis of their cohort to obtain primigravida statistics, the study by Wong et al., (2015) specifically studied low-risk primigravida women. In this retrospective comparative cohort study of 426 women who experienced continuity

of case-loading midwifery care compared with 1220 women who had standard care at a tertiary hospital they found that the former model was safe and reduced obstetric intervention rates and instrumental birth rates while increasing normal vaginal birth rates. This study also differed because the outcomes reported were from a midwifery unit alongside an obstetric unit rather than a comparison of care models within an obstetric unit.

It appears that midwifery care in any birthplace improves outcomes and is safe compared with standard care from other lead maternity carer options (Begley et al., 2011; Birthplace in England Collaboration Group, 2014; Dixon et al., 2014; Farry, 2015; McIntyre, 2012; MoH, 2016a; Sutcliffe et al., 2012). Low-risk primigravida therefore need to be aware that both the choice of birthplace and lead maternity carer can impact upon birth outcomes. As previously noted, 85% of New Zealand women choose a midwife yet if the midwife was to support the same woman to birth in any of the three birthplace options the outcomes are highly likely to be different (Miller, 2014). This effect is most likely due to the policies, practices and culture of each birthplace (Miller, 2014) and is demonstrated in the following section, which explores the outcomes for low-risk primigravida birthing in an obstetric unit, a midwife-led unit or at home in New Zealand.

Birthplace Outcomes

For 'Birthplace - Your Choice' New Zealand rates of vaginal and caesarean birth, postpartum haemorrhage, vaginal tears, admission of babies to neonatal intensive care units, use of respiratory support and an Apgar score less than 7, are presented, along with information on the use of hydrotherapy and transfer rates from home or midwifery unit to an obstetric unit. Ideally, and consistent with best development processes, opinion would have been sought from primigravidas for whom the pDAT was intended and an expert panel on what content should be included

(Coulter et al., 2013). Time and project size constraints prevented this from occurring. Instead, the information on hydrotherapy was obtained from Midwifery and Maternity Providers Organisation [MMPO] (2011) statistics while information on transfer from home or midwifery unit to hospital was generated from the work of Dixon et al., (2014). The remaining outcomes listed were chosen because they are used as primary indicators by the MoH to measure and compare the quality of maternity care for the standard primigravida and their neonates (MoH, 2016a). Moreover, birthplace research uses similar indicators to measure the safety of low-risk primigravida birthing at midwifery units or at home. It therefore makes sense that these indicators be used in 'Birthplace – Your Choice' to aid informed decision making on birthplace options.

Vaginal birth

New Zealand women who birth at home and in midwifery units have higher rates of vaginal birth. In the last five years in New Zealand these birthplaces have maintained vaginal birth rates over 98% (MMPO, 2011; MoH, 2016a). This figure is for all women and includes those who may have some risk factors such as gestational diabetes or desire a vaginal birth after a prior caserean section. Even with these risk factors the chance of these women achieving a vaginal birth is better than a low-risk primigravida who chooses to birth in an obstetric unit (MMPO, 2011; MoH, 2016a). The average vaginal birth rate for a low-risk primigravida who births in a New Zealand obstetric unit is 63.6%, but ranges from 53.6% to 84.5% between facilities, and 52.9 % to 86.4% between District Health Board's (MoH, 2016a). This demonstrates concerning discrepencies in health outcomes for the same group of low-risk primigravida occurring because of their chosen place of birth.

Both New Zealand and international figures show that in an obstetric unit, interventions used during labour and birth are commonplace, with many known to decrease the chance of having a vaginal birth (Dixon, 2016;

Green & Baston, 2007, Jansen, Gibson, Bowles & Leach, 2013; Royal College of Midwives, 2016). In 2014 only one in four low-risk primigravida in New Zealand had a normal vaginal birth and notably 96.6% of these women chose to birth in hospital (MoH, 2016b). A normal birth is defined by the MoH as a labour that starts spontaneously and does not include induction, augmentation, epidural or episiotomy (MoH, 2016b). This means that for these low-risk healthy primigravida approximately 75% had at least one form of intervention: 28.7% had an induction of labour, 31.5% had their labours augmented with syntocinon, 42.2% had an epidural, 28.6% had an episiotomy, and 15.2% had a caesarean with some women having more than one, or all, of these interventions (MoH, 2016a). It is alarming that such high rates of interventions occur in a healthy low-risk population, but New Zealand statistics reflect similar worldwide trends (Anim-Somuah, Smyth, & Jones, 2011; Birthplace in England Collaborative Group, 2011; Bugg, Siddiqui, & Thornton, 2011; Dahlen et al., 2012; Tracy, Sullivan, Wang, Black & Tracy, 2007).

Buckley (2015) points out that from an evolutionary standpoint many of these interventions are new and used without an understanding of their biological impact on mothers and babies. In her monograph 'Hormonal Physiology of Childbearing: Evidence and Implications for Women, Babies, and Maternity Care' the hormonal impact of common interventions and their impact on childbearing, bonding, lactation, infant brain development, adult health and more, are discussed (Buckley, 2015). She states that when the "delicate interconnections that are biologically designed to optimally prepare baby and mother for birth" are disturbed, society as a whole appears to suffer and the medical priori to "do no harm" becomes questionable (Buckley, 2015. p.v). This effect is specifically evident when the 'cascade of intervention' is examined.

THE CASCADE OF INTERVENTION

When one intervention leads to another it is called the 'cascade of intervention' whereby the combining of side-effects often results in

increased risk and decreased likelihood of a vaginal birth (Lothian, 2014; Petersen, Poetter, Michelsen, & Gross, 2013; Rossignol, Chaillet, Boughrassa, & Moutquin, 2014). For example, an epidural, especially if used prior to 5 cm cervical dilation, is more likely to interfere with the hormonal physiological feedback necessary for labour progress (Anim-Somuah et al., 2011; Buckley, 2015; Neal & Lowe, 2012; Sakala, Romano & Buckley, 2016). If labour should slow, augmentation with the synthetic hormone, syntocinon, may be used to induce contractions (Costley, & East, 2013; Medsafe, 2015). Syntocinon augmentation is also known to increase the likelihood of fetal distress necessitating an emergency caesarean (Lothian, 2014; Simpson & James, 2008). An epidural can also prolong the second stage of labour due to the lack of sensation making it more difficult to for the woman to feel the expulsive contractions that give her the urge to push (Anim-Somuah et al., 2011). The resulting lack of descent and labour progress may make an instrumental birth necessary which, in turn, may require an episiotomy (Jansen et al., 2013).

When combined as a whole, this cascade demonstrates the interrelationship between interventions used during labour and how they may decrease the chances of a vaginal birth occurring especially for primigravida (Buckley, 2015; Lothian, 2014; Petersen et al., 2013). A population study of 145,211 low-risk primigravida in Australia demonstrated that vaginal birth rates declined linearly with each inclusion of an intervention during labour (Tracy et al., 2007). Interventions commonly used in primigravida labour are induction of labour, epidural and syntocinon augmentation and with all three, either use individually or combined in a labour, the use of continuous electronic fetal heart rate monitoring is recommended. These interventions are now individually discussed.

Induction of Labour

THE BENEFITS OF SPONTANEOUS LABOUR

Allowing labour to begin spontaneously is beneficial for numerous reasons. Labour onset is mediated by many factors including hormonal messages between the mother and baby that signal both physiological and psychological readiness for birth (Buckley, 2015). Importantly, for the baby this means its organs, specifically its lungs, brain and gastrointestinal system, are mature and ready to function (Hillman, Kallapur, Suhas, & Jobe, 2012). Exposure to intrapartum maternal hormones and the process of labour itself further enhance a successful transition to newborn life (Buckley, 2015). Buckley explains how babies born after a drug-free spontaneous labour differ to those exposed to medicalised births. She states that they are more alert at birth, demonstrate normal newborn behaviour, breastfeed more successfully, require less specialist care and have lower rates of food allergies. Others report similar findings specifically fewer Apgar scores less than 7 and less admissions to a neonatal intensive care units for assistance with breathing (Buckley, 2015; de Jonge et al., 2009; Dixon et al., 2014; Grigg, Tracy, Tracy, Schmied, & Monk, 2015).

INDUCTION OF LABOUR

A normal pregnancy lasts anywhere from 37-42 weeks gestation (Gülmezoglu, Crowther, Middleton, & Heatley, 2012). An induction of labour may be offered when a labour becomes prolonged, typically after 41 weeks gestation, and is defined as the 'process of artificially stimulating the uterus to start labour by administering syntocinon or prostaglandins to the pregnant woman or by manually rupturing the amniotic membranes' (WHO, 2011. p.6). Recommending an induction of labour after 41 weeks assumes that all women ovulate at the same time and gestate their babies for the same length of time despite this not being the case, making some inductions unnecessary (Morken, Melve, &

Skjaerven, 2011).

In a low-risk pregnancy the intention of an induction of labour for post dates is primarily focused on the reduction of stillbirth (Gülmezoglu et al., 2012). The process may use some or all of the following interventions; prostaglandin gel, amniotomy, and syntocinon augmentation with the latter two potentially causing fetal distress due to hyperstimulation of the uterus (Gülmezoglu et al., 2012). In New Zealand the stillbirth rate has declined, while in Australia and America it has risen despite all three countries witnessing increasing rates of induction of labour, especially for primigravidas (Health Quality & Safety Commission New Zealand, 2016; MacDorman, Reddy, & Silver, 2015; Patterson, Ford, Morris & Roberts, 2014). The lack of stillbirth reduction in America and Australia is postulated to be related to other factors such as maternal age, obesity, or smoking which may have more of a causative role than the risk of a prolonged pregnancy (MacDorman et al., 2015; Patterson et al., 2014).

An induction of labour is not recommended until after 41 weeks gestation in New Zealand but induction policies differ internationally and thereafter the optimal management of pregnancies remains unclear (American College of Obstetricians and Gynecologists, 2014; Gülmezoglu et al., 2012; Wennerholm, Hagberg, Brorsson & Bergh, 2009). The Cochrane review by Gülmezoglu et al., (2012) found that when compared with expectant management, where waiting for the onset of labour to occur spontaneously occurs, induction of labour at greater than 41 weeks gestation is associated with fewer fetal deaths, but that the absolute risk of fetal death with either waiting or inducing is small, less than 1%. The authors note that many studies included in the review have potential methodological biases. Rosenstein, Cheng, Snowden, Nicholson, & Caughey, (2012) calculated that to prevent one fetal death after 41 weeks gestation 1476 women would need to be induced. For low-risk primigravida, this means exposing oneself to the side effects of induction including increased risk of uterine rupture, epidural use, postpartum haemorrhage, fetal distress, low Apgar score, and a more than doubling of

the risk of having an emergency caesarean (Davey & King, 2016; Rossignol, Chaillet, Boughrassa, & Moutquin, 2014; Selo-Ojeme, et al., 2011; WHO, 2011; Alfirevic et al., 2009). Dekkar (2016) states that the absolute stillbirth risk increases after 42 weeks when it becomes 1 in 1000 and until that time women should be counselled on the benefits and risks of induction of labour before 42 weeks gestation when the risk is less.

Epidural Anaesthesia

EPIDURAL ANAESTHESIA DURING LABOUR AND BIRTH

In labour, epidural anaesthesia provides excellent pain relief compared to other pharmacological drugs used in labour such as nitrous oxide or opiates such as pethidine (Anim-Somuah et al., 2011). However, the potential for an epidural to disrupt normal birth physiology is well known (Buckley, 2015; Lothian, 2014). The provision of anaesthesia blocks the pain pathways required to stimulate oxytocin release from the anterior pituitary, oxytocin levels fall resulting in a slowing of contractions and syntocinon augmentation frequently become necessary (Anim-Somuah et al., 2011). An epidural also requires intravenous fluids, catherisation, continuous electronic fetal heart rate monitoring, and restricts movement (Lothian, 2014).

A 2011 Cochrane review found epidural anaesthesia use associated with increased risk of maternal hypotension, motor blockade, maternal fever, urinary retention, longer second stage of labour, syntocinon augmentation, instrumental vaginal birth, and caesarean as a result of fetal distress (Anim-Somuah et al., 2011). Other cohort studies that have specifically examined the effect of epidural anaesthesia on low-risk primigravida support the association found with an increased risk of caesarean (Eriksen, Nohr, & Kjærgaard, 2011; Rossignol et al., 2014; Nguyen et al., 2010). A solution suggested to reduce these adverse outcomes is to use low dose epidural anaesthesia thereby reducing the

physiological effect epidural drugs have on maternal and fetal physiology (Sultan, Murphy, Halpern, & Carvalho, 2013). These epidurals are now more common, appear to have fewer side-effects and result in lower rates of instrumental but not caesarean births (Sultan et al., 2013).

Cheng, Shaffer, Nicholson, and Caughey, (2014) found that epidural anaesthesia had a larger effect than previously thought in prolonging of the second stage of labour to longer than 2 hours. Compared to women with no epidural they found that this increased instrumental birth rates (Cheng et al., 2014). Epidural anaesthesia relaxes the pelvic floor muscles potentially delaying progress and increasing the possibility of malposition of the fetal head making instrumental birth more likely (Royal College of Obstetricians and Gynaecologists, 2011). As a result it is recommended that pushing be delayed to allow for passive descent with pushing not to be commenced until this has occurred or a woman has a spontaneous urge to push (Di Franco & Curl, 2014; Lothian, 2014).

Women exposed to opioids and epidural anaesthesia during labour and birth are also at an increased risk of delayed onset of lactation, have more difficulties breastfeeding, experience more pain during recovery, are more likely to have early breastfeeding cessation and increased formula use compared to mothers who receive no labour pain medication (Brown & Jordan, 2014; Brimdyr et al., 2015; Dozier et al., 2013; Lind, Perrine, & Ruowei, 2014; Olza-Fernández, 2014). This is because epidural drugs alter the natural prolactin and oxytocin hormones responsible for lactation (Medsafe, n.d; Odent, 2013).

EPIDURAL ANAESTHESIA AND VALSALVA MANOEUVRE

Pushing during birth with epidural anaesthesia in situ is usually directed by a health professional using a closed glottis (Valsalva) method where a woman is instructed to take a breath, hold it, and push for as long as possible before exhaling and then quickly repeating this until the contraction has finished (Lemos et al., 2015). Valsalva pushing, with or

without epidural anaesthesia, has potential to decrease blood flow to the uterus and therefore oxygen to the fetus, can cause maternal fatigue, damage to the pelvic floor and bladder, fetal acidosis, hypoxia, and low Apgar score although more research is required (Lemos et al., 2015). A meta-analysis of 425 primiparous women demonstrated that Valsalva pushing has a negative effect on urodynamic factors (Prins, Boxem, Lucas, & Hutton, 2011). Authors conclude that the method of pushing should be decided upon by the woman but this may not be possible when a woman has epidural leaving no option but to use Valsalva pushing (Lee, Dy & Azzam, 2016; Lemos et al., 2015; Prins, Boxem, Lucas, & Hutton, 2011).

EPIDURAL ANAESTHESIA AND FETAL/NEONATAL EFFECTS

Epidural anaesthesia may also affect the baby. While it does not appear to affect Apgar score (Anim-Somuah et al., 2011) exposure to analgesic drugs may affect breastfeeding behaviour such as rooting for the breast and the ability to establish breastfeeding which can increase the likelihood of early breastfeeding problems (Dozier et al., 2013; Zanardo et al., 2010; Wiklund, Norman, Uvnas-Moberg, Ransjö-Arvidson, & Andolf, 2009). Grenwell et al., (2011) found a linear relationship between epidural anaesthesia induced elevation of maternal temperature and increased adverse neonatal outcomes including early separation and admission of the baby to neonatal intensive care units.

Overall, epidural anaesthesia is an effective method of pain relief that has both maternal and fetal risks that need to be considered by childbearing women. Epidural anaesthesia is only available in obstetric units where uptake is high especially for primigravidas (42.2%) (MoH, 2016a). Its association with contributing to the 'cascade of intervention' specifically with the need for labour augmentation with syntocinon is a well documented effect that may go some way to explaining the poorer outcomes witnessed in this birthplace (Anim-Somuah et al., 2011).

Augmentation of labour with intravenous syntocinon

Due to the heterogeneity of studies the evidence related to augmentation of spontaneous labour with intravenous syntocinon in primigravidas is unclear. Some studies demonstrate that its use increases vaginal birth rates (Wei Luo, Xu, & Fraser, 2009) yet a recent Cochrane review concluded that it does not affect mode of birth (Bugg, Siddiqui & Thornton, 2013), while evidence about low versus higher doses of syntocinon also remains unclear (Mori, Tokumasu, Pledge, & Kenyon, 2013). When used in the labour of a low-risk primigravida, an Australian population study demonstrated syntocinon augmentation increased the risk of epidural anaesthesia, instrumental births and caesarean section compared to primigravida who did not receive this drug (Buchanan, Patterson, Roberts, Morris & Ford, 2012). Similarly, a Swedish population study reported an increase in epidural use and caesarean section with higher rates of babies experiencing low Apgar score and neonatal intensive care unit admission (Oscarsson, Amer-Wahlin, Rydhstroem, & Kallen, 2006). A prospective study of low-risk primigravidas from Norway found higher rates of episiotomy, and instrumental, and caesarean section births when labour was augmented with syntocinon (Bernitz, Øian, Rolland, Sandvik, & Blix, 2014). Importantly, they found that labour dystocia was the justification given to use syntocinon augmentation for 42.5% of women even though they did not meet the criteria for dystocia in the hospital used in the study (Bernitz et al., 2014).

This finding highlights the commonality of this intervention within everyday obstetrics regardless of clinical indication. Syntocinon augmentation without dystocia is more likely to occur when women have a higher BMI, birth babies with a higher birth weight, a longer duration of labour and use epidural anaesthesia (Bernitz et al., 2014; Selin, Almström, Wallin, & Berg, 2009). It is concerning that researchers have found that women are being exposed to the risk of syntocinon without a clinical indication. They report that this may reflect a lack of knowledge

on normal variations of labour duration, unrealistic expectations for progress in labour, lack of guidelines on syntocinon augmentation or occur due to the practice philosophy of the hospital (Bernitz et al., 2014; Selin et al., 2009).

Syntocinon augmentation is also associated with higher rates of postpartum haemorrhage. This is theorised to be due to the desensitising effect syntocinon has on uterine receptors when it is used in labour (Bernitz et al., 2014; Clark, Simpson, Knox, & Garite, 2009; Phaneuf, Rodriquez Inares, TambyRaja, MacKenzie & Lopez Bernal, 2006). This theory is supported by both Grotegut, Pagila, Johnson, Thames, & James, (2011) and Belghiti, Dupont, Rudigoz, Bouvier-Colle, & Deneux-Tharaux, (2011) who found that women exposed to higher rates of syntocinon augmentation were more likely to have a postpartum haemorrhage caused by uterine atony. When combined with an epidural anaesthetic, syntocinon augmentation also appears to increase rates of fetal distress during labour, risk of low Apgar scores for babies and admission to a neonatal intensive care unit (Anim-Somuah et al., 2011; Tracy, Sullivan, Wang, Black, & Tracy, 2007).

Syntocinon is classified as a high-alert medication because its use is linked to preventable adverse neonatal outcomes such as fetal hypoxia and acidosis (Bernitz et al., 2014; Buchanan et al, 2012; Simpson & James, 2008; Clark et al., 2009; Vardo, Thornburg & Glanz, 2011). Studies have also linked syntocinon exposure to maternal lactation difficulties and a baby's ability to breastfeed due to altered feeding behaviour (Bell, White-Traut & Rankin, 2013; Brimdyr et al., 2015; Brown & Jordan, 2014; Olza Fernández et al., 2012). Bell, Erickson and Carter (2014) note the growing body of evidence demonstrating a link with syntocinon exposure during labour and altered mothering behaviours such as difficulties bonding and postnatal depression. Given that little is known regarding the long term maternal or neonatal consequences of syntocinon it is concerning that approximately 30% of low-risk primigravidas in New Zealand will be exposed to its use even though the United States Food and Drug

administration states its use should be restricted (Hayes & Weinstein, 2008; MoH, 2016a). Syntocinon augmentation is only available in obstetric units therefore avoiding this birthplace could reduce the likelihood of being exposed to this drug during labour and birth.

Both epidural anaesthesia and syntocinon augmentation require additional monitoring due to the potential for increased adverse outcomes to occur to the baby. The most frequently used method is continuous electronic fetal monitoring which in, and of itself adds to the cascade of intervention and introduces risk.

CONTINUOUS ELECTRONIC FETAL MONITORING

The National Institute for Health and Clinical Excellence (NICE) states that intermittent auscultation rather than continuous electronic fetal monitoring should be used with women who have low-risk pregnancies and who are labouring spontaneously (NICE, 2014). Compared with intermittent auscultation, being monitored using EFM prevents mobilisation and use of alternative comfort measures such as water in labour (hydrotherapy) and thus interferes with normal birth physiology making interventions more likely (Buckley, 2015).

Alfirevic, Devane and Gyte's 2017 systematic review of electronic fetal monitoring concluded that its introduction within maternity care provision has made no difference to neonatal cerebral palsy or neonatal perinatal mortality rates despite these being the very indicators that were theorised would be reduced with its use. Moreover, electronic fetal monitoring has been found to increase instrumental and caesarean section rates with no improvement in Apgar score (Alfirevic et al., 2013; Goer & Romano, 2012; Hersh, Megregian, and Emeis, 2014). The false-positive rate of electronic fetal monitoring is 99% meaning that it only indicates fetal distress correctly for 1% of babies (Sartwelle, 2012). Its use is therefore frequently questioned in the literature with Sartwelle (2012)

and others noting that any other medical intervention with such a high failure rate would have long been abandoned (Grimes & Peipert, 2010; King & Parer, 2011).

Questions have also been raised regarding why, despite these findings and recommendations from prominent professional and governmental agencies, organisations such as the American College of Gynaecologist's (ACOG) have not abandoned this technology especially when it is largely accountable for the increase in caesarean sections being performed worldwide (Alfirevic et al., 2017; Sartwelle, 2012). In 2009 the ACOG released a practice bulletin stating electronic fetal monitoring or intermittent auscultation are both acceptable for low-risk women and both options are also supported by the Royal Australian and New Zealand College of Obstetricians and Gynaecologists (2014)(ACOG, 2009). It would therefore appear, that while the limitations of electronic fetal monitoring are noted this non-evidenced based practice will continue to be used possibly due to economic or medical-legal reasons (Vintzileos, 2009).

Intermittent auscultation is when the fetal heart is auscultated using a pinard or electronic Doppler and is the method used more often at homebirth and midwifery units. Intermittent auscultation appears to enhance physiological birthing as it can be used with the woman in any position she desires including water immersion (Hersh, Megregian, and Emeis, 2014). It also appears to be safe and does not expose the fetus to iatrogenic risks associated with electronic fetal monitoring such as emergency caesarean section. (Alfirevic et al., 2014; NICE, 2014).

Caesarean Section

The overall caesarean section rate in New Zealand for low-risk primigravidas is 15.6% but varies from 8.9% to 25.7% depending on the hospital and/or District Health Board area a primigravida woman births in (MoH, 2016a). Globally, the average rate of caesarean section for low-risk

primigravida from 150 countries is 18% with an average increase of 4.4% observed every year since 1990, especially in middle to highly developed countries (Betrán et al., 2016). The World Health Organisation states that rates above 10-15% are higher than considered medically justifiable and result in women and babies being exposed to increased morbidity and mortality compared with vaginal birth (WHO, 2015). It would appear on first glance that New Zealand's primigravida rates are on par internationally but upon closer examination the rates indicate inconsistencies. For low-risk primigravidas the chance of needing a caesarean section is expected to be low because they are healthy (MoH, 2016a). When these women choose to birth at a midwifery unit the chance of having a caesarean section is 0.1% but when the same women birth in an obstetric unit the rate rises to 18.2% (MoH, 2016a).

MATERNAL AND NEONATAL RISKS OF CAESAREAN SECTION

A caesarean section is not without risk. Despite this, rates are increasing for many reasons including maternal preference, preference of the physician, routine use of interventions, fear of litigation, fear of birth, ineffective prenatal education, and staffing issues (WHO, 2015). Compared with a vaginal birth, low-risk primigravida and their babies are more likely to experience more short and long term morbidity and mortality after a caesarean section (Davey & King, 2016). Postpartum haemorrhage, infection, bladder damage, venous thromboembolism, difficulties breastfeeding and bonding, and rates of maternal death are all higher after a caesarean section compared to a vaginal birth (ACOG, 2014; Johnson, 2013; Kinsey, Baptiste-Roberts, Zhu, & Kjerulff, 2014; Klar & Michels, 2014; Liu et al., 2007; Prior et al., 2012; Swain et al, 2008).

Babies who experience birth via caesarean section are less likely to receive the fetal catecholamine surge of late labour that prepares them for newborn respiratory transition, thermoregulation, and glucose regulation (Hillman, et al., 2012). This may explain why they are twice as likely to be admitted to a neonatal intensive care unit compared to those

born vaginally (Hillman, et al., 2012; MoH, 2016a). There is also concern that lack of exposure to the bacterial flora of the vagina, called the microbiota, alters the development of the immune system and metabolic function of caesarean section born babies (Kristensen & Hemriksen, 2016; Matamoros, Gras-Leguen, Le Vacon, Potel, & de La Cochetiere, 2013). This has epigenetic consequences and is associated with the increased risk of non-communicable diseases such as obesity, asthma, food sensitivities and allergies, child onset diabetes, autoimmune and behavioural disorders (Cardwell et al., 2008; Curran et al., 2015; Dahlan, Kennedy, et al., 2013; Kristensen & Hemriksen, 2016; Koplin, Allen, Gurrin, Osborne, Tang, & Dharmage, 2008; Matamoros, Gras-Leguen, Le Vacon, Potel, & de La Cochetiere, 2013; Schwartz et al., 2012).

There is a drive in the United States to reduce the rate of 'primary' or first caesarean sections because of the increased maternal and neonatal morbidity associated with it and the impact upon future pregnancies (American College of Obstetricians and Gynecologists [ACOG] & Society for Maternal-Fetal Medicine [SMFM], 2014). This drive has focused on correct diagnosis of labour dystocia and redefining active labour parameters. The 2014 'Safe Prevention of Primary Cesarean Section' statement re-evaluates the definition of normal and abnormal progress in the first stage of labour and gives clear recommendations for when intervention is required (ACOG & SMFM, 2014). This is important for two reasons; Firstly, labour dystocia, an ambiguously defined and diagnosed term, is the most common cause of a primary caesarean section in low-risk primigravidas (Neal & Lowe, 2012). This is despite there being little evidence to support at which stage of cervical dilation active labour starts, what constituents normal labour progress and how best to measure it, and the best method to manage slow labour (Lavender, Hart, & Smyth, 2013; Neal & Lowe, 2012; Neal et al., 2010; Wei et al., 2013; Zhang et al., 2010).

A recent Concensus released by the ACOG and SMFM states that 'cervical dilation of 6 cm should be considered the threshold for the active phase

of most women in labor' not 3-4cm which still currently informs midwifery and obstetric practice worldwide (ACOG & SMFM, 2014. p.7; Stables & Rankin, 2010; Neal & Lowe, 2012; Zhang et al., 2010). When active labour is defined as beginning at 6cm cervical dilatation intervention use declines, physiological vaginal birth rates increase, and outcomes improve. Neal, Lowe, Koschoreck and Anderson (2016) found in their pilot study in the United States that the use of a partogram based on active labour beginning at 6cm reduced labour dystocia diagnosis and caesarean section rates for low-risk primigravida compared with women for whom labour progress was traditionally assessed. More research is needed but importantly shifting active labour onset to 6cm also accommodates the unique variations of first time labour patterns that exist yet still result in a vaginal birth (Albers, 1999; Neal et al., 2010).

Secondly, having a caesarean section can impact upon future pregnancies. Fertility appears to be affected with more women struggling to become pregnant after a caesarean section compared to women who previously had a vaginal birth (Gurol-Urganci et al., 2013). After conception pregnancies following a caesarean section are at increased risk for abnormal placentation, postpartum haemorrhage, peripartum hysterectomy and preterm birth, while babies are at increased risk of being small for gestational age and experiencing stillbirth (de la Cruz, Thompson, O'Rourke, & Nembhard, 2015; Gurol-Urganci et al., 2013; Moraitis et al., 2015; Sevelsted, Stokholm, Bønnelykke, & Bisgaard, 2015; Thavagnanam, Fleming, Bromley, Shields, & Cardwell, 2008).

Postpartum Haemorrhage

Postpartum haemorrhage is one of the leading causes of maternal mortality worldwide accounting for approximately 25% of all maternal deaths with rates highest in low-income countries and lowest in high-income countries (Say et al, 2014). Postpartum haemorrhage affects 3-5% of New Zealand pregnancies and caused 3 maternal deaths after 20 weeks gestation during the period from 2006

– 2014 (Health Quality & Safety Commission New Zealand 2016; MoH, 2016a). Rates of postpartum haemorrhage caused by uterine atony are reported to be increasing in Australia, Belgium, Canada, France, the United Kingdom and the United States by the International Postpartum Hemorrhage Collaborative Group (Knight et al., 2009). These rising postpartum haemorrhage rates remain even when risk factors such as obesity, maternal age, and parity are considered, leading some authors to conclude that this increase is more likely due to a complex interplay of certain components of care such as induction of labour, use of syntocinon and active management of the third stage (Callaghan, Kulina, & Berg, 2010; Joseph et al., 2007; Knight et al., 2009).

Intervention use is linked with postpartum haemorrhage. Studies have shown that induction of labour, syntocinon augmentation, episiotomy, instrumental birth, caesarean section and active management of the third stage of labour are all associated with increasing the risk of postpartum haemorrhage (Davis et al., 2012; Knight et al., 2009; Rossen, Okland, Nilsen, Eggebø, 2010). First time labours are characteristically longer which of itself can increase the risk of a postpartum haemorrhage occuring due to uterine atony but when combined with the commonality of intervention use in obstetric units the likelihood of a postpartum haemorrhage increases even further (ACOG & SMFM, 2014; Cheng, Hopkins & Caughey, 2004; Davis et al., 2012; MoH, 2016a; Le Ray et al., 2011).

DEFINING POSTPARTUM HAEMORRHAGE

The definition of a postpartum haemorrhage and how best to measure blood loss is debated in the literature (Knight, et al., 2009). The most commonly used definition of a postpartum haemorrhage is a blood loss greater than 500 ml for a vaginal birth as measured by estimation or weighed blood loss (Knight et al., 2009). Accuracy of assessing blood loss this way has been questioned but Conner et al., (2015) found it was still relevant for today's obstetric population. Another method used to diagnose postpartum haemorrhage is blood loss requiring a blood

transfusion (MoH, 2016a). Used to define severe life threatening postpartum haemorrhage it is stated to be a more objective measure (MoH, 2016a). Blood transfusion rates can be affected by individual refusal among other factors (MoH, 2016a), and reporting rates using this method negates the morbidity experienced by women who lose sufficient blood to delay lactation for example, yet their postpartum haemorrhage does not warrant a transfusion so does not become statistically significant. Moreover, the different methods used to define postpartum haemorrhage can lead to difficulties comparing statistics not only for blood loss but also for postpartum haemorrhage outcomes at different birthplaces.

The New Zealand MoH reports a postpartum haemorrhage as having occurred if there has been a requirement for a blood transfusion (MoH, 2016a). Using this method, low-risk primigravida were reported to have postpartum haemorrhage rates of 2.3%, 1.2% and 0.7% when they birthed at an obstetric unit, midwifery unit or at home respectively (MoH, 2016a). On close inspection these rates between birthplaces look comparable with a slightly increased risk for women birthing at an obstetric unit. In contrast, Farry (2015) investigated postpartum haemorrhage rates per blood loss of 500ml or more. Using this method in her study, postpartum haemorrhage rates for obstetric units were observed to be 7.8% and for midwifery units 3.0%, homebirth was not included (Farry, 2015). She concluded that low-risk women birthing in an obstetric unit were significantly more likely to experience a postpartum haemorrhage (Farry, 2015).

BIRTH OF THE PLACENTA AND POSTPARTUM HAEMORRHAGE

A low-risk primigravida can birth her placenta physiologically using maternal effort alone or choose to have this stage of her birth actively managed (Dixon et al., 2013). Active management involves giving a uterotonic drug after the birth of the baby, which causes the uterus to contract so that the placenta can then be pulled out after the cord is

clamped and cut (Begley et al., 2015). Active management was introduced because a major complication of the third stage of labour is uterine atony leading to postpartum haemorrhage (Dixon et al., 2013).
A Cochrane review in 2011 concluded that active management reduces rates of severe postpartum haemorrhage >1000ml blood transfusion and use of iron therapy for anaemia in the postnatal period (Begley et al, 2015). This review included women who were at an increased risk of postpartum haemorrhage because they were induced, augmented or had a history of postpartum haemorrhage and who would therefore likely benefit from active management (Begley et al, 2015). However, a meta-analysis that focused on women at low-risk of bleeding found no difference between either a physiological or actively managed third stage preventing blood loss >1000ml (Begley et al., 2015). This means low-risk women are exposed to the potential side effects of active management drugs such as vomiting, increased blood pressure, after-pains, and increased readmission to hospital for heavy bleeding but obtain no protection against having a postpartum haemorrhage >1000mls (Begley et al., 2011).

Davis et al., (2012) found that for low-risk primigravida in New Zealand, rates of severe postpartum haemorrhage > 1000ms were higher in any birthplace if the third stage was actively managed, finding a two-fold increase compared with physiological management. Dixon et al., (2013) also examined third stage management practices in their population based retrospective cohort study of 33,752 women in New Zealand from 2004-2008. They found that low-risk primigravida women were more likely to have an actively managed third stage than multiparous women and that active management was more likely to occur in an obstetric unit than a midwifery unit or at home supporting the evidence that environment and hospital policy impact upon third stage options when birth occurs in an obstetric unit (Dixon et al., 2013). Overall, they found that women who had a physiological birth and a physiological, rather than actively managed, third stage were twice as likely to need treatment for

postpartum haemorrhage, but that women who were actively managed from the outset were twice as likely to have blood loss greater than 500 ml. These findings demonstrate that low-risk women should be supported to have a physiological third stage regardless of birthplace as it appears protective of blood loss >1000 ml. A physiological third stage also has benefits for the baby compared to active management.

Babies are affected by active management because early clamping of their cord that is part of the process of active management of the birth of the placenta, removes 80mls of their cord blood from their vascular system resulting in lower birth weights, increased rates of anaemia in the first 6 months of life and bradycardia in the first 1-2 minutes of life (Dawson et al., 2010; McDonald, Middleton, Dowswell, & Morris, 2013; WHO, 2014). It is now recommended that delayed cord clamping for 1-3 minutes occurs at all births (National Institute for Health and Clinical Excellence, 2014; Royal College Obstetricians and Gynaecologists, 2015; WHO, 2014).

Birthplace also seems to affect postpartum haemorrhage rates. The women included in the Cochrane review all birthed in an obstetric unit where there is potential for a lack of confidence and experience in managing physiological placental birth (Begley et al, 2015). Midwifery experience in both actively managed and physiological placental birth and use of midwifery units appear protective against postpartum haemorrhage (Begley, Guilliland, Dixon, Reilly, & Keegan, 2012; Dixon et al., 2013; Fahy, et al., 2010). When no intervention occurs during a labour and birth the natural hormonal mechanisms needed to birth the placenta and stem blood flow are optimal (Buckley, 2015). Calm, relaxed environments where mothers and babies are undisturbed after birth, such as those found in midwifery units and at home, appear to support practices such as skin-to-skin and immediate breastfeeding that aid birth of the placenta and decrease postpartum haemorrhage rates for low-risk women (Fahy et al., 2010; Saxon, Fahy, Rolfe, Skinner, & Hastie, 2015).

Perineal Trauma & Episiotomy

The perineum is the area between the base of the vagina and anus that may be damaged during the process of birth itself or if an episiotomy is cut (ACOG, 2016). Damage is assessed depending on the extent of skin, muscle and anal sphincter involved and it is estimated that approximately 53-79% of women experience some degree of perineal trauma when giving birth (ACOG, 2016). Most trauma involves first and second degree tears but there appears to be a trend that rates of severe perineal trauma that involves the anal sphincter are increasing (Dahlen, Priddis, & Thornton, 2015; Gurol-Urganci, et al., 2013; Lindgren, Radestad, Christensson, & Hildingsson, 2008; MoH, 2016a; Vale de Castro Monteiro et al., 2016).

Risk factors most consistently reported for severe perineal trauma are being a primigravida, experiencing an instrumental birth, fetal macrosomia, and episiotomy although ethnicity, specifically being Asian, and improved diagnosis also contribute (Dahlen et al., 2015; Edqvist et al., 2016; Gurol-Urganci, et al., 2013; Landy et al., 2011; Lindgren et al., 2008; Lowder, Burrows, Krohn, Weber, 2007). Perineal trauma is linked to increased pain, infection and prolonged recovery time that may also impact on mothering, breastfeeding and resumption of sexual intercourse (Dahlen & Homer, 2008; ACOG, 2016).

BIRTHPLACE AND PERINEAL TRAUMA

In their prospective observational study in England Smith, Price, Simonite, & Burns, (2013) compared perineal trauma rates in three birthplace locations, hospital, midwifery unit and homebirth. They, and others, concluded that perineal trauma rates vary due to practitioner care practices, birthplace and differences between midwifery and obstetric practices with higher rates observed in obstetric units compared with midwifery units or at home (Dahlen & Homer, 2008; Edqvist et al., 2016; Dahlen, Schmied, Dennis, & Thornton, 2013; Davies-Tuck et al, 2015;

Gurol-Urganci et al., 2013; Landy et al, 2011).

In 2014 in New Zealand, primigravida had higher rates of an intact perineum when they planned to birth at home (90.1%) or in a midwifery unit (55.7%) compared to woman who planned to birth in an obstetric unit (20.5%) (MoH, 2014). Episiotomy rates showed similar discrepancies with 27.2% of obstetric unit women experiencing this intervention compared to 1.9% at a midwifery unit (MoH, 2016a). Findings for homebirth perineal trauma rates are confusing as 90.1% of women were recorded as having an intact perineam, none were reported to have had an episiotomy while 2.6% sustained a third or fourth degree tear (MoH, 2016a). The remaining 7.3% appears unaccounted for and is not explained (MoH, 2016a).

Routine episiotomy use has not been recommended since the seminal randomized control trial by Sleep et al., in 1984 demonstrated its use was associated with more postpartum pain and slower healing compared to women who experienced a 2nd degree tear (Sleep, 1984). Selective episiotomy, though, may decrease the rates of severe perineal trauma (ACOG, 2006; Carroli, & Mignini, 2009; Laine, Skjeldestad, Sandvik, & Staff, 2012). This effect is demonstrated by the observed statistical differences in primigravida who had an episiotomy and had no severe perineal trauma (22.7%) compared to those received severe perineal trauma but did not have an episiotomy in 2014 in New Zealand (4.5%)(MoH, 2014). Although this might demonstrate that there is potential for an episiotomy to reduce the incidence of severe perinal trauma other research has found the opposite is true. Räisänen et al., (2014) found that selective episiotomy use decreased severe perineal trauma in the first , but not subsequent births, after which rates of severe perineal trauma increased with use of an episiotomy. Yamasato et al., (2016) found in their retrospective analysis that selective episiotomy use was associated with an increase in 3rd and 4th degree tears in spontaneous vaginal births. It would appear then that if the evidence on the use of episiotomy to prevent severe perineal trauma is contradictory, best-

practice recommendations would be better guided by practices that reduce both its use and improve rates of intact perineum.

The lower episiotomy rates found at midwifery units and at homebirth may be explained by the ability of these birthplaces to better support physiological birth and for midwives to practice midwifery (Birthplace in England Collaborative Group, 2011; Lingren, Brink, Kinberg-Allvin, 2011; Monk, Tracy, Foureur, Grigg & Tracy, 2014). Birth position is known to affect perineal outcome with positions which free the sacrum potentially improving perineal outcomes compared with lying supine (de Jonge, Teunissem & Largo Janssen, 2004; Dahlen, Dowling, Tracy, Schmied, & Tracy, 2013; Di Franco & Curl, 2014; Kemp, Kingswood, Kibuka, & Thornton, 2013). Birthing while squatting, on hands and knees, side-lying (especially with an epidural) and on a birth stool, if used for less than half an hour, have been found to reduce perineal tearing as has immersion in water (Cluett & Burns, 2009; Gupta, Hofmeyr, & Shehmar, 2012; Shorten, Donsante, Shorten; 2002; Thies-Lagergren, Kvist, Christensson, & Hildingsson, 2011). Valsalva pushing is known to increase pressure on the perineum resulting in more tears and weakening of the pelvic floor musculature leading to urinary incontinence (Di Franco & Curl, 2014; Schaffer, et al., 2005).

Being experienced in assisting women to birth in upright positions may also decrease second-degree tears (de Jonge, Teunissen, & Largro-Janssen, 2004). A randomized control trial on perineal techniques found that the use of warm compresses on the perineum demonstrated reduced rates of 3rd and 4th degree tears, postnatal pain on day 1 and 2 and urinary incontinence compared to women who received standard techniques to protect the perineum (Aasheim et al., 2011). Use of such techniques is important as severe perineal trauma is linked to pelvic floor disorders such as stress urinary incontinence and faecal incontinence (Dahlen & Homer, 2008; Memon & Handa, 2013).

PELVIC FLOOR DISORDERS

The literature on associations between pelvic floor disorders and mode of birth is weak with a lack of randomized control trials and methodological issues apparent (Tähtinen, et al., 2016; Memon & Handa, 2013). Risk factors include advanced maternal age, obesity, multiparity, episiotomy, fetal macrosomia and prolonged second stage with active pushing and/or instrumental birth, and instrumental birth itself especially forceps (Haddock & Handa; 2016; Kepenekci et al, 2011; Memon & Handa, 2013). Hormonal, mechanical and neuromuscular changes occur during pregnancy to assist with achieving childbirth but these changes themselves may also be associated with causing pelvic floor disorders irrespective of mode of birth (Johannessen, Wibe, Stordahl, Sandvik, & Mørkved, 2015; Sangsawang & Sangsawang, 2013).

Vaginal birth may increase the rates of stress urinary incontinence and faecal incontinence with greater rates observed immediately after the first birth (Gyhagen, Åkervall, and Milsom, 2015; Memon & Handa, 2012; Hallock & Handa, 2016; Thom & Rortveit, 2010). While caesarean before, or after, labour onset appears protective against both stress and urgent urinary incontinence it does not appear to protect against faecal incontinence and carries other significant short and long term risks for mother and baby (Tähtinen et al., 2015; Johannessen et al., 2015; Nelson, Furner, Westercamp, & Farquhar, 2010). Caesarean is also postulated to be protective of sexual function compared with a vaginal birth but the literature remains inconclusive (Sayasneh & Pandeva, 2010).

In their review, Memon and Handa (2013), state that 'the exact mechanism of injury associating vaginal birth with pelvic floor disorders is unclear but is likely multifactorial' with birth practices and physiology playing a part (p.265). Use of the Valsalva maneouver, for example, during childbirth increases pressure on the pelvic organs and tissues and may result in injury to nerves, bones, and the levator ani muscles increasing the likelihood of pelvic floor disorders in primigravida (Miller et al., 2015; Van Delft, Sultan, Thakar, Schwertner-Tiepelmann, & Kluivers,

2014; Schwertner-Tiepelmann et al., 2012). The shape and structure of the female pelvic anatomy may predispose women to more pelvic floor disorders compared to men but also genetic disposition may explain the higher rates observed in primigravidas who have either a vaginal birth or caesarean as their first and only birth but experience pelvic floor disorders (Gyhagen et al., 2015; Hallock & Handa, 2016). Pelvic floor muscle training is associated with reducing urinary incontinence and should be taught to all women antenatally and postnatally to protect pelvic organ function (Mørkved & Bo, 2013; Sangsawang & Sangsawang, 2013).

There is a dearth of studies examining rates of pelvic floor disorders after vaginal births conducted by midwives in non-medical environments where practices that may help protect the pelvic structures and reduce pelvic floor disorders, such as non-directive pushing and selective episiotomy, are used.

A prospective study in England found lower rates of severe perineal trauma when women laboured in midwifery units with use of a pool, hands-off the perineal technique, and digital perineal stretching found to be protective (Smith et al., 2013). While Rogers study of 782 American primigravida concluded that the 630 who received midwifery care and had a vaginal birth compared to an elective caesarean had less pelvic dysfunction at 6 months (Rogers et al., 2013). Midwifery care appears to improve perineal and pelvic function especially when it is able to be provided outside of an obstetric unit.

Skin to skin after birth

Skin-to-skin is the practice of having undisturbed time between a mother and baby in the immediate period after birth, also referred to as the 'Sacred Hour' and as often as desired in the immediate postnatal period regardless of whether a woman intends to breastfeed or not (Crenshaw, 2012). Skin-to-skin benefits both the mother and baby. For a mother having her baby skin-to-skin elevates the release of hormones such as prolactin, beta-endorphin and oxytocin, which are respectively associated

with breastfeeding, analgesia, and attachment and nurturing interactions (Dumas et al., 2013; Matthiesen, Ransjö-Arvidson, Nissen, & Uvnäs-Moberg, 2001; Moore, Anderson, Bergman, & Dowswell, 2012). All of these hormones are released in higher amounts compared to mothers where there is a delay in skin-to-skin such as in caesarean births or when routine neonatal procedures take precedence (Sobel, Silvestre, Mantaring, Oliveros, Nyunt-U, 2011).

Skin-to-skin supports the baby in its transition to newborn life. It provides a thermo-neutral environment thereby facilitating regulation of glucose metabolism, respiration and stabilises the heart rate (Moore et al., 2012). These babies appear to cry less, have lower stress levels as measured by cortisol, establish a microbiota that reflects maternal rather than hospital flora, have enhanced breastfeeding initiation and are breastfed for longer in the first year of life (Sobel et al., 2011; Takahashi, Tamakoshi, Matsushima, & Kawabe, 2011).

Non-Pharmacological methods for labour pain relief

Non-Pharmacological labour pain methods include massage, aromatherapy, breathing techniques, one-to-one support, mobilisation and upright positions, and use of water, called hydrotherapy. In comparison with epidural anaesthesia for example, these options do not expose the mother or baby to the side-effects of medications likely to disrupt normal labour physiology and may in fact enhance labour progress by reducing stress and increasing the release of hormones specifically beta-endorphin, a natural pain reliever (Buckley, 2015).

CONTINUOUS ONE-TO-ONE SUPPORT

The ACOG & SMFM concluded that ‘the most effective tool to improve labour and delivery outcomes is the continuous presence of support personnel’ (ACOG & SMFM, 2014. p.13). Continuous one-to-one support

during labour and birth is believed to be a factor contributing to the improved maternal and fetal outcomes achieved with case-loading midwifery care (Hodnett, Gates, Hofmeyr, & Sakala, 2013). Women who receive such support feel more emotionally and physically supported, remain confident, are more able to actively work with their labour and are less likely to require epidural anaesthesia, syntocinon augmentation or caesarean section (Hodnett et al., 2013). When this support is provided from someone else other than the midwife this appears to improve satisfaction but not improve clinical outcomes (Hodnett et al., 2013).

BEING UPRIGHT AND MOBILE

Being upright and mobile in labour has maternal and fetal benefits but some interventions such as epidural and continuous electronic fetal heart rate monitoring restrict freedom to move (Zwelling, 2010). Changing positions allows women to cope with their pain and uses gravity to its best advantage in helping bring the baby down (Ondeck, 2014). Lying down during labour can reduce contraction strength, slow dilatation and effacement, cause dystocia, increase pain, epidural and episiotomy use, and decreased the blood flow to the placenta and fetus causing failure to progress and fetal distress (Jansen et al., 2013). In the second stage of labour lying down is associated with increased instrumental births, pain, perineal trauma and caesarean (Zwelling, 2010). Being upright and mobile counters these issues but is assoicated with an increased blood loss over 500 ml (Gupta, Hofmeyr & Shehmar, 2012; Lawrence, Lewis, Hofmeyr, and Styles, 2013). This blood loss is attributed to second degree tears not the upright position itself and may be reduced when the midwife is experienced with protecting the perineum in upright postiions (Gupta, Hofmeyr & Shehmar, 2012).

Importantly, women report they are more satisfied with their childbirth when they can move, compared with women who labour semi-reclined or lying down (Priddis, Dahlen, & Schmied, 2011). When a mother moves during labour and birth oxygenation of the baby is improved, the incidence of abnormal fetal heart rate patterns decreases as does the

number of babies admitted to neonatal intensive care units and Apgar scores <7 at five minutes (Lawrence, Lewis, Hofmeyr, and Styles, 2013; Simpson & James, 2005). The rate of severe perineal trauma experience by primigravida is reduced when the sacrum and pelvic bones are not restricted (Edgvist et al., 2016).

HYDROTHERAPY

Use of water in labour is called hydrotherapy and is a non-medical method of providing pain relief. It involves the woman's abdomen being totally submerged in warm water (Cluett & Burns, 2009). Water immersion and waterbirth differ. Water immersion is defined as immersion in water only during the first stage of labour (Liu et al., 2014) while waterbirth is defined as intentionally giving birth to a baby underwater (Bovbjerg, Cheyney, & Everson, 2016). It is unknown how many New Zealand women use water immersion only but do not proceed to a waterbirth (MMPO, 2011). Women find use of water immersion soothing and calming enabling anxiety and stress to be reduced, which facilitates the optimal release of hormones that not only aid labour progress but provide endogenous pain relief (Buckley, 2015; Richmond, 2003; Rooks, 2012). Maternal release of analgesic beta-endorphins is enhanced providing endogenous pain relief which, when combined with the buoyancy of water, may reduce contraction pain (Cluett & Burns, 2009). This effect may explain the decreased rates of epidural anaesthesia or other analgesia commonly reported with women who use water immersion during labour (Buckley, 2015; Cluett & Burns, 2009; Rooks, 2012; Torkamani et al., 2010; Mollamahmutoğlu et al., 2012).

As a non-pharmacological pain-relief option, water immersion does not expose either the mother or fetus to adverse physiological effects known to occur with pharmacological options such as opioids (Jones et al, 2012). Immersion in water during labour also increases the use of upright positions optimizing fetal position and contraction efficacy compared with conventional birth (Dahlen, Dowling, Tracy, Schmied, & Tracy, 2013). This

may explain the shortening of the duration of first and second stage of labour observed with labouring in water (American College of Obstetrics and Gynaecologists & American Academy of Pediatrics, 2016; Cluett, & Burns, 2009; Torkamani, Kangani, & Janani, 2010; Mollamahmutoğlu, et a., 2012).

Waterbirth

Waterbirth, the intentional act of giving birth to a baby underwater, is more common in a midwifery unit or at a homebirth (Bovbjerg, Cheyney, & Everson, 2016; Lukasse, Rowe, Townend, Knight, & Hollowell, 2014; MMPO, 2011). In New Zealand, in 2011 waterbirth rates for all women were 21.9%, 21.2% and 2.3% at home, in a midwifery unit and in an obstetric unit respectively (MMPO, 2011). In total only 7% of babies are born into water indicating that despite its benefits, uptake is low (MMPO, 2011). Waterbirth is less likely to be used in an obstetric unit because a pool might not be available, staff may not be confident in supporting waterbirth, staff shortages may prevent provision of one-to-one care needed for waterbirth, or higher use of interventions may prevent the woman from entering the pool (Nicholls, Hauck, Bayes, & Butt, 2016; Midwifery Employee Representation and Advisory Service, 2014).

BENEFITS OF WATERBIRTH

Use of water for birth may be especially advantageous for low-risk primigravidas because it increases vaginal birth rates, decreases the length of first and second stage of labour, reduces interventions such as augmentation, amniotomy, epidural, episiotomy, and does not increase the risk of maternal infection or postpartum haemorrhage (Anselmi, 2016; Bovbjerg et al., 2016; Burns, Boulton, Cluett, Cornelius, & Smith, 2012; Cluett & Burns, 2009; Dahlen et al., 2013; Liu et al., 2014; Lukasse et al., 2014; Mollamahmutoğlu et al., 2012; Zanetti-Dällenbach, Lapaire, Maertens, Holzgreve, & Hösli, 2006). There may also be potential for a reduction in caesarean births (Liu et al., 2014).

IS WATERBIRTH SAFE?

A widely-voiced concern about waterbirth regards safety for the baby. Recent American College of Obstetrics and Gynaecologists (ACOG) and American Academy of Pediatrics' (AAP) guidelines advise women that immersion in water for labour is considered safe but that waterbirth is not recommended (ACOG & AAP, 2016). This guideline has been criticised for being based on rare severe neonatal complications and use of case reports, the lowest form of research evidence, when robust population cohort studies exist (ACOG & AAP, 2016; Bovbjerg et al., 2016; Montori et al., 2013). Most waterbirth research to date is observational and descriptive and although this means causal associations cannot be concluded the existing evidence is reassuring regarding maternal and neonatal morbidity and mortality (Nutter, Meyer, Shaw-Battista, & Marowitz, 2014).

Bovbjerg, et al., (2016) conducted the largest retrospective cohort study on waterbirth in midwifery units and homes in the United States and the cohort included higher risk pregnancies such as twins and breech. From these 18,343 births, which included 18,397 neonates, waterbirth was not associated with any adverse neonatal outcome. Women had no increased risk of adverse outcomes except for genital tract trauma, which was higher (Bovbjerg et al., 2016). A review by Nutter et al., (2014) which examined cohort studies in Europe concluded, that based on the thousands of women who have given birth in water, that the potential risks appear minimal while maternal satisfaction with the childbirth experience is greater. Similarly, systematic review and meta-analysis conclude outcomes are similar, if not improved, between waterbirth and conventional birth for low-risk women (Davies, Davis, Pearce, & Wong, 2015; Taylor, Kleine, Bewley, Loucaides, & Sutcliffe, 2016).

WATERBIRTH AND PERINEAL TRAUMA

The relationship between waterbirth and perineal injury is unclear as rates of trauma are compared to conventional births where episiotomy is

often routinely used (Henderson et al, 2014; Mollamahmutoğlu et al., 2012). It appears that the chance of perineal damage occurring during a waterbirth is the same or less than the chance you would get an episiotomy on land (Dahlen et al., 2012; Henderson et al, 2014; Mollamahmutoğlu et al., 2012). Studies demonstrate lower use of episiotomy and less severe vaginal and perineal trauma with waterbirth (Dahlen et al, 2013; Henderson et al., 2014; Nutter et al., 2014; Zanetti-Dällenbach et al, 2006). This may be explained by the physiological effect warm water has on perineal tissues. Warm water aids flexibility of the birth canal and perineum and facilitates the extension of both during birth through improved perineal blood circulation and reduced hypoxia and ischemia (Liu et al., 2014). Dahlen et al., (2013) found that low-risk women who had a waterbirth in a midwifery unit had better perineal outcomes compared with six positions on land, which included birthing semi-recumbent, the traditional position used to birth with an epidural.

In the first study ever to examine pelvic organ prolapse and stress urge incontinence, Liu et al., (2014), found rates were lower for women who had experienced waterbirth. Although promising they note more research is needed to determine if this is due to waterbirth itself. Choosing a waterbirth may also offer protection against transfer occuring during or after labour as it has been found to decrease rates of maternal or neonatal transfer from home or a midwifery unit to an obstetric unit (Bovbjerg et al., 2016; Burns et al., 2012; Lukasse et al., 2014).

WATERBIRTH AND NEONATAL OUTCOMES

Outcomes for baby appear similarly positive. Johnson, (1996) explains that as long as the baby is brought immediately to the surface, the diving reflex mechanically blocks the airway of submerged newborns preventing them from aspirating water and drowning is prevented. Current studies have found similar or improved rates of Apgar score at 5 minutes compared with babies born on land, although a lower Apgar at 1 min is often observed but is reported to be without consequence (Anselmi,

2016; Bovbjerg et al., 2016; Cluett & Burns, 2009; Davies et al., 2015; Dahlen et al., 2013; Lukasse et al., 2014; Thoeni, Zech, Moroder & Ploner, 2005; Zanetti-Dällenbach et al., 2006). There appears to be no difference in rates of neonatal injury or mortality, infection, cord snapping, resuscitation, admission to neonatal intensive care units, cord pH values, or infection compared to conventional labour (Bovbjerg et al., 2016; Cluett & Burns, 2009; Davies et al., 2015; Nutter et al., 2014; Thoeni et al., 2005). Interestingly, some studies have demonstrated that neonates fare better being born into water with reported lower rates of infection and neonatal intensive care unit admission (Bovbjerg et al., 2016; Davies et al., 2015).

It appears that low-risk women should have the choice to use water immersion for labour and/or birth because common concerns raised do not appear to be supported by evidence (New Zealand College of Midwives, 2015; Young & Kruske, 2012).

Transfer in labour

The reasons women may not choose to birth at a midwifery unit or at home are multifactorial, but the need to transfer to an obstetric unit should a complication occur is one contributing factor (Grigg et al., 2014). By improving the understanding of the likelihood of transfer and the reasons for its necessity, more women may be reassured to choose these birthplace locations, hence this was an important section in 'Birthplace – Your Choice'.

TRANSFER RATES

Rates of transfer vary worldwide. In New Zealand, continuity of care from a midwife appears to contribute to lower rates compared to other countries. Dixon, Prileszky, Guilliland, Miller & Anderson (2014) reported an overall antenatal, intrapartum and postnatal transfer rates for low-risk

primigravida from midwifery units and homebirth of 25.6% and 35.8% respectively compared with rates of 36.3% and 45% from a low-risk primigravida cohort in the UK (Birthplace in England Collaborative Group, 2011). Compared with Denmark, a country with a strong midwifery-based maternity service, the rate of transfer for low-risk primigravidas from a midwifery unit in New Zealand is lower than the 36.7% reported for intrapartum and postnatal transfers in a recent Danish study (Christensen & Overgaard, 2017). When intrapartum rates for primigravida transferred from a midwifery unit are examined, New Zealand's 11.8 % appears on par with the international rates of America 10.1%, Australia 13.2%, and Denmark 11.6% (Grigg, Tracy, Tracy, Schmied, & Monk, 2015; Monk et al.,, 2014; Overgaard, Moller, Fenger-Gron, Knudsen, & Sandall, 2011; Stapleton, Osborne, & Illuzzi, 2013).

PRIMIGRAVIDA LABOUR CHARACTERICS AND TRANSFER

Characteristics of primigravida labour, such as longer length and an increased chance of intrapartum complications occurring, are associated with the higher rates of transfers observed for this group compared with parous women (Birthplace in England Collaborative Group, 2011; Dixon et al., 2014; Hutton, et al., 2015; Halfdansdottir et al., 2015). The impact of age where higher risk of complications are more likely, such as women younger than 20 years or older than 35 years, and rates of transfer is unclear (de Jonge et al., 2009; Hunter et al., 2011; Dixon et al., 2014; Rowe, Fitzpatrick, Hollowell, & Kurinczuk, 2012; Overgaard et al., 2011 Dixon et al., 2014). This increased risk of complications has led to safety concerns being expressed about the suitability of these women for non-obstetric unit birthplaces if transfer is not timely (Christensen & Overgaard, 2017). But it would appear these concerns are not supported by the research because not only does transfer appear timely but maternal and neonatal outcomes for transferred women are similar to planned hospital birth (Dixon et al., 2014, Grigg et al., 2015; Halfdansdottir et al., 2015).

Midwives follow National guidelines, which indicate when referral for obstetric advice should occur or when transfer to an obstetric unit is recommended or required for certain clinical complications (MoH, 2012). As a result most transfers to an obstetric unit occur during the antenatal period for reasons such as induction of labour, prolonged rupture of membranes, maternal choice, or because of medical complications such as pre-eclampsia or pregnancy-induced hypertension (Grigg et al., 2015; Walsh & Downe, 2004; Stapleton et al., 2015). For example, Monk et al., (2014), reported that 34% of transfers from a free-standing midwifery unit in Australia to an obstetric unit occurred during the antenatal period. Similarly, in their New Zealand study Grigg et al., (2015), reported 73% of women transferred during labour did so before admission to a midwifery unit. This indicates that midwives are screening and referring low-risk women appropriately.

REASONS FOR TRANSFER

During labour the most common cause for transfer is prolonged labour in first stage, followed by prolonged labour in second stage and labour arrest (Blix, Kumle, Kjærgaard, Øia, & Lindgren, 2014; Christensen & Overgaard, 2017; Dixon et al., 2014; Monk et al, 2014; Rowe et al., 2012; Walsh & Downe, 2004; Stapleton et al., 2015). The majority of transfers are 'non-emergency' with only a small proportion being for emergency situations such as a fetal distress (Christensen & Overgaard, 2017; Grigg et al., 2015; Rowe et al., 2013; Stapleton et al., 2015). That most transfers are non-urgent is supported in the findings of a recent NZ study where the average time after arrival at an obstetric unit until birth was 4.5 hours (Grigg et al., 2015). Studies suggest that rates of spontaneous vaginal birth are lower while instrumental or caesarean birth are higher after transfer (Christensen & Overgaard, 2017; Kruske, Schultz, Eales, & Kildea, 2015; Rowe et al., 2013). However, Monk, Grigg, Foureur, Tracy, & Tracy, (2017) found all modes of birth of transferred women to be similar to women who had planned to birth in an obstetric unit. This means the women transferred have the same chance of having a vaginal birth had

they originally planned to birth in an obstetric unit. Transfers after birth are less common with women being transferred up to three days postpartum (Grigg et al., 2015). The most common transfer immediately after birth is due to perineal trauma needing repair (12.7%) followed by postpartum haemorrhage (1.3%) (Christensen & Overgaard, 2017).

TRANSFER TO A NEONATAL INTENSIVE CARE UNIT

In New Zealand, babies who are born at home or in midwifery units have better outcomes compared with babies that need to be transferred from these birthplaces, and compared with babies born after a planned birth in an obstetric unit (Dixon et al., 2014). For babies born after a transfer in New Zealand the rates of admission to neonatal intensive care unit and Apgar score <7 appear similar to babies planned to be born in an obstetric unit (Dixon et al., 2014; Monk et al., 2017).

Dixon et al. (2014) found that 2 out of 100 babies born in a midwifery unit or at home required transfer to a neonatal intensive care unit compared with 4 out of 100 for babies born in an obstetric unit. The chance of babies needing respiratory support for longer than 4 hours appears low for all birthplaces: 1 in 100 for those born in a midwifery unit or at home, and 2 in 100 for babies planned to be born in an obstetric unit (MoH, 2016a). Rates of Apgar score greater than 7, which indicates a good transition after birth, are lowest in obstetric unit births (97%) and highest in home (99%) or at midwifery unit (98%) births (Dixon, et al., 2014). Farry (2015) found similar rates for neonatal intensive care unit admissions between birthplaces but reported that an Apgar score less than seven was three times more likely in the obstetric unit born babies for low-risk primigravidas and multigravidas. These statistics indicate that low-risk babies born in an obstetric unit have higher rates of neonatal intensive care admissions, Apgar score less than 7 and respiratory support for longer than 4 hours. Severe neonatal morbidity (Apgar <7) and neonatal death without congenital abnormality during birth are rare for term babies, less than 1%, in any birthplace and too small to make useful

comparisons between birthplaces (Dixon et al., 2014; Monk et al, 2014; Overgaard et al., 2011).

The heterogeneity of studies regarding transfer can make controlling for confounding factors and comparisons difficult. Despite this it appears that when registered midwives provide care combined within collaborative care frameworks and established referral pathways, outcomes for babies that require transfer are similar or improved in non-obstetric unit birthplaces (Birthplace in England Collaborative Group, 2011; Dixon et al., 2014; Christensen & Overgaard, 2017; Overgaard et al., 2011). These findings might help to reassure women that community-based birthplaces do not increase the risk for their babies and are in fact protective of physiological birth. When women are educated antenatally about the reasons for transfer, are able to maintained a sense of control should it occur, experience effective communication support and information from their midwife, transfer is less likely to be viewed negatively (Grigg, Tracy, Schmied, Monk & Tracy, 2015; Kuliulas, Duggas, Lewis & Hauck, 2016).

Methods

The purpose of this project is to promote informed decision making on birthplace options and provide evidence based information about outcomes for standard primigravidas when birth occurs at an obstetric unit, a midwifery unit or at home. An App called 'Birthplace – Your Choice' was developed for this purpose based on the International Patient Decision Aid Standards criteria. Initially the project was intended to be a complete pDAT in the form of an App but because of the limitations of time and the capacity of the smartphone platform 'Birthplace – Your Choice' became an App with some pDAT components.

The practice project 'Birthplace – Your Choice' was conducted in Auckland, New Zealand. Ethical Approval was sought and granted from Auckland University of Technology Ethics Committee (AUTEC 16/158).

Ethics approval was required because the App was alpha tested by pregnant women.

Content selection

The content was designed to provide women with an understanding of the decision needing to be made and the benefits and risks of different birthplace options. An extensive literature review was undertaken to provide the content for 'Birthplace – Your Choice' using current international evidence, professional guidelines and expert opinion. Where possible information was sourced preferentially from Cochrane reviews, meta-analysis of randomized controlled trials, individual randomized control trials and other meta-analysis. Although randomized controlled trials are considered the gold standard of research their relevance to childbearing research is limited by what can ethically be randomized so other study methodologies such as prospective or retrospective studies were included if the methodology was sound (Petrisor & Bhandari, 2007).

Information was presented on the likelihood of the following occurring for each birthplace: vaginal or caesarean birth, vaginal tear, postpartum haemorrhage, use of hydrotherapy, neonatal admission to neonatal intensive care unit, specialist neonatal care and low Apgar score at birth for the baby. Information was also provided on the reasons for transfer and the outcome should a transfer occur during labour. Numerous edits of the content occurred to facilitate ease of reading, comprehension of the graphics, and fix errors that occurred with spelling, grammar, incorrect pop-up answers and text spacing. Of note was the difficulty in presenting statistics for postpartum haemorrhage rates. The MoH defines a postpartum haemorrhage as having occurred if a blood transfusion is needed while others report statistics using blood loss greater than 500mls (MoH, 2016a; Farry, 2015). Having two graphs and attempting to explain different ways a postpartum haemorrhage may be measured became too

complicated so it was decided to remove the graphs and instead present in written form that there appears to be a trend for postpartum haemorrhage rates to be greater in hospital is apparent.

Authorship information was provided, references of content made available and attributed throughout the App while information was presented in a balanced, non-biased way to ensure 'Birthplace – Your Choice' is a quality health-related information resource (Boulous et al., 2014). Literacy level of the content was unable to be formally assessed within the timeframe of development.

New Zealand specific statistical data was presented to ensure relevance to the New Zealand primigravida. Obtaining preferred statistical data proved difficult. Formal requests to both the MoH and MMPO on physiological birth rates and associated complications for standard primigravida birthing in different birthplaces were unable to be generated in the short timeframe of the project. As a result the MoH Maternity Clinical Indicators were used for the majority of statistics (MoH, 2016). The MMPO statistics were used for information on hydrotherapy (MMPO, 2011) while transfer information was informed by the study of Dixon et al., (2014). This was necessary because the MoH does not collect statistics on the former while their statistics on the latter lacked clarity. Statistical information was presented per the IPDAS recommendation that numerous forms be used so both written and visual formats were used to aid comprehension (Trevena et al., 2013). Percentages and simple frequencies were both used with a denominator of 100 to ensure consistency in data presentation and to reduce the possibility of incorrectly interpreting the statistics. Bar charts and icon arrays were also used based on a denominator of 100.

Values clarification Methods

The aim of value clarification methods is to help the participant identify if they need more information, are experiencing decisional conflict, and to

ascertain if they are ready to make a choice. Two methods were used in this project; one in the App and the other in the second questionnaire. The App integrated the 4-item SURE (Sure of myself; Understand information; Risk-benefit ratio; Encouragement) screening test within the 'Quiz Yourself' section. Questions 1-22 in the second questionnaire utilized a Decisional Conflict Scale developed specifically for computer-based tools by Dolan et al., (2013) but amended to suit 'Birthplace – Your Choice' (Table 2). Consent was obtained for use because it not only contains the decision subscales that measure clarity of values, being informed and uncertainty from the Decisional Conflict Scale by O'Connor (1993) but also incorporates subscales specific for computer tools such as mechanical, cognitive, and emotion ease of use, and how effective the tool is in aiding the effectiveness of a decision (Dolan et al., 2013). This enabled generation of feedback specific for assessing both participants' decisional conflict but also App quality. A 5-point rather than 7-point scale was used to simplify data generation and to reflect the question style used in questionnaire one.

Collaboration with Centre for Learning and Teaching (CfLAT)

The 'Birthplace – Your Choice' App was developed by me with technical support and development sought from the Auckland University of Technology, Centre for Learning and Teaching (CfLAT) to make my idea become a reality. After it was confirmed that assistance could be provided within the practice project timeframe meetings became ongoing throughout the development process between Victorio Burcio-Martin and myself. Initial meetings focused on the development of an icon to identify the App and icons to represent birthplace choices, colours, and development of a wireframe. The wireframe I designed outlines where the content is to reside in the App and how navigation between areas will occur. I deliberately chose to have the same content area repeated three

times within the wireframe so that regardless of which birthplace a woman chose all women would receive the same information.

Table 2: Questionnaire two: Decisional Conflict Scale

Scale component	Items
Ease of use, mechanical	I found the Place of Birth App easy to use
	It was easy to move through the information
	The design of the App was Appropriate
Ease of use, cognitive	The information presented was clear and easy to understand
	The App provides believable information
	The App provides relevant information
	The App provides information at the right level
	The App provides information in an Appropriate format
Ease of use, emotional	I felt nervous using the App
	The App was intimidating to me
Decision-aiding effectiveness	I found the App useful in learning about birthplace options
	Using the App would help me learn about birthplace options more quickly
	I think this App would would make it easier for me to talk to my midwife/obstetrician about my birthplace options
	The App would help me to reach a decision on the birthplace location that is right for me
Decisional conflict scale, informed sub-scale	I know what birthplace options are available to me
	I know the benefits of each birthplace option
	I know the risks of each birthplace option
Decisional conflict scale, values clarification sub-scale	I am clear about which benefits matter most to me
	I am clear about which risks matter most to me
Decisional conflict scale, uncertainty sub-scale	I am clear about the best birthplace option for me
	I feel sure about which birthplace option to choose
	The decision on birthplace location is easy for me to make

Each of these three content areas also included the same graphs to ensure that users would not be able to avoid seeing outcomes at birthplaces they had not chosen. This technique is recommended by Hoffman et al, (2013) to ensure important information can not be bypassed due to navigation choices. Each graph was requested to be altered to highlight the birthplace chosen e.g. for a woman accessing homebirth information, the homebirth bar on the graph would be foregrounded, while the other options e.g. obstetric unit and midwifery unit would be backgrounded. This request caused problems with the

solution offered being to widen the bar to indicate that this was the birthplace choice the woman had navigated to.

The level of content detail underwent numerous edits with the insertion of drop-down boxes requested to encourage user control of the information provided and avoid information overload. Interactive components were integrated to test knowledge, demonstrate transfer rates and to access decisional conflict and to add discovery learning within the App (Hoffman et al., 2013). Icons of a pregnant woman and a baby were requested to be developed for incorporation into the interactive icon arrays needed in the App section "Change of Plan" that discusses maternal and neonatal transfer. This was to make the risk statistics being presented more relevant to this group of women. Graphs were combined with the same statistical information written in simple frequencies to aid comprehension (Trevena et al, 2013). Spelling, grammar and spacing issues were identified by myself and required numerous edits as content changed.

A final prototype was loaded onto AEM preflight for testing which began in mid-October, 2016. AEM preflight was used to protect the intellectual property of the App and for security purposes as 'Birthplace – Your Choice' is a prototype not yet ready for publication.

Alpha Testing

A study advertisement was sent via email to midwives in the NZCOM Auckland region requesting any interested women who met the MoH definition of the standard primigravida to contact Sarah Ballard (MoH, 2016a). Primigravida women were selected because the outcome of the first pregnancy strongly influences subsequent births (Chen et al, 2013; Lobel & DeLuca, 2007; Wong et al., 2015). Four primigravida women of various ages and gestation were enrolled in the project and one multiparous woman by accident. The data from this woman was excluded but deserves special mention in the discussion. Consent was obtained

from all women and they were assigned a number to protect their anonymity. Demographic information was not collected but gestation of pregnancies ranged from 12 to 38 weeks.

Testing involved answering questionnaire one (Appendix V), using the App, and then in a week's time answering questionnaire two (Appendix VI) which was returned via post. The first questionnaire was informed by the work of Grigg, Tracy, Schmied et al., (2015) with consent. It sought to find out where women had chosen to birth and why, and their knowledge of birthplace options. The second questionnaire sought feedback on the usability of the App and on the visual graphs and interactive features such as the icon arrays and drop down boxes. Feedback on birthplace outcomes and specific interventions were sought to assess if exposure to the App had enhanced knowledge in these areas. Questions 1-22 were used with consent from Dolan et al., (2014). His decisional conflict scale was developed for web-designed pDATs and amended by myself, for 'Birthplace – Your Choice'.

Notes were taken while users were being observed noting which sections they navigated to or avoided, any issues experienced and any comments made (Appendix VII)

Discussion - The main findings from Alpha testing

Feedback from Questionnaire One

All women had made the decision of where to birth before or early on in their pregnancy. This finding supports the need for high quality information on birthplace options and outcomes to be consistently available if any impact in improving knowledge on birthplace options and informing women's choice is to occur.

Three women had chosen a midwifery unit and one woman an obstetric unit. Feeling safe, being in a comfortable environment, having control over the labour and birth and a strong belief in their bodies capability to

birth were all factors in their choice. The midwifery unit women could list advantages and disadvantages of both their chosen birthplace and of an obstetric unit. In contrast, the obstetric unit woman was only aware of the advantage of having specialist care available but could not state any disadvantages of birthing in an obsetric unit and was unable to provide any information on any other birthplace options.

This possibility indicates that women who choose birthplaces outside of hospital are more informed about the benefits and risks of their choice particularly as their comments tend to reflect the findings of current literature. These women stated, for example, that they were safer out of hospital, that having a drug-free birth would offer their baby the best start in life and that specialist care was unnecessary as they were well. In comparison, the woman who chose the obstetric unit did so due to fear of an emergency occurring and felt that having specialist staff available was a necessity for a first birth. These opposing beliefs reflect the paradigms previously discussed around childbirth being viewed as a normal life event or an event to fear, needing to be treated, controlled and contained within the perceived safety of an obstetric unit (Coxon et al., 2014; Mackenzie et al., 2010).

'Birthplace – Your Choice' Observation

The women all easily navigated the App taking roughly 30-40 minutes to explore the content. They appeared to be interested in what they were reading and the information available. Comments were made out loud such as "Wow", "that's appalling" when one woman was looking at vaginal birth rates in hospital and "I didn't know that!". The majority of women navigated methodically beginning at their birthplace and worked systematically through the information. All women ignored the caesarean section content area which was an interesting observation but unfortunately not able to be explored further within the context of this project. Some assistance had to be provided when multiple pop ups or

drop down boxes opened simultaneously to enable use of the App to resume.
Some women verbalised after completing using the App that they had already attempted, but failed, to find similar information and expressed much satisfaction in having had the information provided by 'Birthplace – Your Choice'.

App design issues

After testing it became obvious that having three content areas repeated was not necessary. Instead navigation from home, midwifery-unit or obstetric unit options could be to one area on 'childbirth outcomes'. This would then make the need to customise each graph per birthplace redundant. As the current graphs are not aesthetically pleasing and may contribute to graph interpretation bias this appears a good solution.
An issue also exists were multiple pop-up answers or drop down boxes occur simultaneously. This needs to be remedied as it caused frustration for the users.

Feedback from Questionnaire Two

Written feedback from questionnaire two indicated that the women felt that the information presented was at the right level of detail, clear and easy to understand, believable and relevant. Having statistics and information which backed up what they already knew about their birthplace and importantly, what they had been told by their midwife was appreciated. Most women liked having a mixture of graphs and words explaining the statistics indicating the importance of having options available for individuals with different literacy capabilities (Trevena et al, 2013). Similarly, having the option of pop-ups allowed individual control of information which was appreciated to avoid 'overload' (Hoffman et al., 2013).

Areas that caused confusion for two participants were the interactive icon graphs and use of obstetric terms. While use of icon arrays in general seem to have a positive effect on statistical interpretation it may have been the addition of interactivity that confused some women (Garica-Retamero et al., 2010). 'Pop-up' shading of the numerator to represent each woman or baby that needed to be transferred after the screen had been touched might have reduced confusion (Ancker et al., 2009).
It had been intended to include definitions of obstetric terms in the form of a pop-up attached to the word but this was beyond the capabilities of the design platform and the timeframe of development. In hindsight, a glossary of obstetric terminology would have been beneficial for these women.

Women who had chosen to birth at a midwifery unit did not alter from this decision after using the 'Birthplace – Your Choice'. Instead they reported that using the App confirmed that they had made the best choice for themselves and their baby, the knowledge they already had was correct, and that it reinforced what their midwife had told them improving feelings of trust in this relationship. One woman who tested the App at 38 weeks gestation stated that had she had this information earlier she might have chosen a homebirth. The woman who indicated that she planned to birth in an obstetric unit said she had changed to a midwifery unit. This was because of learning the poor likelihood of achieving a vaginal birth, the negative effect of commonly available and frequently used interventions such as epidural, and that a midwifery unit would be more likely to support her to have the physiological birth she desired. Two of the women felt that they had obtained new knowledge about vaginal birth, instrumental or caesarean birth, epidural and postpartum haemorrhage and all stated that they would share this information with other women. This is a positive finding as anecdotal information has a strong influence on women's choices and beliefs around childbirth (Haines et al., 2012; Hunter et al., 2011).

Two women stated that the information was very useful and that they were thankful to have been part of the project with one stating she was immensely grateful that this "research is being done" as she felt it necessary.

The multiparous woman

The multiparous woman recruited by accident challenged some of the information in the App, specifically around the effect of interventions on breastfeeding. She became quite defensive to such an extent that I stopped observing her and we had a conversation where reasons that this can occur were explained. This woman had stated that for her, hospital birth was where you are safest. I did not expect her to complete the second questionnaire but it was returned and contained much relevant feedback on the App. She specifically identified that the general statements regarding the effect of interventions on breastfeeding needed to clarify why, which was beneficial feedback. Interestingly, although she stated in her second questionnaire that she intended to remain birthing in an obstetric unit I have since heard that she now plans to have a midwifery unit birth. This highlights the importance for women to have access to the depth of information provided in 'Birthplace – Your Choice' as it has potential to impact on first and potentially subsequent births.

Values clarification methods analysis

Statistical analysis of the values clarification methods used in the App and in questionnaire two was not possible due to the small cohort but it would appear that 'Birthplace – Your Choice' has potential to aid decision-making and does not increase decisional conflict. All women clicked 'yes' on the SURE decisional conflict scale in the 'Quiz Yourself' section indicating that they understood the options available and information provided including the risks and benefits and had enough support to make

a decision and knew what this decision was. Regarding the decisional conflict sub-scales that measured clarity of values, being informed, and uncertainty all women responded with 'strongly agree' or 'agree'. This translates to an extremely high level of feeling clear about their personal values regarding risks and benefits, feeling informed and certain of their decision. Both these values clarification methods indicate low levels of decisional conflict indicating that the women were confident with their decision (Say et al., 2011).

Literacy: One woman commented that they found the use of obstetric terms difficult to understand. Prior to alpha testing 'Birthplace – Your Choice' had undergone numerous edits to condense and improve the wording because I was concerned about the quantity of writing participants would be exposed to. It had been intended to provide the option of pop-up definitions but format restrictions prevented this. Interestingly, this might have made a difference in comprehension as demonstrated when I informally graded two sections using the Flesch-Kincaid Grade scale programme embedded in Word. When obstetric words were present the score was approximately 47 indicating high literacy is required. When these words were removed the two sections scored approximately 62 demonstrating that the addition of pop-up definitions could change the readability of the data from that of a university student to that of 13-15 year old which is desirable for health education resources (Badarudeen & Sabharwal, 2010).

International Patient Decision Aid Standards criteria

The IPDAS checklist was used to assess the quality of the pDAT (IPDAS, 2006). Of the 64 items on the checklist only 42 were applicable to this project; 19 criteria regarding content quality, 20 criteria regarding the quality of the development process, and three criteria regarding internet-based decision aids. The effectiveness of the pDAT was not assessed as it has only undergone alpha testing and has not been tested in clinical

practice, therefore it does not meet the seven IPDAS criteria numbered 12.1-12.8 that relate to effectiveness. The IPDAS checklist for 'Birthplace - Your Choice' is included in the Appendix (VIII). It outlines the criteria that the App has been assessed against and identifies the corresponding criteria number which will be discussed in more detail below. Many of the criteria were not applicable because the IPDAS checklist refers to decisions regarding health screening, the quality of testimonials, individualised risk estimates, or clinical effectiveness of tests such a breast screening or possible treatment drugs. A natural life event such as pregnancy, where there is no 'option of doing nothing' for example, becomes problematic to meet certain criteria.

IPDAS CONTENT CRITERIA AND 'BIRTHPLACE - YOUR CHOICE'

With regard to content 13 out of 19 criteria were met. For those criteria pertaining to providing information about options in sufficient detail for decision-making, five out of five criteria were met. The health condition was described using the MoH standard primigravida definition (2.1), options listed of birthplaces (2.2), positive and negative features described (2.6, 2.7), and chances of positive/negative outcomes (2.8) presented (MoH, 2016a). Regarding presenting probabilities of outcomes in an unbiased and understandable way five out of eight of the criteria were met. Probabilities were able to be compared with the same denominator of 100 (3.2), visual diagrams were used (3.5), multiple methods used to view probabilities (3.7), probabilities were specific to the primigravidas situation (3.9), and during use of the icon array's probabilities were framed in both the positive and negative (3.13). Criteria not met were including a description of uncertainty around probabilities (3.4), enabling uses to select how they wish to view probabilities (3.8), and including comparison to a real life probability, e.g a car crash (3.10). The criteria met for including methods to clarify and express patient's values were describing the outcomes e.g. vaginal birth, to help women imagine what it is like to experience the physical,

emotional and social effects e.g. faster recovery, improved breastfeeding and bonding (4.1). The imbedded SURE decisional conflict scale suggested that the primigravidas intended to share what matters most for them with others (4.3) but they were not asked to consider which positive and negative features matter most (4.2). Guidance for deliberation and communication was minimal in 'Birthplace - Your choice' with no provision of the steps needed to make a decision (6.1) or tools to use to discuss options with others such as a worksheet (6.3). Women were encouraged to talk about their decision with a health professional (6.2).

IPDAS DEVELOPMENT CRITERIA AND 'BIRTHPLACE - YOUR CHOICE'

For the criteria for the development process, 10 of the 20 were met. The 10 not met included not writing the pDAT according to a validated readability score (10.4), whether those with limited reading skills can understand the pDAT (10.6) or providing other methods to aid understanding other than reading (10.5). Four criteria scores for the use of scientific evidence were not achieved. This was because information on when 'Birthplace - Your Choice' was last updated was not included (11.3, 11.4), the steps used to conduct the literature review were not reported (11.2) and detail on the quality or lack of the evidence provided was absent (11.5). Although in some sections the research used was commented on, actual research quality was not identified using a system such as GRADE or levels of hierarchy (Guyatt, et al., 2008; Ingham-Broomfield, 2016). While this is possible in web-based pDATs, such as those produced by the Queensland Centre for Mothers and Babies, the format of an App restricts how much information can be presented (Queensland Centre for Mothers and Babies, n.d.).

Although authorship information was provided (1.1) two more criteria would have been achieved had mention been made to any partner affiliations or conflicts of interest (7.1-7.2 & 7.3-7.4). With regard to the Internet criteria, 'Birthplace – Your choice' only met 1 out of 3 criteria by providing a step-by-step way to move progress through the areas (8.1).

The remaining two criteria were not achieved because users could not search for keywords (8.2) or print out information as a single document (8.6). The other criteria were not Applicable because they pertained to the entering of personal information (8.3 & 8.4) and usability within other web pages (8.5) when this pDAT does not function this way due to being in a standalone App format.

Overall, 'Birthplace – Your Choice' scored 22 out of 40 for meeting the IPDAS criteria. This is disappointing but also reflects the limitations of what components of a pDAT are able to be feasibly included in an App. Of the criteria not able to be met but which could be easily incorporated such as (7.1/7.2, 7.3/7.4, 8.2, and 10.5) the score could improve to 26 out of 40. The IPDAS do not state the minimum number of criteria needed to ensure a high quality pDAT but do offer pre-assessment, formative or summative feedback of developed pDATs for a fee (IPDAS instrument, n.d).

Evaluation of the completed project

The final version of 'Birthplace – Your Choice', and the positive effect it had on facilitating informed decision making, even in those whose birthplace choice did not change, was immensely pleasing. Women appeared to appreciate the opportunity to be involved in the study and learn about birthplace options and outcomes. This information was deemed important for them to have to inform their birthplace decision. They expressed frustration that no other reliable resources are currently available leaving them reliant on their midwife and family or friends for information which they recognised had potential for bias.

The strength of this project is in its specific focus on low-risk primigravida women. By providing evidence-based information women may be able to make a more informed decision on their birthplace. The provision of New

Zealand specific data from the MoH ensured the birthplace information was relevant for New Zealand women

By necessity this project was small and development decisions had to be made to ensure completion on time. As a result, neither an expert panel nor primigravida themselves were approached to confirm what information they thought necessary should be included in the App. The cohort of women was primarily European with only one Pasifika woman participating. This project has revealed that New Zealand women desire information on birthplace options and outcomes. The alpha testing of 'Birthplace - Your Choice' highlights the current format of the pDAT needs improving to aid readability and ease of navigation.

Future recommendations and implications

Due to the size of this project no statistically relevant conclusions can be made regarding the effectiveness of 'Birthplace – Your Choice'. Further development needs to ascertain if the App format can accommodate the necessary IPDAS criteria unable to be achieved in the prototype. If this is not possible two options exist: Create the pDAT as a webpage or move away from developing a pDAT entirely and create a high quality App-based information resource using a new framework. 'Beta' testing of this prototype would need to extensive. A large cohort of primigravida would be needed to generate statistical conclusions, midwives and obstetricians would need to be included for peer review and the practicalities of incorporating the pDAT or App within care provision further explored. 'Birthplace – Your Choice' offers potential as a tool to improve education on birthplace options in New Zealand. By explaining the benefits of physiological birthing for mothers and babies, along with birthplace options and outcomes, it fills a gap not being met by any current Public Health initiatives in this country. Women not only have a right under the Code of Health and Disability Services Consumers' Rights (Health and Disability Commissioner, n.d.) in New Zealand to be informed of

birthplace options but have also been found to want to exercise this right and make decisions about where to give birth (Hadjigeorgiou, Kouta, Papastavrou, Papadopoulos, & Martensson, 2012; Hunter et al., 2011). Information provision is therefore crucial if any attempt is to be made to improve the outcomes experienced by many low-risk primigravida women and their babies and challenge the growing medicalisation of birth and the rising maternity health care costs in New Zealand. In 2014 only 1 (0.1%) standard primigravida transferred from a midwifery unit and had an emergency caesarean. In contrast 1358 (18.2%) standard primigravida had a caesarean at an obstetric unit. This number includes elective caesareans performed before labour but regardless the difference between the numbers is startling. In 2011, the cost of a caesarean at Counties Manukau was approximately $10,200 (Counties Manukau District Health Board, 2011). Therefore if the information found in 'Birthplace – Your Choice' could assist in reducing the caesarean rate to the 15% recommended by the World Health Organisation this would mean 244 fewer mothers and babies would have a caesarean and be exposed unnecessary to its associated risks, and the savings to the New Zealand tax payer would be $2,488,880.

Conclusion

Choice of birthplace is an important decision that may dictate the ultimate outcomes experienced by a mother and baby. Current awareness of the safety of birthing at a midwifery unit or at home appears low in New Zealand despite these environments resulting in similar, if not improved outcomes, for mothers and babies compared to birthing in an obstetric unit. 'Birthplace – Your Choice' is the first App designed specifically for primigravida New Zealand women with the aim to facilitate informed decision-making regarding birthplace options and outcomes. It appears that providing information in an App format has potential to be successul through the acceptability, accessibility, familiarity and ease of use of this format. Much work needs to be done to reduce the increasing

medicalisation of birth experienced by New Zealand primigravidas in today's society. 'Birthplace – Your Choice' has potential to become an essential tool to improve the health of New Zealand women and their babies through education on birthplace options and outcomes.

References

Aasheim, V., Nilsen, A.B.V., Lukasse, M., & Reinar, L.M. (2011). Perineal techniques during the second stage of labour for reducing perineal trauma. *Cochrane Database Systematic Reviews, 2011*(12), 1-44. doi: 10.1002/14651858.CD006672.pub2

Albers, L.L. (1999). The duration of labor in healthy women. *J Perinatol*, 19, 2, 114-119

Alfirevic, Z., Devane, D. & Gyte, G.M. (2017). Continuous cardiotocography (CTG) as a form of electronic fetal monitoring (EFM) for fetal assessment during labour. *Cochrane Database Systematic Reviews, 2017*(2), 1-141. doi:10.1002/14651858.CD006066.pub3

Alfirevic, A.J., Kelly, T., & Dowswell, T. (2009). Intravenous oxytocin alone for cervical ripening and induction of labour. *Cochrane Database Systematic Reviews, 2009*(4), 1-322. doi:10.1002/14651858.CD003246.pub2

American College of Obstetricians and Gynecologists. (2006). ACOG Practice Bulletin Number 71. Episiotomy. Clinical Management Guidelines for Obstetrician-Gynecologists. *Obstet Gynecol*. 107, 4, 957-962

American College of Obstetricians and Gynecologists. (2014). ACOG Practice Bulletin Number 146: Management of Late-Term and Postterm Pregnancies. *Obstet Gynecol*, 124, 390-396

American College of Obstetricians and Gynecologists. (2014). Obstetric care consensus no. 1: Safe prevention of the primary cesarean delivery. *Obstetrics and Gynecology*, 123, 3, 693–711

American College of Obstetricians and Gynecologists, (2016). ACOG Practice Bulletin No. 165: Prevention and Management of Obstetric Lacerations at Vaginal Delivery. *Obstet Gynecol*, 128, 1, e1-e5. doi: 10.1097/AOG.0000000000001523

American College of Obstetricians and Gynecologists & Society for Maternal-Fetal Medicine. (2014). *Obstetric care consensus: Safe prevention of the primary cesarean delivery*. Washington, DC: American College of Obstetricians and Gynecologists. Retrieved from http://www.acog.org/Resources-And-Publications/Obstetric- Care-Consensus-Series/Safe-Prevention-of-the-Primary-Cesarean- Deliver

American College of Obstetricians and Gynaecologists & American Academy of Pediatrics (2016). *Committee Opinion: Immersion in Water During Labor and Delivery*. Retrieved from http://www.acog.org/ Resources_And_Publications/Committee_Opinions/Committee_on_Obstetric_ Practice/Immersion_ in_Water _During _Labor_and_Delivery

Ancker, J.S., Weber, E.U. & Kukafka, R. (2009). Effects of Game-Like Interactive Graphics on Risk Perceptions and Decisions. *Medical Decision Making*, 31, 1, 130-142. doi 10.1177/0272989X10364847

Anim-Somuah, M., Smyth, R., & Jones, L. (2011). Epidural versus non-epidural or no analgesia in labour. *Cochrane Database Systematic Reviews*, (2011)12, 1-127. doi: 10.1002/14651858.CD000331.pub3

Association of Women's Health, Obstetric and Neonatal Nurses of Canada, the Canadian Association of Midwives, the College of Family Physicians of Canada, the Society of Rural Physicians of Canada. (2013). Supporting Healthy and Normal Physiologic Childbirth: A Consensus Statement by ACNM, MANA, and NACPM. *The Journal of Perinatal Education*, 22, 1, 14–18. doi:10.1891/1058-1243.22.1.14.

Auckland District Health Board. (2015). *National Women's Health Annual Clinical Report 2015*. Retrieved from http://nationalwomenshealth.adhb.govt.nz/healthprofessionals/annual-clinical-report/yearly-annual-clinical-reports

Auckland District Health Board (n.d). *Vitamin K for Newborn Babies*. Retrieved from http://www.adhb.govt.nz/newborn/Guidelines/Blood/VitaminK.htm

Badarudeen, S., & Sabharwal, S. (2010). Assessing Readability of Patient Education Materials: Current Role in Orthopaedics. *Clinical Orthopaedics and Related Research*, 468, 10, 2572–2580. doi:10.1007/s11999-010-1380-y

Begley, C., Devane, D., Clarke, M., McCann, C., Hughes, P., Reilly, M., … & Doyle, M. (2011). Comparison of midwife-led and consultant-led care of healthy women at low risk of childbirth complications in the Republic of Ireland: A randomised trial. *BMC Pregnancy and Childbirth*, 11, 85. doi:10.1186/1471-2393-11-85

Begley, C., Guilliland, K., Dixon, L., Reilly, M., & Keegan, C. (2012). Irish and New Zealand midwives' expertise in expectant management of the third stage of labour: the 'MEET' study. Midwifery, 28, 6, 733-739. doi:10.1016/j.midw.2011.08.008

Begley, C., Gyte, G., Devane, D., & McGuire, W., & Weeks, A. (2015). Active versus expectant management for women in the third stage of labour. *Cochrane Database Systematic Review, 2011*(11), 1-157. doi:10.1002/14651858.CD007412.pub4

Bekker, H.L., Winterbottom, A.E., Dillard, A. J., Fledman-Stewart, D., Fowler, F.J., Jibaja_Weiss, M.L. … Volk, R.J. (2013). Do personal stories make patient decision aids more effective? A critical review of theory and evidence. *BMC Medical Informatics and Decision Making*, 13, S9. doi:10.1186/1472-6947-13-S2-S9

Belghiti, J., Kayem, G., Dupont, C., Rudigoz, R., Bouvier-Colle, M., & Deneux-Tharaus, C. (2011). Oxytocin during labour and risk of severe postpartum haemorrhage: a population based, cohort-nested case-controlled study. *BMJ Open*, 1, 2. doi:10.1136/bmjopen-2011-000514

Bell, A.F., Erickson, E.N., & Carter, C.S. (2014). Beyond labor: the role of natural and synthetic oxytocin in the transition to motherhood. *J Midwifery Womens*, 59, 1, 35-42. doi: 10.1111/jmwh.12101

Bell, A.F., White-Traut, R., & Rankin, K. (2013). Fetal exposure to synthetic oxytocin and the relationship with prefeeding cues within one hour postbirth. *Early Hum Dev*, 89, 3, 137–143

Bernitz, S., Øian, P., Rolland, R., Sandvik, L., & Blix, E. (2014). Oxytocin and dystocia as risk factors for adverse birth outcomes: A cohort of low-risk nulliparous women. *Midwifery*, 30, 364–370. doi:10.1016/j.midw.2013.03.010

Betrán, A.P., Ye, J., Moller, A.B., Zhang, J., Gülmezoglu, A.M., & Torloni, M.R. (2016). The Increasing Trend in Caesarean Section Rates: Global, Regional and National Estimates: 1990-2014. *PLoS ONE*, 11, 2, doi:10.1371/journal.pone.0148343.s002

Birthplace in England Collaborative Group. (2011). Perinatal and maternal outcomes by planned place of birth for healthy women with low risk pregnancies- the Birthplace in England national prospective cohort study. *BMJ*. 343, 1-13. doi:org/10.1136/bmj.d7400

Blix, E., Huitfeldt, A.S., Øian, P., Straume, B., & Kumle, M. (2012). Outcomes of planned home births and planned hospital births in low-risk women in Norway between 1990 and 2007: A retrospective cohort study. *Sexual & Reproductive Healthcare*, 3, 4, 147-153. doi:http://dx.doi.org/10.1016/j.srhc.2012.10.001

Blix, E., Kumle, M., Kjærgaard, H., Øia, P., & Lindgren, H.E. (2014). Transfer to hospital in planned home births: a systematic review.*BMC Pregnancy and Childbirth*, 14, 179

Bolton, N., de Jonge, A., Zwagerman, E., Zwagerman, P., Klomp, T., Zwart, J.J., & Geerts, C.C. (2016). Effect of planned place of birth on obstetric interventions and maternal outcomes among low-risk women: a cohort study in the Netherlands. *BMC Pregnancy and Childbirth*, 16, 329. doi:10.1186/s12884-016-1130-6

Boulous, M. N. K., Brewer, A. C., Karimkhani, C., Buller, D. B., & Dellavalle, R. P. (2014). Mobile medical and health apps: state of the art, concerns, regulatory control and certification. *Online Journal of Public Health Informatics*, 5, 3, 229. http://doi.org/10.5210/ojphi.v5i3.4814

Bovbjerg, M. L., Cheyney, M. & Everson, C. (2016). Maternal and newborn outcomes following waterbirth: The Midwives Alliance of North America statistics project, 2004 to 2009 Cohort. *Journal of Midwifery & Women's Health*, 61, 11–20. doi:10.1111/jmwh.12394

Brimdyr, K., Cadwell, K., Widström, A.M. Svensson, K., Neumann, M., Hart, E.A., … Phillips, R. (2015). The association between common labor drugs and suckling when skin-to-skin during the first hour after birth. *Birth*, 42, 4, 319-328. doi:10.1111/birt.12186

Brown, A., & Jordan, S. (2014). Active management of the third stage of labor may reduce breastfeeding duration due to pain and physical complications. *Breastfeeding Medicine*, 9, 10, 494-502. doi:10.1089/bfm.2014.0048

Buchanan, S. L., Patterson, J. A., Roberts, C. L., Morris, J. M. & Ford, J. B. (2012). Trends and morbidity associated with oxytocin use in labour in nulliparas at term. *Aust N Z J Obstet Gynaecol*, 52, 173–178. doi:10.1111/j.1479-828X.2011.01403.x

Bugg, G., Siddiqui, F., & Thornton, J. (2011). Oxytocin versus no treatment or delayed treatment for slow progress in the first stage of spontaneous labour. *Cochrane Database of Systematic Reviews, 2011*(7), 1-24. doi:10.1002/14651858.CD007123.pub2.

Burns, E., Boulton, M., Cluett, E., Cornelius, V., & Smith, L. (2012). Characteristics, interventions, and outcomes of women who used a birthing pool: A prospective observational study. Birth, 39, 192–202. doi:10.1111/j.1523-536X.2012.00548.x

Callaghan, W.M., Kuklina, E.V., & Berg, C.J. (2010). Trends in postpartum hemorrhage: United States, 1994-2006. Am J Obstet Gynecol, 202, 4. doi:10.1016/j.ajog.2010.01.011

Cardwell, C.R., Stene, L.C., Joner, G., Cinek, O., Svensson, J., & Goldacre, M.J. (2008). Caesarean section is associated with an increased risk of child-hood-onset type 1 diabetes mellitus: a meta-analysis of observational studies. *Diabetologia*, 51, 726–735. doi:10.1007/s00125-008-0941-z

Carolan-Olah, M., Kruger, G., & Garvey-Graham, A. (2015). Midwives' experiences of the factors that facilitate normal birth among low risk women at a public hospital in Australia. *Midwifery*, 31, 1, 112-121. doi:10.1016/j.midw.2014.07.003

Carroli, G., & Mignini, L. (2009). Episiotomy for vaginal birth. *Cochrane Database Systematic Reviews. 2009*(1), 1-57. doi:10.1002/14651858. CD000081.pub2

Chadwick, R.J. & Foster, D. (2013). Negotiating risky bodies: Childbirth and constructions of risk, *Health, Risk & Society,* 16, 1, 68-83

Chen, J.S., Ford, J.B., Ampt, A., Simpson, J.M., & Roberts, C.L. (2013). Characteristics in the first vaginal birth and their association with mode of delivery in the subsequent birth. *Paediatr Perinat Epidemiol*, 27, 2, 109-17. doi: 10.1111/ppe.12039

Cheng, Y., Hopkins, L., & Caughey, A. (2004). How long is too long: Does a prolonged second stage of labor in nulliparous women affect maternal and neonatal outcomes? *American Journal of Obstetrics and Gynecology*, 191, 933-938

Cheng, Y.W., Shaffer, B.L., Nicholson, J.M., & Caughey, A.B. (2014). Second stage of labor and epidural use: a larger effect than previously suggested. *Obstet Gynecol*, 123, 3, 527-535. doi: 10.1097/AOG.0000000000000134

Cheyney, M., Bovbjerg, M., Everson, C., Gordon, W., Hannibal, D. & Vedam, S. (2014). Outcomes of Care for 16,924 Planned Home Births in the United States: The Midwives Alliance of North America Statistics Project, 2004 to 2009. *Journal of Midwifery & Women's Health*, 59, 17–27. doi:10.1111/jmwh.12172

Christensen, L.F. & Overgaard, C. (2017). Are freestanding midwifery units a safe alternative to obstetric units for low-risk, primiparous childbirth? An analysis of effect differences by parity in a matched cohort study. *BMC Pregnancy and Childbirth*, 17, 14. doi:10.1186/s12884-016-1208-1

Clark, S.L., Simpson, K.R., Knox, G.E., & Garite, T.J. (2009). Oxytocin: new perspectives on an old drug. *Am J Obstet Gynecol*, 200, 1. doi:10.1016/j.ajog.2008.06.010

Cluett, E., & Burns, E. (2009). Immersion in water in labour and birth. *Cochrane Database Systematic Reviews, 2009*(2), 1-105. doi:10.1002/14651858.CD000111.pub3

Conner, S.N., Tuuli, M.G., Colvin, R., Shanks, A.L., Macones, G.A., & Cahill, A.G. (2015). Accuracy of Estimated Blood Loss in Predicting Need for Transfusion after Delivery. *Am J Perinatol*, 32, 13, 1225-1230. doi:10.1055/s-0035-1552940

Conrad, P., 1992. Medicalization and social-control. *Annual Review of Sociology*, 18, 209–232

Costley, P.L., & East, C.E. (2013). Oxytocin augmentation of labour in women with epidural analgesia for reducing operative deliveries. *Cochrane Database Systematic Reviews, 2013*(7), 1-24. doi:10.1002/14651858.CD009241.pub3

Counties Manakau District Health Board. (2011). *Are you eligible for free maternity care in New Zealand?* Retrieved from https://webcache.googleusercontent.com/search?q=cache:3W1QZHmJTCwJ:https://www.healthpoint.co.nz/download,369182.do+&cd=1&hl=en&ct=clnk&gl=nz&client=firefox-b-ab

Coxon, K., Sandall, J., & Fulop, N. (2014). To what extent are women free to choose where to give birth? How discourses of risk, blame and responsibility influence birth place decisions. *Health, Risk & Society*, 1, 51-67. doi:org/10.1080/13698575.2013.859231

Coxon, K., Sandall, J., & Fulop, N. J. (2015). How Do Pregnancy and Birth Experiences Influence Planned Place of Birth in Future Pregnancies?: Findings from a Longitudinal, Narrative Study. *Birth*, 42, 2, 141-148. doi:10.1111/birt.12149

Coxon, K. (2014). *Birth Place Decisions*. Retrieved from http://www.nhs.uk/Conditions/pregnancy-and-naby/Documents/Birth_place_decision_support_Generic_2_.pdf

Coulter, A., Stilwell, D., Kryworuchko, J., Mullen, P.D., Ng, C.J. & van der Weijden. T. (2013). A systematic development process for patient decision aids. *BMC Medical Informatics and Decision Making*, 13, 2. doi:10.1186/1472-6947-13-S2-S2

Crenshaw, J. T. (2014). Healthy Birth Practice #6: Keep Mother and Baby Together— It's Best for Mother, Baby, and Breastfeeding. *The Journal of Perinatal Education*, 23, 4, 211–217. doi:10.1891/1058-1243.23.4.211

Curran, E., O'Neill, S., Cryan, J., Kenny, L., Dinan, T., Khashan, A., … & Kearney, P. (2015). Research review: birth by caesarean section and development of autism spectrum disorder and attention-deficit/hyperactivity disorder: a systematic review and meta-analysis. *J Child Psychol Psychiatry*, 56, 5, 500–508. doi:10.1111/jcpp.12351

Dahlen, H. & Homer, C. (2008). Perineal trauma and postpartum perineal morbidity in Asian and non-Asian primiparous women. *J. Obstet. Gynecol*. Neonatal Nursing, 37, 455–463. doi:10.1111/j.1552-6909.2008.00259.x

Dahlen, H.G., Priddis, H., & Thornton, C. (2015). Severe perineal trauma is rising, but let us not overreact. *Midwifery*, 31, 1, 1-8. doi:http://dx.doi.org/10.1016/j.midw.2014.09.004

Dahlen, H.G., Tracy, S., Tracy, M., Bisits, A., Brown, C., & Thorton, C. (2012). Rates of obstetric intervention among low-risk women giving birth in private and public hospitals in NSW: a population-based descriptive study. *BMJ Open*, 2, 5. doi:10.1136/bmjopen-2012-001723

Dahlen, H.G., Dowling, H., Tracy, M., Schmied, V., & Tracy S. (2013). Maternal and perinatal outcomes amongst low risk women giving birth in water compared to six birth positions on land. A descriptive cross sectional study in a birth centre over 12 years. *Midwifery*, 29, 7, 759-764. doi:10.1016/j.midw.2012.07.002.

Dahlen, H.G., Kennedy, H.P., Anderson, C.M., Bell, A.F., Clark, A., Foureur, M., … & Downe, S. (2013). The EPIIC hypothesis: Intrapartum effects on the neonatal epigenome and consequent health outcomes. *Medical Hypothesis*, 280, 5, 656-662. doi:10.1016/j.mehy.2013.01.017

Dahlen, H., Schmied, V., Dennis, C.L., & Thornton, C. (2013). Rates of obstetric intervention during birth and selected maternal and perinatal outcomes for low risk women born in Australia compared to those born overseas. *BMC Pregnancy Childbirth*, 13. doi:10.1186/1471-2393-13-100

Darra, S., & Murphy, F. (2016). Coping and help in birth: An investigation into 'normal' childbirth as described by new mothers and their attending midwives. *Midwifery*, 40, 18-25. doi:10.1016/j.midw.2016.05.007

Dawson, J. A., Kamlin, C., Wong, C., te Pas, A., Vento, M., Cole, T. J., . . . & Morley, C. J. (2010). Changes in heart rate in the first minutes after birth. *Archives of Disease in Childhood.Fetal and Neonatal Edition*, 95, 3. doi:http://dx.doi.org/10.1136/adc.2009.169102

Davies, R., Davis, D., Pearce, M., & Wong, N. (2015). The effect of waterbirth on neonatal mortality and morbidity: a systematic review and meta-analysis. *JBI Database System Rev Implement Rep*, 13, 10,180-231. doi:10.11124/jbisrir-2015-2105

Davies-Tuck, M., Biro, M.A., Mockler, J., Stewart, L., Wallace, E.M., East, C. (2015). Maternal Asian ethnicity and the risk of anal sphincter injury. *Acta Obstet Gynecol Scand*, 94, 308–315. doi:10.1111/aogs.12557

Davis, D., Baddock, S., Pairman, S., Hunter, M., Benn, C., Wilson, D., . . . Herbison, P. (2011). Planned Place of Birth in New Zealand: Does it Affect Mode of Birth and Intervention Rates Among Low-Risk Women? Birth, 38, 2, 111-119

Davis, D., Baddock, S., Pairman, S., Hunter, M., Benn, C., Anderson, J., Dixon, L. & Herbison, P. (2012). Risk of Severe Postpartum Hemorrhage in Low-Risk Childbearing Women in New Zealand: Exploring the Effect of Place of Birth and Comparing Third Stage Management of Labor. *Birth*, 39, 98–105. doi:10.1111/j.1523-536X.2012.00531.x

Davis-Floyd, R. (2001). The technocratic, humanistic, and holistic paradigms of childbirth. *International Journal of Gynecology & Obstetrics*, 75, 1, S5-S23

Davey. M., & King, J. (2016). Caesarean section following induction of labour in uncomplicated first births- a population-based cross-sectional analysis of 42,950 births. *BMC Pregnancy and Childbirth*, 16, 92. doi:10.1186/s12884-016-0869-0

de Jonge, A., van der Goes, B., Ravelli, A., Amelink-Verburga M, Mol, B., Nijhuis, J., … Buitendijk. (2009). Perinatal mortality and morbidity in a nationwide cohort of 529,688 low-risk planned home and hospital births. *BJOG*, 116, 1177-1184

de Jonge, A., Geerts, C., van der Goes, B., Mol, B., Buitendijk, S., & Nijhuis, J. (2015). Perinatal mortality and morbidity up to 28 days after birth among 743 070 low-risk planned home and hospital births: A cohort study based on three merged national perinatal databases. *BJOG*, 122:720–728. doi:10.1111/1471-0528.13084

de Jonge, A., Teunissen, T.A., & Largro-Janssen, A.L. (2004). Supine position compared to other positions during the second stage of labour: a meta-analytic review. *Journal of Psychosomatic Obstetrics Gynecology*, 25, 35–45

de la Cruz, C., Thompson, E., O'Rourke, K., & Nembhard, W. (2015). Cesarean section and the risk of emergency peripartum hysterectomy in high-income countries: A systematic review. *Archives of Gynecology and Obstetrics*, 292, 6, 1201-1215

Declercq, E.R., Sakala, C., Corry, M.P., Applebaum, S., & Herrlich, A. (2013). *Listening to Mothers III: Pregnancy and Birth*. New York: Childbirth Connection

Dekker, R.L. (2016). Labour induction for late-term or post-term pregnancy. *Women Birth*, 29, 4, 394-8. doi:10.1016/j.wombi.2016.01.007

Derbyshire, E. & Dancey, D. (2013). Smartphone Medical Applications for Women's Health: What Is the Evidence-Base and Feedback? *International Journal of Telemedicine and Applications*. doi:10.1155/2013/782074

De Vries, R. & Buitendijk, S. (2012). Science, safety, and the place of birth: lessons from the Netherlands. *European Obstetrics & Gynaecology*, 7, 1, 13-17

Di Franco J., Curl M. (2014). Healthy birth practice #5: Avoid giving birth on your back and follow your body's urge to push. *The Journal of Perinatal Education*, 23, 4, 207–210

Dixon, L. (2016). Insights into interventions during labour and birth. *Midwifery News*, June, 9-10

Dixon, L., Tracy, S.K., Guilliland, K., Fletcher, L., Hendry, C., & Pairman, S. (2013). Outcomes of physiological and active third stage labour care amongst women in New Zealand. *Midwifery*, 29, 1, 67-74. doi:10.1016/j.midw.2011.11.003

Dixon, L., Prileskzy, G., Guilliland, K., Miller, M., & Anderson, J. (2014). Place of birth and outcomes for a cohort of low risk women in New Zealand: A comparison with Birthplace England. *New Zealand College of Midwives*, 50, 11-18

Dodwell, M., & Newburn, N. (2010). *Normal birth as a measure of the quality of care. Evidence on safety, effectiveness and women's experiences*. Retrieved from http://www.nct.org.uk/sites/default/files /related_documents/Normalbirthasameasureofthequali tyofcareV3.pdf

Dolan, J.G., Veazie, P.J., Russ, A., J. (2013). Development and initial evaluation of a treatment decision dashboard. *BMC Medical Infromatics and Decision Making*, 13, 51. doi:10.1186/1472-6947-13-51

Downe, S., McCormick, C., & Beech ,B. (2001). Labour interventions associated with normal birth. *British Journal of Midwifery*, 9, 10, 602-606. doi:10.12968/bjom.2001.9.10.12689

Dozier, A.M., Howard , C.R., Brownell, E.A., Wissler, R.N., Glantz, J.C., Ternullo, S.R., …& Lawrence, R.A. (2013), Labor epidural anesthesia, obstetric factors and breastfeeding cessation. *Matern Child Health J*, 17, 4, 689-698. doi:10.1007/s10995-012-1045-4

Dugas, M.,Shorten, A., Dubé, E., Wassef, M., Bujold, E., & Chaillet, N. (2012). Decision aid tools to support women's decision making in pregnancy and birth: a systematic review and meta-analysis. *Soc Sci Med*, 74, 12, 1968-1978. doi: 10.1016/j.socscimed.2012.01.041

Dumas, L., Lepage, M., Bystrova, K., Matthiesen, A. S., Welles-Nystrom, B., & Widstrom, A. M. (2013). Influence of skin-to-skin contact and rooming-in on early mother-infant interaction: A randomized controlled trial. *Clinical Nursing Research*, 22, 3, 310–336

Durand, M.A., Stiel, M., Boivin, J. & Elwyn, G. (2008). Where is the theory? Evaluating the theoretical frameworks described in decision support technologies. *Patient Educ Couns*, 71, 1, 125-35. doi:10.1016/j.pec.2007.12.004

Eden, K.B., Perrin, N.A., Vesco, K.K., & Guise, J. (2014). A randomized comparative trial of two decision tools for pregnant women with prior cesareans. *JOGNN*, 42, 568-579. doi:10.1111/1552-6909.12485

Edqvist, M., Blix, E., Hegaard, H., Ólafsdottir, O.A., Hildingsson, I., Ingversen, K., Mollberg, M., & Lindgren, H. (2016). Perineal injuries and birth positions among 2992 women with a low risk pregnancy who opted for a homebirth. *BMC Pregnancy Childbirth*, 29, 16. doi:10.1186/s12884-016-0990-0

Edwards, A., & Conduit, J. (2011). Do women's ideas of 'normal' birth match those held by professionals? *British Journal of Midwifery*, 19, 11, 720-728. doi: http://dx.doi.org/10.12968/bjom.2011.19.11.720

Elwyn, G., O'Connor, A., Stacey, D., Volk, R., Edwards, A., Coulter, A., … & Whelan T., (2006). International Patient Decision Aids Standards (IPDAS) Collaboration: Developing a quality criteria framework for patient decision aids: online international Delphi consensus process. *BMJ*, 26, 333, 417-423. doi:10.1136/bmj.38926.629329.AE

Elwyn, G., O'Connor, A., Bennett, C., Newcombe, R., Politi, M., Durand, M., ... & Edwards, A. (2009). Assessing the quality of decision support technologies using the International Patient Decision Aid Standards instrument (IPDASi). *PLoS One*. 4, 3, e4705. doi:10.1371/journal.pone.0004705

Eriksen, L. M., Nohr, E. A., & Kjærgaard, H. (2011). Mode of delivery after epidural analgesia in a cohort of low-risk nulliparas. *Birth*, 38, 317–326. doi:10.1111/j.1523-536X.2011.00486.x

Essex, H., Green, J., Baston, H., & Pickett, K. (2013). Which women are at an increased risk of a caesarean section or an instrumental vaginal birth in the UK: an exploration within the Millennium Cohort Study. *BJOG*, 120, 732–743

Everly, M. C. (2012). Facilitators and barriers of independent decisions by midwives during labor and birth. *Journal of Midwifery & Women's Health*, 57, 49–54. doi:10.1111/j.1542-2011.2011.00088.x

Fagerlin, A., Pignone, M., Abhyankar, P., Col, N., Feldman-Stewart, D., Gavaruzzi, T., … & Witteman, H.O. (2013). Clarifying values: an updated review. *BMC Med Inform Decis Mak*, 13, S8. doi: 10.1186/1472-6947-13-S2-S8

Fahy, K., Hastie, C., Bisits, A., Marsh, C., Smith, L., & Saxton, A. (2010). Holistic physiological care compared to active management of the third stage of labour for women at low risk of postpartum haemorrhage: A cohort study. *Midwifery and Birth*, 23, 146-152. doi:10.1016/j.wombi.2010.02.003

Farry, A. (2015). *Comparing outcomes of low risk birth by "Place presenting in labour" in Counties Manakau DHB from 2011-2012*. (Unpublished master's thesis). Auckland University of Technology

Fenwick, J., Staff, L., Gamble, J., Creedy, D.K., and Bayes, S. (2010). Why do women request casesarean section in normal, healthy first pregnancy? *Midwifery*, 26, 4, 394-400. doi: 10.1016/j.midw.2008.10.011

Food and Drug Administration. (2015). *Mobile Medical Applications: Guidance for Industry and Food and Drug Administration Staff*. Retrieved from http://google2.fda.gov/search?q=mobile+medical&client=FDAgov&site=FDAgov&lr=&proxystylesheet=FDAgov&requiredfields=-archive%3AYes&output=xml_no_dtd&getfields=*

Frosch, D. L., Légaré, F., & Mangione, C. M. (2008). Using decision aids in community-based primary care: A theory-driven evaluation with ethnically diverse patients. *Patient Education and Counseling*, 73, 3, 490–496. doi:10.1016/j.pec.2008.07.040

Gaissmaier, W., Wegwarth, O., Skopec, D., Müller, A., Broschinski, S., & Politi, M.C. (2012). Numbers can be worth a thousand pictures: individual differences in understanding graphical and numerical representations of health-related information. *Health Psychology*, 31, 3, 286-296. doi:10.1037/a0024850

Garcia-Retamero, R., Okan, Y., & Cokely, E.T. (2012). Using visual aids to improve communication of risks about health: A review. *The Scientific World Journal*. doi:10.1100/2012/562637

Garcia-Retamero, R., & Cokely, E.T. (2013). Communicating health risks with visual aids. *Current Directions in Psychological Science*, 22, 5, 392–399. doi:10.1177/0963721413491570

Garcia-Retamero, R., Galesic, M., & Gigerenzer, G. (2010). Do icon arrays help reduce denominator neglect? *Med Decis Making*, 30, 6, 672-684. doi:10.1177/0272989X10369000

Goer, H., & Romano, A. (2012). *Optimal Care in Childbirth: The Case for a Physiologic Approach*. Seattle, WA: Classic Day Publishing

Green, J. M. and Baston, H. A. (2007). Have women become more willing to accept obstetric interventions and does this relate to mode of birth? Data from a prospective study. *Birth*, 34, 6–13. doi:10.1111/j.1523-536X.2006.00140.x

Greenwell, E.A., Wyshak, G., Ringer, S.A., Johnson, L.C., Rivkin, M.J., & Lieberman, E. (2012). Intrapartum temperature elevation, epidural use, and adverse outcome in term infants. *Pediatrics*, 129, 2, 447-454. doi:10.1542/peds.2010-2301

Grigg, C., Tracy, S.K., Daellenbach, R., Kensington, M., & Schmied, V. (2014). An exploration of influences on women's birthplace decision-making in New Zealand: a mixed methods prospective cohort within the Evaluating Maternity Units study. *BMC Pregnancy and Childbirth*, 14, 210. doi:10.1186/1471-2393-14-210

Grigg, C., Tracy, S., Schmied, V., Monk, A., & Tracy, M. (2015). Women's experience of transfer from primary maternity unit to tertiary hospital in New Zealand: part of the prospective cohort Evaluating Maternity Units study. *BMC Pregnancy and Childbirth*, 15, 339. doi:10.1186/s12884-015-0770-2

Grigg, C., Tracy, S., Tracy, M., Schmied, V., & Monk, A. (2015). Transfer from primary maternity unit to tertiary hospital in New Zealand - timing, frequency, reasons, urgency and outcomes: Part of the Evaluating Maternity Units study. *Midwifery*, 31, 879-887. doi:10.1016/j.midw.2015.04.018

Grimes, D.A., & Peipert, J. (2010). Electronic fetal monitoring as a public health screening program: The arithmetic of failure. *Obstet Gynecol*, 116, 1397–1400. doi: 10.1097/AOG.0b013e31820dbe16

Grotegut, C., Pagila, M., Johnson, L., Thames, B., & James, A. (2011). Oxytocin exposure during labor among women with postpartum hemorrhage secondary to uterine atony. *Am J Obstet Gynecol*, 204, 1, doi:10.1016/j.ajog.2010.08.02

Guilliland, K., & Pairman, S. (2010). *The Midwifery Partnership - A Model for Practice*. 2nd Ed. New Zealand College of Midwives, Christchurch

Gülmezoglu, A.M., Crowther, C.A., Middleton, P., & Heatley, E. (2012). Induction of labour for improving birth outcomes for women at or beyond term. *Cochrane Database Systematic Review, 2012*(6), 1-95. doi:10.1002/14651858.CD004945.pub3

Gupta, J., Hofmeyr, G., & Shehmar, M. (2012). Position in the second stage of labour for women without epidural anaestheia. *Cochrane Database Systematic Reviews, 2012*(5), 1-96. doi: 10.1002/14651858.CD002006.pub3

Gurol-Urganci, I, Cromwell, D., Edozien, L., Mahmood, T., Adams, E., Richmond D.,… & van der Meulen, J. (2013). Third- and fourth-degree perineal tears among primiparous women in England between 2000 and 2012: time trends and risk factors. *BJOG*, 120, 1516–1525. doi:10.1111/1471-0528.12363

Gurol-Urganci, I., Bou-Antoun, S., Lim, C., Cromwell, D., Mahmood, T., Templeton, A., & Meulen, J. (2013). Impact of caesarean section on subsequent fertility: A systematic review and meta-analysis. *Human Reproduction*, 28, 7, 1943-1952. doi: 10.1093/humrep/det130

Guyatt, G.H., Oxman, A.D., Vist, G.E., Kunz, R., Falck-Ytter, Y., Alonso-Coello, P., & Schünemann, H.J. (2008). GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. *BMJ*, 26, 336, 924-926. doi:10.1136/bmj.39489.470347.AD

Gyhagen, M., Åkervall, S., & Milsom, I. (2015). Clustering of pelvic floor disorders 20 years after one vaginal or one cesarean birth. *Int Urogynecol J*, 26, 1115-1121. doi: 10.1007/s00192-015-2663-3

Halfdansdottir, B., Smarason, A., Olafsdottir, O., Hildingsson, I., & Sveinsdottir, H. (2015). Outcome of planned home and hospital births among low-risk women in Iceland in 2005–2009: a retrospective cohort study. *Birth*, 42, 16–26. doi: doi:10.1111/birt.12150

Haines, H.M., Rubertsson, C., Pallant, J.F., & Hildingsson, I. (2012). The influence of women's fear, attitudes and beliefs of childbirth on mode and experience of birth. *BMC Pregnancy and Childbirth*, 12, 55. doi:10.1186/1471-2393-12-55

Hadjigeorgiou, E., Kouta, C., Papastavrou, E., Papadopoulos, I., & Martensson, L.B. (2012). Women's perceptions of their right to choose the place of childbirth: an integrative review. *Midwifery*, 28, 380-390. doi:10.1016/j.midw.2011.05.006

Hallock, J. & Handa, V. (2016). The Epidemiology of Pelvic Floor Disorders and Childbirth. *Obstet Gynecol Clin N Am*, 43, 1–13. doi:10.1016/j.ogc.2015.10.008

Hawley, S.T., Zikmund-Fraser, B., Ubel, P., Jancovic, A., Lucas, T., & Fagerlin, A. (2008). The impact of the format of graphical presentation on health related knowledge and treatment choices. *Patient Education and Counselling*, 73, 448-455. doi:10.1016/j.pec.2008.07.023

Hayes, E.J. & Weinstein, L. (2008). Improving patient safety and uniformity of care by a standardized regimen for the use of oxytocin. *Am J Obstet Gynecol*, 98, 6. doi:10.1016/j.ajog.2008.01.039

Healy, S., Humphreys, E., & Kennedy, C. (2016). Can maternity care move beyond risk? *British Journal of Midwifery*, 24, 3, 203-209. doi:http://dx.doi.org/10.12968/bjom.2016.24.3.203

Health and Disability Commissioner. (2007). *Code of Health and Disability Services Consumer Rights*. Health and Disability Commissioner, Auckland

Health Quality & Safety Commission New Zealand. (2016). *Tenth Annual Report of the Perinatal and Maternal Mortality Review Committee*. Retrieved from http://www.hqsc.govt.nz/our-programmes/mrc/pmmrc/publications-and-resources/publication/2550/

Henderson, J., Burns, E., Regalia, A., Casarico, G., Boulton, M., & Smith, L. (2014). Labouring women who used a birthing pool in obsteric units in Italy: prospective observational study. *BMC Pregnancy and Childbirth*, 14, 17. doi:org/10.1186/1471-2393-14-17

Hersh, S., Megregian, M., & Emeis, C. (2014). Intermittent Auscultation of the Fetal Heart Rate During Labor: An Opportunity for Shared Decision Making. *Journal of Midwifery and Women's Health*, 59, 344–349. doi:10.1111/jmwh.12178

Hillman, N., Kallapur, S., Suhas, G., & Jobe, A. (2012). Physiology of transition from intrauterine to extrauterine life. *Clinics in Perinatology*, 39, 4, 769-783. doi:10.1016/j.clp.2012.09.00

Hodnett, E.D., Downe, S., & Walsh, D. (2012). Alternative versus conventional institutional settings for birth. *Cochrane Database Systematic Reviews, 2012*(8), 1-51. doi:10.1002/14651858. CD000012.pub4

Hodnett, E., Gates, S., Hofmeyr, G., & Sakala, C. (2013). Continuous support for women during childbirth. *Cochrane Database Systematic Reviews, 2013*(7), 1-118. doi:10.1002/14651858.CD003766.pub5

Hoffman, A.S., Volk. R.J., Saarimaki, A., Stirling, C., Li, L.C., Härter, M., Kamath, G.R., & Llewellyn-Thomas, H. (2013). Delivering patient decision aids on the Internet: definitions, theories, current evidence, and emerging research areas. *BMC Medical Informatics and Decision Making*, 13, 2. doi:10.1186/1472-6947-13-S2-S13

Homer, C.S.E., Thornton, C., Scarf., V.L., Ellwood, D.A., Oats, J.J.N., Foueur, M.J., … & Dahlen, H.G. (2014). Birthplace in New South Wales, Australia: an analysis of perinatal outcomes using routinely collected data. *BMC Pregnancy and Childbirth*, 14, 206. doi:10.1186/1471-2393-14-206

Houghton, G., Bedwell, C., Forsey, M., Baker, L., & Lavender, T. (2008). Factors influencing choice in birth place – an exploration of the views of women, their partners and professionals. *Evidence Based Midwifery*, 6, 2, 59–64

Hutton, E., Cappellletti, A., Reitsma, A., Simioni, J., Hornew, J., McGregor, C. & Ahmed, R. (2015). Outcomes associated with planned place of birth among women with low risk pregnancies. *CMAJ*, 188, 5, E80-E90. doi:10.1503/cmaj.150564

Hunter, M., Pairmain, S., Benn, C., Baddock, S., Davis, D., Herbison, P., … & Anderson, J. (2011). Do low risk women actually birth in their planned place of birth and does ethnicity influence women's choices of birthplace? *New Zealand College of Midwives*. 44, 5-11

Ingham-Broomfield, R. (2016). A nurse's guide to the hierarchy of research designs and evidence. *Australian Journal of Advanced Nursing*, 33, 3

International Patient Decision Aids Standards Collaboration. (2006). *IPDAS Checklist for Judging the Quality of Patient Decision Aids*. Retrieved from http://ipdas.ohri.ca/resources.html

International Patient Decision Aids Standards. (2012). *Updated Chapter D: Clarifying and Expressing Values*. Retrieved from http://ipdas.ohri.ca/IPDAS-Chapter-D.pdf

Jansen, L., Gibson, M., Bowles, B. C., & Leach, J. (2013). First Do No Harm: Interventions During Childbirth. *The Journal of Perinatal Education*, 22, 2, 83–92. doi:http://doi.org/10.1891/1058-1243.22.2.83

Jibaja-Weiss, M.L., Volk, R.J., & Granchi, T.S. (2011). Entertainment education for breast cancer surgery decisions: A randomized trial among patients with low health literacy. *Patient Educ Couns*, 84: 41-48. doi:10.1016/j.pec.2010.06.009

Johannessen, H.H., Wibe, A., Stordahl, A., Sandvik, L., & Mørkved, S. (2015). Anal incontinence among first time mothers – What happens in pregnancy and the first year after delivery? *Acta Obstet Gynecol Scand*, 94, 1005–1013. doi:10.1111/aogs.12689

Johnson, K. (2013). Maternal-infant bonding: A review of literature. *International Journal of Childbirth Education*, 28, 3, 17-22

Johnson P. (1996). Birth under water: To breathe or not to breathe. *Br J Obstet Gynaecol*. 103, 3, 202-208

Jones, L., Othman, M., Dowswell, T., Alfirevic, Z., Gates, S., Newburn, M., … & Neilson, J.P. (2012). Pain management for women in labour: an overview of systematic reviews. *Cochrane Database Systematic Reviews, 2012*(3), 1-163. doi:10.1002/14651858.CD009234.pub2

Joseph, K.S., Rouleau, J., Kramer, M.S., Young, D.C., Liston, R.M., & Baskett, T.F. (2007). Investigation of an increase in postpartum haemorrhage in Canada. *BJOG*, 114,751–759. doi:10.1111/j.1471-0528.2007.01316.x

Kemp, E., Kingswood, C.J, Kibuka, M., & Thornton, J.G. (2013). Position in the second stage of labour for women with epidural anaesthesia. *Cochrane Database Systematic Reviews, 2013*(1), 1-30. doi:10.1002/14651858.CD008070.pub2

Kepenekci, I., Keskinkilic, B., Akinsu, F., Cakir, P., Elhan, A.H., Erkek, A.B., & Kuzu, M.A. (2011). Prevalence of pelvic floor disorders in the female population and the impact of age, mode of delivery, and parity. *Dis. Colon Rectum*, 54, 85–94

King, T.L., & Parer, J.T., (2011). On electronic fetal heart rate monitoring. *J Obstet Gynecol Neonatal Nurs*, 40, 669–671. doi:10.1111/j.1552-6909.2011.01291.x

Kinsey, C., Baptiste-Roberts, K., Zhu, J., & Kjerulff, K. (2014). Birth-related, psychosocial, and emotional correlates of positive maternal–infant bonding in a cohort of first-time mothers. *Midwifery*, 30, e188-e194. doi:10.1016/j.midw.2014.02.006

Klar, M., & Michels, K.B. (2014). Cesarean section and placental disorders in subsequent pregnancies: A meta-analysis. *Journal of Perinatal Medicine*, 4, 5, 871-883. doi:10.1515/jpm-2013-0199.

Klein, M.C., Janusz, K., Hearps, S.J.C, Tomkinson, J., Baradaran, N., Hall, W.A., … & Fraser, W.D. (2011). Birth Technology and Maternal Roles in Birth: Knowledge and Attitudes of Canadian Women Approaching Childbirth for the First Time. *J Obstetrics Gynaecol Can*, 33, 6, 598-608

Knight, M., Callaghan, W. M., Berg, C., Alexander, S., Bouvier-Colle, M., Ford, J.B., …& Walker, J. (2009) Trends in postpartum hemorrhage in high resource countries: a review and recommendations from the International Postpartum Hemorrhage Collaborative Group. *BMC Pregnancy Childbirth*, 9, 55. doi:10.1186/1471-2393-9-55

Koplin, J., Allen, K., Gurrin, L., Osborne, N., Tang, M.L., & Dharmage, S. (2008). Is caesarean delivery associated with sensitization to food allergens and IgE-mediated food allergy: a systematic review. *Pediatr Allergy Immunol*, 19, 8, 682-687. doi:10.1111/j.1399-3038.2008.00731.x

Kraschnewski, J.L., Chuang, C. H., Poole, E. S., Peyton, T., Blubaugh, I., Feher, A., & Reddy, M. (2014). Paging "Dr. Google": Does technology fill the gap created by the prenatal care visit structure? qualitative focus group study with pregnant women. *Journal of Medical Internet Research*. 16, 6, e147. doi:10.2196/jmir.3385.

Kreuter, M.W., Holmes, K., & Alcaraz, K. (2010). Comparing narrative and informational videos to increase mammography in low-income African American women. *Patient Educ Couns*, 81: S6-S14

Kristensen, K., & Hemriksen, L. (2016). Cesarean section and disease associated with immune function. *J Allergy Clin Immunol*, 137, 587-590

Kruske, S., Schultz, T., Eales, S. & Kildea, S. (2015). A retrospective, descriptive study of maternal and neonatal transfers, and clinical outcomes of a Primary maternity unit in rural Queensland, 2009–2011. *Women and Birth*, 28, 30–39. doi: 10.1016/j.wombi.2014

Kuliukas, L., Duggan, R., Lewis, L., & Hauck, Y. (2016). Women's experience of intrapartum transfer from a Western Australian birth centre co-located to a tertiary maternity hospital. *BMC Pregnancy Childbirth*, 8, 16, 33. doi:10.1186/s12884-016-0817-z

Kuppermann, M., Norton, M.E., Gates, E., Gregorich, S.E., Learman, L.A., & Nakagawa, S., … & Nease, R.F. (2009). Computerized prenatal genetic testing decision-assisting tool: A randomized controlled trial. *Obstet Gynecol*, 113, 53–63. doi:10.1097/AOG.0b013e31818e7ec4

Lagan, B.M., Sinclair, M., & Kernohan, W.G. (2010). Internet use in pregnancy informs women's decision making: a web-based survey. *Birth*, 37, 106–115

Laine, K., Skjeldestad, F.E., Sandvik, L., & Staff, A.C. (2012). Incidence of obstetric anal sphincter injuries after training to protect the perineum: cohort study. *BMJ Open*, 2. doi:10.1136/bmjopen-2012-001649

Landy, H. J., Laughon, S. K., Bailit, J., Kominiarek, M. A., Gonzalez-Quintero, V. H., Ramirez, M., … & Zhang, J. (2011). Characteristics associated with severe perineal and cervical lacerations during vaginal delivery. *Obstetrics and Gynecology*, 117, 3, 627–635. doi:10.1097/AOG.0b013e31820afaf2

Lavender, T., Hart, A., & Smyth, R. (2012). Effect of partogram use on outcomes for women in spontaneous labour at term (review). *Cochrane Database of Systematic Reviews, 2012*(4), 1-79. doi:10.1002/14651858.CD005461.pub2

Lawrence, A., Lewis, L., Hofmeyr, G.J., & Styles C. (2013). Maternal positions and mobility during first stage labor. *Cochrane Database Systematic Reviews, 2013*(2), 1-54. doi:10.1002/14651858

Laws, P.J., Xu, F., Welsh, A., Tracy, S.K., & Sullivan, E.A. (2014). Maternal morbidity of women receiving birth center care in New South Wales: a matched-pair analysis using linked health data. *Birth*, 41, 3, 268-275. doi:10.1111/birt.12114

Le Ray, C., Fraser, W., Rozenberg, P., Langer, B., Subtil, D., & Goffinet, F. (2011). Duration of passive and active phases of the second stage of labour and risk of severe postpartum haemorrhage in low-risk nulliparous women. *European Journal of Obstetrics & Gynecology and Reproductive Biology*, 158, 2, 167-172. doi:10.1002/14651858. CD007123.pub3

Lee, L., Dy, J. & Azzam, H. (2016). Management of Spontaneous Labour at Term in Healthy Women. *Journal of Obstetrics and Gynaecology Canada*. JOGC, 38, 9, 843-865

Lemos, A., Amorim, M. M. R., Dornelas de Andrade, A., de Souza, A.I. , Cabral Filho, J.E., & Correia, J.B. (2015). Pushing/bearing down methods for the second stage of labour. *Cochrane Database Systematic Reviews, 2015*(10),1-96. doi:10.1002/14651858. CD009124.pub2

Licqurish, S., & Evans, A. (2016). 'Risk or Right': A discourse analysis of midwifery and obstetric colleges' homebirth position statements. *Nursing Inquiry*, 23, 86–94. doi: 10.1111/nin.12111

Lind, J.N., Perrine, C.G., & Li, R. (2014). Relationship between use of labor pain medications and delayed onset of lactation. *Journal of Human Lactation*, 30, 2, 167-173

Lindgren, H.E., Brink, Å., & Klinberg-Allvin, M. (2011). Fear causes tears - perineal injuries in home birth settings. A Swedish interview study. *BMC Pregnancy Childbirth*, 18; 11. doi:10.1186/1471-2393-11-6

Lindgren, H.E., Radestad, I.J., Christensson, K., & Hildingsson, I.M. (2008). Outcome of planned home births compared to hospital births in Sweden between 1992 and 2004. A population-based register study. *Acta Obstet Gynecol Scand*, 87, 751–759

Liu, S., Liston, R., Joseph, K., Heaman, M., Sauve, R., & Kramer, M. (2007). Maternal mortality and severe morbidity associated with low-risk planned cesarean delivery versus planned vaginal delivery at term: maternal health study group of the Canadian perinatal surveillance system. *CMAJ*, 176, 4, 455–460. doi:10.1503/cmaj.060870

Liu, Y., Liu, Y., Huang, X., Du, C., Peng, J., Huang, P., & Zhang, J. (2014). A comparison of maternal and neonatal outcomes between water immersion during labor and conventional labor and delivery. *BMC Pregnancy and Childbirth*, 14, 160. doi:10.1186/1471-2393-14-160

Lobel M, & DeLuca, R. (2007). Psychosocial sequelae of cesarean delivery: review and analysis of their causes and implications. *Soc Sci Med*, 64, 11, 2272–2284. doi:10.1016/j.socscimed.2007.02.028

Loiacono, E.T., Watson, R.T., & Goodhue, D.L. (2007). WebQual: An Instrument for Consumer Evaluation of Web Sites. *International Journal of Electronic Commerce*, 11, 3, 51-87. doi:10.2753/JEC1086-4415110302

Lothian, J. A. (2014). Healthy Birth Practice #4: Avoid interventions unless they are medically necessary. *The Journal of Perinatal Education*, 23, 4, 198–206. doi:10.1891/1058-1243.23.4.198

Lowder, J.L., Burrows, L.J., Krohn, M.A., & Weber, A.M. (2007). Risk factors for primary and subsequent anal sphincter lacerations: a comparison of cohorts by parity and prior mode of delivery. *Am J Obstet Gynecol*, 196, 4, e1-e5

Luce, A., Cash, M., Hundley, V., Cheyne, H., van Teijlingen, E. & Angell, C. (2016). “Is it realistic?” the portrayal of pregnancy and childbirth in the media. *BMC Pregnancy and Childbirth*, doi:10.1186/s12884-016-0827-x

Lukasse, M., Rowe, R., Townend, J., Knight, M., & Hollowell, J. (2014). Immersion in water for pain relief and the risk of intrapartum transfer among low risk nulliparous women: secondary analysis of the Birthplace national prospective cohort study. *BMC Pregnancy Childbirth*, 6, 14, 60. doi:10.1186/1471-2393-14-60

Lupton, D. (2016). The use and value of digital media for information about pregnancy and early motherhood: A focus group study. *BMC Pregnancy and Childbirth*, 16, 171-181. doi:http://dx.doi.org/10.1186/s12884-016-0971-3

MacDorman, M.F., Reddy, U.M., & Silver, R.M. (2015). Trends in stillbirth by gestational age in the United States, 2006–2012. *Obstet Gynecol*, 126, 1146–1150. doi:10.1097/AOG.0000000000001152

MacKenzie Bryers, H., & van Teijlingen, E. (2010). Risk, theory, social and medical models: A critical analysis of the concept of risk in maternity care. *Midwifery*, 26, 5, 488-496. doi:10.1016/j.midw.2010.07.003

Matamoros, S., Gras-Leguen, C., Le Vacon, F., Potel, G., & de La Cochetiere, M. (2013). Development of intestinal microbiota in infants and its impact on health. *Trends Microbiol*, 21, 4, 167-73. doi:10.1016/j.tim.2012.12.001

Maternity Services Consumer Council (n.d). *Labour and Birth: Your Choice*. Retrieved from www.maternity.org.nz/your-choices/labour-and-birth/

Matthiesen, A.S., Ransjö-Arvidson, A.B., Nissen, E., & Uvnäs-Moberg, K. (2001). Postpartum maternal oxytocin release by newborns: Effects of infant hand massage and sucking. *Birth*, 28, 1, 13-19

McAra-Couper, J., Jones, M., & Smyth, L. (2010). Rising rates of intervention in childbirth. *British Journal of Midwifery*, 18, 3, 160- 169

McCandlish, R., Bowler, U., van Asten, H., Berridge, G., Winter, C., Sames, L., … & Elbourne, D. (1998). A randomised controlled trial of care of the perineum during second stage of normal labour. *Br J Obstet Gynaecol*, 105, 12, 1262–1272

McDonald, S.J., Middleton, P., Dowswell, T., & Morris, P.S. (2013). Effect of timing of umbilical cord clamping of term infants on maternal and neonatal outcomes. *Cochrane Database Systematic Reviews, 2013*(7), 1-92. doi:10.1002/14651858.CD004074.pub3

McIntyre, M.J., Francis, K., & Chapman, Y. (2011). Shaping public opinion on the issue of childbirth; A critical analysis of articles published in an Australian newspaper. *BMC Pregnancy Childbirth*, 11, 47. doi:10.1186/1471-2393-11-47

McIntyre, M.J. (2012). Safety of non-medically led primary maternity care models: a critical review of the international literature. *Aust Health Rev*, 36, 2, 140-147. doi: 10.1071/AH11039

McLachlan, H.L., Forster, D.A., Davey, M.A., Farrell, T., Gold, L., Biro, M.A., … & Waldenstrom, U. (2012). Effects of continuity of care by a primary midwife (caseload midwifery) on caesarean section rates in women of low obstetric risk: the COSMOS randomised controlled trial. *BJOG*, 119, 1483–1492. doi:10.1111/j.1471-0528.2012.03446.x

Medsafe. (2015). *New Zealand Data Sheet Syntocinon*. Retrieved from www.medsafe.govt.nz/profs/Datasheet/s/syntocinoninj.pdf

Memon, H., & Handa, V.L. (2013). Vaginal childbirth and pelvic floor disorders. *Women's Health*, 9, 3, 265-277. doi:10.2217/whe.13.17

Memon, H., & Handa, V. L. (2012). Pelvic floor disorders following vaginal or cesarean delivery. *Current Opinion in Obstetrics & Gynecology*, 24, 5, 349–354. doi:10.1097/GCO.0b013e328357628b.

Midwifery Employee Representation and Advisory Service (2014). *MERAS Midwifery Staffing Standards for Maternity Facilities*. Retreived from https://www.midwife.org.nz/meras-staffing-standard

Miller, J.M., Low, L., Zielinski, R., Smith, A.R., DeLancey, J.O.L., & Brandon, C. (2015). Evaluating maternal recovery from labor and delivery: bone and levator ani injuries. *American Journal of Obstetrics and Gynecology*, 213, 2, 188.e1–188.e11. doi:10.1016/j.ajog.2015.05.001

Miller, S. (2014). *Are midwives more at home at home?* Retrieved May 21st, 2017, from http://www.birthspirit.co.nz/are-midwives-more-at-home-at-home/

Ministry of Education (n.d). *Adult Literacy in New Zealand. Results from the International Adult Literacy Survey*. Retrieved from https://www.educationcounts.govt.nz/publications/literacy/5731

Ministry of Health. (2012). *Guidelines for Consultation with Obstetric and Related Medical Services (Referral Guidelines)*. Wellington: Ministry of Health

Ministry of Health. (2016a). *New Zealand Maternity Clinical Indicators 2014*. Wellington: Ministry of Health

Ministry of Health. (2016b). *Report on Maternity, 2014*. Wellington: Ministry of Health

Ministry of Health. (n.d). *Where to give birth*. Retrieved February 19th, 2017, from http://www.health.govt.nz/your-health/pregnancy-and-kids/services-and-support-during-pregnancy/where-give-birth

Mollamahmutoğlu, L., Moraloğlu, Ö., Özyer, Ş., Su, F. A., Karayalçın, R., Hançerlioğlu, N., … Dilmen, U. (2012). The effects of immersion in water on labor, birth and newborn and comparison with epidural analgesia and conventional vaginal delivery. *Journal of the Turkish German Gynecological Association*, 13, 1, 45–49. doi:10.5152/jtgga.2012.03

Monk, A., Tracy, M., Foureur, M., Grigg, C., & Tracy, S. (2014). Evaluating Midwifery Units (EMU): a prospective cohort study of freestanding midwifery units in New South Wales, Australia. *BMJ Open*, 4, 1–11. doi:10.1136/ bmjopen-2014-006252

Monk, A.R., Grigg, C.P., Foureur, M., Tracy, M., & Tracy, S.K. (2017). Freestanding midwifery units: Maternal and neonatal outcomes following transfer. *Midwifery*, 46, 24–28. doi:http://dx.doi.org/10.1016/j.midw.2017.01.006

Montori, V.M., LeBlanc, A., Buchholz, A., Stilwell, D.L., & Tsapas, A. (2013). Basing information on comprehensive, critically appraised, and up-to-date syntheses of the scientific evidence: a quality dimension of the International Patient Decision Aid Standards. *BMC Med Inform Decis Mak*, 13, Suppl 2, S5. doi:10.1186/1472-6947-13-S2-S5

Moore, E., Anderson, G., Bergman, N., & Dowswell, T. (2012). Early skin-to-skin contact for mothers and their healthy newborn infants. *Cochrane Database Systematic Reviews, 2012*(5), 1-163. doi:10.1002/14651858.CD003519.pub3

Moraitis, A., Oliver-Williams, C., Wood, A., Fleming, M., Pell, J., & Smith, G. (2015). Previous caesarean delivery and the risk of unexplained stillbirth: retrospective cohort study and meta-analysis. *BJOG*, 122, 11, 1467-1474. doi:10.1111/1471-0528.13461

Mori, R., Tokumasu, H., Pledge, D., & Kenyon, S. (2013). High-dose versus low-dose oxytocin for augmentation of delayed labour. *Cochrane Database Systematic Reviews, 2013*(7), 1-27. doi: 10.1002/14651858.CD007201.pub3

Morken, N.H., Melve, K., & Skjaerven, R. (2011). Recurrence of prolonged and post-term gestational age across generations: maternal and paternal contribution. *BJOG*, 118, 1630–1635. doi:10.1111/j.1471-0528.2011.03154.x

Mørkved, S. & Bø, K. (2013). Effect of pelvic floor muscle training during pregnancy and after childbirth on prevention and treatment of urinary incontinence: a systematic review. *Br J Sports Med*, 48, 4, 299-310. doi:10.1136/bjsports-2012-091758

Munroe, S., Stacey, D., Lewis, K.B., & Bansback, N. (2016). Choosing treatment and screening options congruent with values: Do decision aids help? Sub-analysis of a systematic review. *Patient Education and Counseling*, 99, 4, 491-500. doi:10.1016/j.pec.2015

Nassar, N., Roberts, C.L., Raynes-Greenow, C.H., Barrat, A., & Peat, B. (2007). Evaulation of a decision aid for women with breech presentation at term: A randomized trial. *BJOG*, 114, 3, 325-333

National Institute for health and Care Excellence (2014). *Intrapartum care for healthy women and babies. Clinical guideline CG190*. Retrieved from https://www.nice.org.uk/guidance/cg190?unlid= 420682734201610102374

Neal, J., & Lowe, N. (2012). Physiologic partograph to improve birth safety and outcomes among low-risk, nulliparous women with spontaneous labor onset. *Medical Hypotheses*, 78, 319–326. doi:10.1016/j.mehy.2011.11.012

Neal, J., Lowe, N.K., Ahijevych, K.L., Patrick, T.E., Cabbage, L.A., & Corwin, E.J. (2010). 'Active labor' duration and dilation rates among low-risk, nulliparous women with spontaneous labor onset: a systematic review. *J. Midwifery Womens Health*, 55, 308–318. doi:10.1016/j.jmwh.2009.08.004

Neal, J., Lowe, N.K, Nacht, A.S. Koschoreck, K., & Anderson, J. (2016). Pilot study of physiologic partograph use among low-risk, nulliparous women with spontaneous labor onset. *J Midwifery Womens Health*, 61, 2235-2241. doi:10.1111/jmwh.12442

Nelson, R.L., Furner, S.E., Westercamp, M., & Farquhar, C. (2010). Cesarean delivery for the prevention of anal incontinence. *Cochrane Database Systematic Reviews, 2010*(2), 1-31. doi:10.1002/14651858.CD006756.pub2

New Zealand College of Midwives. (2009). *Normal Birth Consensus Statement*. Retrieved from https://www.midwife.org.nz/quality-practice/nzcom-consensus-statements

New Zealand College of Midwives. (2011). *Handbook for Practice*. New Zealand. Christchurch

New Zealand College of Midwives. (2015). *Consensus statement: The Use of Water for Labour and Birth*. Retrieved from https://www.midwife.org.nz/quality-practice/nzcom-consensus-statements

National Institute for Health and Care Excellence (2014). *Intrapartum care: care of healthy women and their babies during childbirth*. Retrieved October 12th, 2016, from http://www.nice.org.uk/guidance/cg190/chapter/1-recommendations#place-of-birth

Nicholls, S., Hauck, Y.L., Bayes, S., & Butt, J. (2016). Exploring midwives' perception of confidence around facilitating water birth in Western Australia: A qualitative descriptive study. *Midwifery*, 33, 73-81. doi:10.1016/j.midw.2015.10.010

Nguyen, U.S., Rothman, K.J., Demissie, S., Jackson, D.J., Lang, J.M., & Ecker, J.L. (2010). Epidural analgesia and risks of cesarean and operative vaginal deliveries in nulliparous and multiparous women. *Matern Child Health J*, 14, 5, 705-712. doi:10.1007/s10995-009-0515-9

Nutter, E., Meyer, S., Shaw-Battista, J., & Marowitz, A. (2014). Waterbirth: An integrative analysis of peer-reviewed literature. *J Midwifery Womens Health*, 59, 3, 286-319. doi:10.1111/jmwh.12194

O'Connell, R., & Downe, S. (2009). A metasynthesis of midwives' experience of hospital practice in publicly funded settings: compliance, resistance and authenticity. *Health*, 13, 589–609

O'Connor, A.M. (1993). *User manual –Decisional Conflict Scale, updated 2010*. Retrieved from www.ohri.ca/decisionaid

Odent, M. R. (2013). Synthetic oxytocin and breastfeeding: Reasons for testing an hypothesis. *Medical Hypotheses*, 81, 5, 889-891. doi:http://dx.doi.org/10.1016/j.mehy.2013.07.044

Olza Fernandez, I., Marin Gabriel, M., Malalana Martinez, A., Fernandez-Canadas Morillo, A., Lopez Sanchez, F., & Costarelli, V. (2012). Newborn feeding behaviour depressed by intrapartum oxytocin: a pilot study. *Acta Paediatr*, 101, 7, 749–754. doi:10.1111/j.1651-2227.2012.02668.x

Ondeck, M. (2014). Healthy birth practice #2: walk, move around, and change positions throughout labor. *J Perinat Educ*, 23, 4, 188-193. doi:10.1891/1058-1243.23.4.188

Oscarsson, M.E., Amer-Wahlin, I., Rydhstroem, H., & Kallen, K. (2006). Outcome in obstetric care related to oxytocin use. A population-based study. *Acta Obstet Gynecol Scand*, 85, 9, 1094-1098

Ottawa Hospital Research Institute. (n.d). *Decision Aid Library Inventory (DALI)*. Retrieved 21st January, 2017, from https://decisionaid.ohri.ca/cochinvent.php

Ottawa Hospital Research Institute. (2015). *Ottawa Patient Decision Aid Development eTraining Framework*. Retrieved from https://decisionaid.ohri.ca/eTraining/index.php

Oudhoff, J.P. & Timmermans, D. (2015). The Effect of Different Graphical and Numerical Likelihood Formats on Perception of Likelihood and Choice. *Med Decis Making*, 35, 487-500. doi:10.1177/0272989X15576487

Overgaard, C., Moller, A., Fenger-Gron, M., Knudsen, L.B., & Sandall, J. (2011). Freestanding midwifery unit versus obstetric unit: a matched cohort study of outcomes in low-risk women. *BMJ Open*, 2, 1–11. doi:10.1136/bmjopen-2011-000262

Pang, M., Leung, T., Lau, T. & Hang Chung, T. (2008). Impact of first childbirth on changes in women's preference for mode of delivery: Follow-up of a longitudinal observational study. *Birth*, 35, 121–128. doi:10.1111/j.1523-536X.2008.00225.x

Parayre, A.F., Labrecque, M., Rousseau, M., Turcotte, S., & Legare, F. (2014). Validation of SURE, a four item clinical checklist for detecting decisional conflict in patients. *Medical Decision Making*. doi:10.1177/0272989X13491463

Patterson, J.A., Ford, J.B., Morris, J.M., & Roberts, C.L. (2014). Trends and recurrence of stillbirths in NSW. *Aust N Z J Public Health*, 38, 4, 384-389. doi:10.1111/1753-6405.12179

Petersen, A., Poetter, U., Michelsen, C. & Gross, M.M. (2013). The sequence of intrapartum interventions: a descriptive approach to the cascade of interventions. *Arch Gynecol Obstet*. 288, 245–254. doi:10.1007/s00404-013-2737-8

Petrisor, B., & Bhandari, M. (2007). The hierarchy of evidence: Levels and grades of recommendation. *Indian Journal of Orthopaedics*, 41, 1, 11–15. doi:10.4103/0019-5413.30519

Phaneuf, S., Rodriguez Linares, R.B., TambyRaja, R.L., MacKenzie, I.Z., & Lopez Bernal, A. (2000). Loss of myometrial oxytocin receptors during oxytocin-induced and oxytocin-augmented labour. *J Reprod Fertil*, 120, 91–97. doi:10.1530/jrf.0.1200091

Portsmouth Hospitals NHS Trust. (2015). *My Birthplace computer app*. Retrieved from http://mybirthplace.org/portsmouth/#page=1

Priddis, H., Dahlen, H. & Schmied, V. (2012). What are the facilitators, inhibitors, and implications of birth positioning? A review of the literature. *Women Birth*, 25, 3, 100-106. doi:10.1016/j.wombi.2011.05.001

Price, M., Cameron, R., & Butow, P. (2007). Communicating risk information: the influence of graphical display format on quantitative information perception-accuracy, comprehension and preferences. *Patient Education and Counseling*, 69, 121-128

Prins, M., Boxem, J., Lucas, C., & Hutton, E. (2011). Effect of spontaneous pushing versus Valsalva pushing in the second stage of labour on mother and fetus: a systematic review of randomised trials. British *Journal of Obstetrics and Gynecology*, 118, 6, 662-670. doi:10.1111/j.1471-0528.2011.02910.x

Prior, E., Santhakumaran, S., Gale, C., Philipps, L., Modi, N., & Hyde, M. (2012). Breastfeeding after cesarean delivery: a systematic review and meta-analysis of world literature. *American Journal of Clinical Nutrition*, 95, 1113-1135. doi:10.3945/ajcn.111.030254

Queensland Centre for Mothers and Babies. (n.d). Retrieved from http://www.havingababy.org.au on December 17th 2016

Räisänen, S., Selander, T., Cartwright, R., Gissler, M., Kramer, M.R., Laine, K., … & Henionen, S. (2014). The association of episiotomy with obstetric anal sphincter injury - a population based matched cohort study. *PLoS One*, 9, 9. doi:10.1371/journal.pone.0107053

Raynes-Greenow, C.H., Nassar, N., Torvaldsen, S., Trevena, L., & Roberts, L. (2010). Assisting informed decision making for labour analgesia: a randomised controlled trial of a decision aid for labour analgesia versus a pamphlet. *BMC Pregnancy and Childbirth*, 10, 15. doi: 10.1186/1471-2393-10-15

Research New Zealand (2015). *A Report on a Survey of New Zealanders' Use of Smartphones and other Mobile Communication Devices 2015*. Retrieved from Research New Zealand http://www.researchnz.com/special-reports.html

Richmond, H. (2003). Women's experience of waterbirth. *Practising Midwife*. 6, 3, 26-31

Rogers, R.G., Leeman, L.M., Borders, N., Qualls, C., Fullilove, A.M., Teaf, D., … & Albers, L.L. (2014). Contribution of the second stage of labour to pelvic floor dysfunction: a prospective cohort comparison of nulliparous women. *BJOG*, 121, 1145–53. doi:10.1111/1471-0528.12571

Rodger, D., Skuse, A., Wilmore, M., Humphreys, S., Dalton, J., Flabouris, M., & Clifton, V. (2013). Pregnant women's use of information and communication technologies to access pregnancy-related health information in South Australia. *Australian Journal of Primary Health*, 19, 308-312. doi:10.1071/PY13029

Rooks, J. P. (2012), Labor pain management other than neuraxial: What do we know and where do we go next? *Birth*, 39: 318–322. doi:10.1111/birt.12009

Rossen, J., Okland, I., Nilesen., O. & Eggebo, T. (2010). Is there an increase of postpartum hemorrhage, and is severe hemorrhage associated with more frequent use of obstetric interventions? *Acta Obstetricia et Gynecologic*, 89, 1248–1255. doi:10.3109/00016349.2010.514324

Rossignol, M., Chaillet, N., Boughrassa, F., & Moutquin, J.M. (2014). Interrelations between four antepartum obstetric interventions and cesarean delivery in women at low risk: a systematic review and modeling of the cascade of interventions. *Birth*, 41, 1, 70-78. doi:10.1111/birt.12088

Royal Australian and New Zealand College of Obstetricians and Gynaecologists. (2014). *Intrapartum Fetal Surveillance: Clinical Guideline (Third Edition)*. The Royal Australian and New Zealand College of Obstetricians and Gynaecologists: https://www.ranzcog.edu.au/intrapartum-fetal-surveillance-clinical-guidelines.html

Royal College of Midwives (2016). *Interventions in Normal Labour and Birth*. Retrieved from https://www.rcm.org.uk/sites/default/files/Labour%20Interventions%20Report.pdf

Royal College of Obstetricians & Gynaecologists. (2007). *Normal Birth Consensus Statement*. Retrieved from http://www.rcog.org.uk/womens-health/clinical-guid ance/making-normal-birth-reality

Royal college of Obstetricians and Gynaecologists, (2011). *Operative Vaginal Delivery, Green-top guideline No. 26*. Retrieved from https://www.rcog.org.uk/en/guidelines-research-services/guidelines/gtg26/

Royal College of Obstetricians & Gynaecologists. (2015). The Management of Third- and Fourth-Degree Perineal Tears. *Green-top Guideline No.29*. Retireved from https://www.rcog.org.uk/en/guidelines-research-services/guidelines/gtg29/

Royal College of Obstetricians & Gynaecologists. (2015). *Clamping of the Umbilical Cord and Placental Transfusion, Scientific Impact Paper No. 14, February 2015*. Retrived from https://www.rcog.org.uk/ globalassets/ documents/guidelines/scientific-impact-papers/sip-14.pdf

Rowe, R., Fitzpatrick, R., Hollowell, J., & Kurinczuk, J. (2012). Transfers of women planning birth in midwifery units: data from the Birthplace prospective cohort study. *BJOG*, 119, 1081–1090. doi:10.1111/j.1471-0528.2012.03414.x

Rowe, R., Townend, J., Brocklehurst, P., Knight, M., Macfarlane, A., McCourt, C., …Hollowell, J. (2013). Duration and urgency of transfer in births planned at home and in freestanding midwifery units in England: secondary analysis of the birthplace national prospective cohort study. *BMC Pregnancy and Childbirth*, 13, 224. doi:10.1186/1471-2393-13-224

Rowlands, J. & Redshaw, M. (2012). Mode of birth and women's psychological and physical wellbeing in the postnatal period. *BMC Pregnancy and Childbirth*, 12, 138. doi:org/10.1186/1471-2393-12-138

Rosenstein, M. G., Cheng, Y. W., Snowden, J. M., Nicholson, J. M., & Caughey, A. B. (2012). Risk of stillbirth and infant death stratified by gestational age. *Obstetrics and Gynecology*, 120, 1, 76–82. doi:10.1097/AOG.0b013e31825bd286

Sakala, C., Romano, A., & Buckley, S. (2016). Hormonal physiology of childbearing, an essential framework for maternal–newborn nursing. *JOGNN*, 45, 264–275. doi.org/10.1016/j.jogn.2015.12.006

Sandall, J., Soltani, H., Gates, S., Shennan, A., and Devane, D. (2016). Midwife-led continuity models versus other models of care for childbearing women. *Cochrane Database Systematic Reviews, 2016*(9), 1-122. doi:10.1002/14651858.CD004667.pub5

Sangsawang, B., & Sangsawang, N. (2013). Stress urinary incontinence in pregnant women: a review of prevalence, pathophysiology, and treatment. *International Urogynecology Journal*, 24, 6, 901–912. doi:10.1007/s00192-013-2061-7

Sartwelle, T. (2012). Electronic fetal monitoring: A bridge too far. *Journal of Legal Medicine*, 33, 313-379

Saxton, A., Fahy, K., Rolfe, M., Skinner, V., & Hastie, C. (2015). Does skin-to-skin contact and breast feeding at birth affect the rate of primary postpartum haemorrhage: Results of a cohort study. *Midwifery*, 31, 1110–1117. doi:10.1016/j.midw.2015.07.008

Say, L., Chou, D., Gemmill, A., Tunçalp, Ö., Moller, A., Daniels, J, … & Alkema, L. (2014). Global causes of maternal death: a WHO systematic analysis. *Lancet*, 2, 6. doi:http://dx.doi.org/10.1016/S2214-109X(14)70227-X

Say, R., Robson, S., & Thomson, R. (2011). Helping pregnant women make better decisions: a systematic review of the benefits of patient decision aids in obstetrics. *BMJ Open*. doi:10.1136/bmjopen-2011-000261

Sayakhot, & Carolan-Olah, M. (2016). Internet use by pregnant women seeking pregnancy-related information: A systematic review, *BMC Pregnancy and Childbirth*, 16, 1. doi: 10.1186/s12884-016-0856-5

Sayasneh, A. & Pandeva, I. (2010). Postpartum sexual dysfunction: A literature review of risk factors and role of mode of delivery. *British Journal of Medical Practitioners*, 3, 2, 23-27

Schaffer, J., Bloom, S., Casey, B., McIntire, D., Nihira, M., & Leveno, K. (2005). A randomized trial of the effects of coached vs uncoached maternal pushing during the second stage of labor on postpartum pelvic floor structure and function. *American Journal of Obstetrics and Gynecology*, 192, 1692-1696

Scamell, M., & Alaszewski, A. (2012). Fateful moments and the categorisation of risk: Midwifery practice and the ever-narrowing window of normality during childbirth. *Health, Risk & Society*, 14, 2, 207-221. doi:10.1080/13698575.2012.661041

Scholl, I., Koelewijn-van Loon, M., Sepucha, K., Elwyn, G., Légaré, F., Härter, M., Dirmaier, J. (2011). Measurement of shared decision making - a review of instruments. *Z Evid Fortbild Qual Gesundhwes*, 105, 4, 313-324. doi:10.1016/j.zefq.2011.04.012

Schroeder, E., Petrou, S., Patel, N., Hollowell, J., Puddicombe, D., Redshaw, M. & Brocklehurst, P. (2012). Cost effectiveness of alternative planned places of birth in woman at low risk of complications: evidence from the Birthplace in England national prospective cohort study. *BMJ*, 344, e2292

Schwartz, S., Friedberg, I., Ivanov, I., Davidson, L., Goldsby, J., Dahl, D., … & Chapkin, R. (2012). A metagenomic study of diet-dependent interaction between gut microbiota and host in infants reveals differences in immune response. *Genome Biology*, 13, 4. doi:10.1186/gb-2012-13-4-r32

Schwertner-Tiepelmann, N., Thakar, R., Sultan, A.H., & Tunn, R. (2012), Obstetric levator ani muscle injuries: current status. *Ultrasound Obstet Gynecol*, 39, 372–383. doi:10.1002/uog.11080

Selin, L., Almström, E., Wallin, G., & Berg, M. (2009).Use and abuse of oxytocin for augmentation of labor. *Acta Obstetricia et Gynecologica Scandinavica*, 88, 1352–1357. doi:10.3109/00016340903358812

Selo-Ojeme, D., Rogers, D., Mohanty, A., Zaidi, N., Villar, R., & Shangaris, P. (2011). Is induced labour in the nullipara associated with more maternal and perinatal morbidity? *Arch Gynecol Obstet*, 284, 2, 337-341. doi:10.1007/s00404-010-1671-2

Sepucha, K.R., Borkhoff, C.M., Lally, J., Levin, C.A., Matlock, D.D., Ng, C.J., … & Thomson, R. (2013). Establishing the effectiveness of patient decision aids: key constructs and measurement instruments. *BMC Medical Informatics and Decision Making*, 13. doi:10.1186/1472-6947-13-S2-S12

Sevelsted, A., Stokholm, J., Bønnelykke, K., & Bisgaard, H. (2015). Cesarean section and chronic immune disorders. *Pediatrics*, 135, 1, e92-e98. doi:10.1542/peds.2014-0596

Shaffer, V.A. & Zikmund-Fisher, B.J. (2013). All stories are not alike: A purpose, content, and valence-based taxonomy of patient narratives in decision aids. *Med Decis Making*, 33, 4-13. doi:10.1177/0272989X12463266

Sheehan, J., & Sherman, K.A., (2012). Computerised decision aids: a systematic review of their effectiveness in facilitating high-quality decision-making in various health-related contexts. *Patient Educ Couns*, 88, 1, 69-86. doi:10.1016/j.pec.2011.11.006

Shorten, A., Chamberlain, M., Shorten, B., & Kariminina, A. (2004). Making choices for childbirth: development and testing of a decision-aid for women who have experienced previous caesarean. *Patient Education and Counseling*, 52, 307-313. doi:10.1016/S0738-3991(03)00106-X

Shorten, A., Donsante, J., & Shorten, B. (2002). Birth position, accoucheur, and perineal outcomes: Informing women about choices for vaginal birth. *Birth*, 29, 1, 18–27

Shorten, A., Shorten, B., Keogh, J., West, S., & Morris, J. (2005). Making choices for childbirth: a randomized controlled trial of a decision-aid for informed birth after cesarean. *Birth*, 32, 252–261. doi:10.1111/j.0730-7659.2005.00383.x

Simpson, K.R., & James, D.C. (2008). Effects of oxytocin-induced uterine hyperstimulation during labor on fetal oxygen status and fetal heart rate patterns. *Am J Obstet Gynecol*, 34-36. doi:10.1016/j.ajog.2007.12.015

Skjøth, M. M., Hansen, H. P., Draborg, E., Pedersen, C. D., Lamont, R. F., & Jørgensen, J. S. (2015). Informed choice for participation in down syndrome screening: development and content of a web-based decision aid. *JMIR Research Protocols*, 4, 3. doi:org/10.2196/resprot.4291

Sleep, J., Grant, A., Garica, J., Elbourne, D., Spencer, J., & Chalmers, I. (1984). West Berkshire perineal management trial. *BMJ*, 289, 587-590

Smith, L.A., Price, N., Simonite, V., & Burns, E.E. (2013). Incidence of and risk factors for perineal trauma: a prospective observational study. *BMC Pregnancy Childbirth*, 13, 59

Smyth, R.M.D., Markham, C., & Dowswell, T. (2013). Amniotomy for shortening spontaneous labour. *Cochrane Database Systematic Reviews, 2013*(6), 1-74. doi:10.1002/14651858.CD006167.pub4

Sobel, H. L., Silvestre, M. A. A., Mantaring, J. B. V., Oliveros, Y. E., & Nyunt-U S. (2011). Immediate newborn care practices delay thermoregulation and breastfeeding initiation. *Acta Paediatrica*, 100, 8, 1127–1133. doi:10.1111/j.1651-2227.2011.02215.x

Society of Obstetricians and Gynaecologists of Canada, Association of Women's Health, Obstetric and Neonatal Nurses of Canada, the Canadian Association of Midwives, the College of Family Physicians of Canada, the Society of Rural Physicians of Canada, (2008). Joint policy statement on normal childbirth. SOGC Clinical Practice Guideline No. 221, *J Obstet Gynaecol Can*, 30, 1163–1165

Stables, D., & Rankin, J. (2010). *The first stage of labour*. In D. Stables & J. Rankin (Eds.). Physiology in Childbearing with Anatomy and Related Biosciences (pp. 497-515). United Kingdom, Baillière Tindall.

Stacey, D., Bennett, C.L., Barry, M.J., Col, N.F., Eden, K.B., Holmes-Rovner, M.,… & Thomson, R. (2011). Decision aids for people facing health treatment or screening decisions. *Cochrane Database Systemative Reviews, 2014*(1), 1-335. doi:10.1002/14651858.CD001431.pub4

Stapleton, S.R., Osborne, C., & Illuzzi, J. (2013). Outcomes of care in birth centers: demonstration of a durable model. *J Midwifery Womens Health*, 58, 1,3-14. doi:10.1111/jmwh.12003

Stevens, G., Miller, Y.D., Watson, B., & Thompson, R. (2012). Choosing a Model of Maternity Care: Decision Support Needs of Australian Women. *Birth*, 43, 2, 167-175. doi:10.1111/birt.12212

Sultan, P., Murphy, C., Halpern, S., & Carvalho, B. (2013). The effect of low concentrations versus high concentrations of local anesthetics for labour analgesia on obstetric and anesthetic outcomes: a meta-analysis. *Can J Anaesth*, 60, 840-854

Surtees, R. (2010), 'Everybody expects the perfect baby … and perfect labour … and so you have to protect yourself': discourses of defence in midwifery practice in Aotearoa / New Zealand. *Nursing Inquiry*, 17, 82–92. doi:10.1111/j.1440-1800.2009.00464.x

Sutcliffe, K., Caird, J., Kavanagh, J., Rees, R., Oliver, K., Dickson, K., ... & Thomas, J. (2012), Comparing midwife-led and doctor-led maternity care: a systematic review of reviews. *Journal of Advanced Nursing*, 68, 2376–2386. doi:10.1111/j.1365-2648.2012.05998.x

Swain, J.E., Tasgin,E., Mayes, L.C., Feldman, R., Constable, R.T., & Leckman, J.F. (2008). Maternal brain response to own baby-cry is affected by cesarean section delivery. *J Child Psychol Psychiatry*, 49, 10, 1042-1052. doi:10.1111/j.1469-7610.2008.01963.x.

Syrowatka, A., Krömker, D., Meguerditchian, A.N., & Tamblyn, R. (2016). Features of computer-based decision aids: systematic review, thematic synthesis, and meta-analyses. *J Med Internet Res*, 26, 18, 1. doi:10.2196/jmir.4982

Tähtinen, M., Cartwright, R., Tsui, J., Aaltonen, R., Aoki, Y., Cárdenas, J., … & Tikkinen, K.A.O. (2016). Long-term impact of mode of delivery on stress urinary incontinence and urgency urinary incontinence: A systematic review and meta-analysis. *European Urology*, 70, 1, 148–158. doi:10.1016/j.eururo.2016.01.037

Takahashi, Y., Tamakoshi, K., Matsushima, M., & Kawabe, T. (2011). Comparison of salivary cortisol, heart rate, and oxygen saturation between early skin-to-skin contact with different initiation and duration times in healthy, full-term infants. *Early Human Development*, 87, 3, 151–157. doi:10.1016/j.earlhumdev.2010.11.012

Taylor, H., Kleine, I., Bewley, S., Loucaides, E., & Sutcliffe, A. (2016). Neonatal outcomes of waterbirth: a systematic review and meta-analysis. *Archives of Disease in Childhood - Fetal and Neonatal Edition*, 101. doi:10.1136/archdischild-2015-309600

Thavagnanam, S., Fleming, J., Bromley, A., Shields, M., & Cardwell, C. (2008). A meta-analysis of the association between Caesarean section and childhood asthma. *Clin Exp Allergy*, 38, 629-633. doi:org/10.1111/j.1365-2222.2007.02780.x

Thies-Lagergren, L., Kvist, L.J., Christensson, K., & Hildingsson, I., (2011). No reduction in instrumental vaginal births and no increased risk for adverse perineal outcome in nulliparous women giving birth on a birth seat: results of a Swedish randomized controlled trial. *BMC Pregnancy Childbirth*, 11, 22. doi:10.1186/1471-2393-11-22

Thoeni, A., Zech, N., Moroder, L., & Ploner, F. (2005). Review of 1600 water births. Does water birth increase the risk of neonatal infection? *J Matern Fetal Neonatal Med*. 17, 357-361. doi:10.1080/14767050500140388

Thom, D.H. & Rortveit, G. (2010). Prevalence of postpartum urinary incontinence: a systematic review. *Acta Obstet Gynecol Scand*, 89, 1511–1522

Thomas, G.M. & Lupton, D. (2015). Threats and thrills: Pregnancy apps, risk and consumption. *Health Risk & Society*, 17, 7–8, 1-15. doi:10.1080/13698575.2015.1127333

Torkamani, S., Kangani, F., & Janani, F. (2010). The effects of delivery in water on duration of delivery and pain compared with normal delivery. *Pak J Med Sci*, 26, 3, 551-555

Tracy, S. K. & Tracy, M. B. (2003). Costing the cascade: estimating the cost of increased obstetric intervention in childbirth using population data. *BJOG*: 110: 717–724. doi:10.1111/j.1471-0528.2003.02045x

Tracy, S. K., Sullivan, E., Wang, Y. A., Black, D., & Tracy, M. (2007). Birth outcomes associated with interventions in labour amongst low risk women: a population-based study. *Women and Birth*, 20, 2, 41-48

Tracy, S.K., Welsh, A., Hall, B., Hartz, D., Lainchbury, A., Bisits, A., … & Tracy, M.B. (2014). Caseload midwifery compared to standard or private obstetric care for first time mothers in a public teaching hospital in Australia: a cross sectional study of cost and birth outcomes. *BMC Pregnancy and Childbirth*, 14, 4. doi:10.1186/1471-2393-14-46

Trevena, L.J., Zikmund-Fisher, B.J., Edwards, A., Gaissmaier, W., Galesic, M., Han, P., …& Woloshin S. (2013). Presenting quantitative information about decision outcomes: a risk communication primer for patient decision aid developers. *BMC Med Inform Decis Mak*. 13, Suppl 2:S7. doi: 10.1186/1472-6947-13-S2-S7

Tripp, N., Hainey, K., Liu, A., Poulton, A., Peek, M., Kim, J., & Nanan, R. (2014). An emerging model of maternity care: smartphone, midwife, doctor? *Women Birth*, 27, 1, 64-67. doi:10.1016/j.wombi.2013.11.001

Tucker Edmonds, B. (2014). Shared decision making and decision support: their role in obstetrics and gynaecology. *Curr Opin Obstet Gynecol*, 26, 523-530. doi:10.1097/GCO.0000000000000120

Vale de Castro Monteiro, M., Pereira, G.M., Aguiar, R.A., Azevedo, R.L., Correia-Junior, M.D., & Reis, Z.S. (2016). Risk factors for severe obstetric perineal lacerations. *Int Urogynecol J*, 2, 7, 61–67. doi:10.1007/s00192-015-2795-5

Van Delft, K., Sultan, A.H., Thakar, R., Schwertner-Tiepelmann, N., & Kluivers, K. (2014). The relationship between postpartum levator ani avulsion and signs and symptoms of pelvic floor dysfunction. *Br J Obstet Gynecol*, 121, 1164–1172. doi: 10.1111/1471-0528.12666

Vardo, J.H., Thornburg, L.L. & Glantz, J.C. (2011). Maternal and neonatal morbidity among nulliparous women undergoing elective induction of labor. *Journal of Reproductive Medicine*, 56, 1, 25–30

Vintzileos, A.M. (2009). Evidence-based compared with reality-based medicine in obstetrics (Review). *Obstetrics and Gynecology*, 113, 6, 1335-1340. doi:10.1097/AOG.0b013e3181a11b99

Volk, R. J., Llewellyn-Thomas, H., Stacey, D., & Elwyn, G. (2013). Ten years of the International Patient Decision Aid Standards Collaboration: evolution of the core dimensions for assessing the quality of patient decision aids. *BMC Medical Informatics and Decision Making*, 13, S1. doi:10.1186/1472-6947-13-S2-S1

Vlemmix, F., Warendorf, J., Rosman, A., Kok, M., Mol, B., Morris, J., & Nassar, N. (2013). Decision aids to improve informed decision-making in pregnancy care: a systematic review. *BJOG*, 120, 257–266

Wac, K. 2012. Smartphone as a personal, pervasive health informatics services platform: literature review. *Yearb Med Inform*. 7, 1, 83-93

Walsh, D., & Downe, S.M. (2004). Outcomes of free-standing, midwife-led birth centers: A structured review. *Birth*, 31, 3, 222-229. doi:10.1111/j.0730-7659.2004.00309.x

Wei, S.Q., Luo, Z.C., Xu, H., & Fraser, W.D. (2009). The effect of early oxytocin augmentation in labor: A meta-analysis. *Obstet Gynecol*, 114, 641–649

Wei, S., Wo, B.L., & Qi, H.P. Luo, Z., Roy, C., & Fraser, W.D. (2013). Early amniotomy and early oxytocin for prevention of or therapy for, delay in first stage spontaneous labour compared with routine care. *Cochrane Database of Systematic Reviews, 2013*(2), 1-78. doi:10.1002/14651858.CD006794.pub

Wendland, C. L. (2007), The Vanishing Mother: Cesarean Section and "Evidence-Based Obstetrics". *Medical Anthropology Quarterly*, 21: 218–233. doi:10.1525/maq.2007.21.2.218

Wennerholm, U.B., Hagberg, H., Brorsson, B., & Bergh C. (2009). Induction of labor versus expectant management for post-date pregnancy: is there sufficient evidence for a change in clinical practice? *Acta Obstetricia et Gynecologica*, 88, 6-17

Wallwiener, S., Müller, M., Doster, A., Laserer, W., Reck, C., Pauluschke-Fröhlich, J., …Wallwiener, M. (2016). Pregnency eHealth and mHealth: user proportions and characteristics of pregnant women using Web-based information sources - a cross-sectional study. *Arch Gynecol Obstet*. 294, 5. doi:10.1007/s00404-016-4093-y

Wiklund, I., Norman, M., Uvnas-Moberg, K., Ransjö-Arvidson, A., & Andolf, E. (2009). Epidural analgesia: Breast-feeding success and related factors. *Midwifery,* 25, 2, e31–e38

Witteman, H.O., Gavaruzzi, T., Scherer, L.D., Pieterse, A.H., Fuhrel-Forbis, A., Chipenda Dansokho, S., … & Fagerlin, A. (2016). Effects of design features of explicit values clarification methods: a systematic review. *Med Decis Making*, 36, 6, 760-776. doi:10.1177/0272989X16634085

Wong, N., Browne, J., Ferguson, S., Taylor, J., & Davis, D. (2015). Getting the first birth right: A retrospective study of outcomes for low-risk primiparous women receiving standard care versus midwifery model of care in the same tertiary hospital. *Women and Birth*, 28, 4, 279-284. doi:10.1016/j.wombi.2015.06.005

World Health Organization (2011). *WHO Recommendations for Induction of Labor*. Retrieved from http://www.who.int/reproductivehealth/publications/maternal_perinatal_health/9789241501156/en/

World Health Organization (2011). *New Horizons for Health Through Mobile Technologies*. In Global observatory for eHealth series. Geneva: World Health Organisation

World Health Organization (2014). *Delayed umbilical cord clamping for improved maternal and infant health and nutrition outcomes*. Retrieved from http://www.who.int/nutrition/publications/guidelines/cord_clamping/en

World Health Organization (2015). *WHO Statement on Caesarean Section Rates*. Geneva: World Health Organization

Yamasato, K., Kimata, C., Huegel, B., Durbin, M., Ashton, M., & Burlingame, J.M. (2016). Restricted episiotomy use and maternal and neonatal injuries: a retrospective cohort study. *Arch Gynecol Obstet*, 294, 6, 1189-1194

Yee, L. M., Wolf, M., Mullen, R., Bergeron, A. R., Bailey, S.C., Levine, R., & Grobman, W. (2014). A randomized trial of a prenatal genetic testing interactive computerized information aid. *Prenatal Diagnosis*, 34, 6, 552–557. doi:org/10.1002/pd.4347

Yeomans, E.R. (2010). Operative vaginal delivery. *Obstet Gynecol*, 115, 3, 645-653. doi:10.1097/AOG.0b013e3181cfbefd

Young, K., & Kruske, S., (2013). How valid are the common concerns raised against water birth? A focused review of the literature. *Women and Birth*, 26, 2, 105-109. doi:10.1016/j.wombi.2012.10.006

Zanardo, V., Svegliado, G., Cavallin, F., Giustardi, A., Cosmi, E., Litta, P., & Trevisanuto, D. (2010). Elective cesarean delivery: Does it have an effect on breastfeeding? *Birth*, 37, 4, 275–279

Zanetti-Dällenbach, R., Lapaire, O., Maertens, A., Holzgreve, W., & Hösli, I. (2006). Water birth, more than a trendy alternative: a prospective, observational study. *Arch Gynecol Obstet*, 274, 6, 355-65. doi:10.1007/s00404-006-0208-1

Zhang, J., Landy. H, Branch, W., Burkman, R., Haberman, S., Gregory, K., … & Reddy, U. (2010). Contemporary patterns of spontaneous labor with normal neonatal outcomes. *Obstetrics & Gynecology*, 116, 6, 1281-1287. doi:10.1097/AOG.0b013e3181fdef6e

Zikmund-Fisher, B.J., Dickson, M., & Witteman, H.O. (2011). Cool but counterproductive: Interactive, web-based risk communications can backfire. *J Med Internet Res*, 13 (3); e60. doi: 10.2196/jmir.1665

Zikmund-Fisher, B.J., Witteman, H.O., Dickson, M., Fuhrel-Forbis, A., Kahn, V.C., Exe, N.L., … & Fagerlin, A. (2014). Blocks, ovals, or people? Icon type affects risk perceptions and recall of pictographs. *Medical Decision Making*, 34, 3. 443-453. doi: 10.1177/0272989X13511706

Zipkin, D.A., Umscheid, C.A., Keating, N.L., Allen, E., Aung, K., Beyth, R., … & Feldstein, D.A. (2014). Evidence-Based risk communication: A systematic review. *Ann Intern Med*, 161, 270-280. doi:10.7326/M14-0295

Zwelling, E. (2010). Overcoming the challenges: Maternal movement. *The American Journal of Maternal/Child Nursing*, 35, 2, 72–80. doi:10.1097/NMC.0b013e3181caeab3

Appendix I

1 June 2016
Jackie Gunn
Faculty of Health and Environmental Sciences

Dear Jackie

Re Ethics Application: 16/158 Place of birth - your choice.
Thank you for providing evidence as requested, which satisfies the points raised by the Auckland University of Technology Ethics Committee (AUTEC).
Your ethics Application has been Approved for three years until 24 May 2019.
As part of the ethics Approval process, you are required to submit the following to AUTEC:

- A brief annual progress report using form EA2, which is available online through http://www.aut.ac.nz/researchethics. When necessary this form may also be used to request an extension of the Approval at least one month prior to its expiry on 24 May 2019;
- A brief report on the status of the project using form EA3, which is available online through http://www.aut.ac.nz/researchethics. This report is to be submitted either when the Approval expires on 24 May 2019 or on completion of the project.

It is a condition of Approval that AUTEC is notified of any adverse events or if the research does not commence. AUTEC Approval needs to be sought for any alteration to the research, including any alteration of or addition to any documents that are provided to participants. You are responsible for ensuring that research undertaken under this Approval occurs within the parameters outlined in the Approved Application.
AUTEC grants ethical Approval only. If you require management Approval from an institution or organisation for your research, then you will need to obtain this.
To enable us to provide you with efficient service, please use the Application number and study title in all correspondence with us. If you have any enquiries about this Application, or anything else, please do contact us at ethics@aut.ac.nz.
All the very best with your research,

Kate O'Connor
Executive Secretary
Auckland University of Technology Ethics Committee
Cc: Sarah Ballard

Appendix II

PLEASE NOTE

- ***This form must be typed. Handwritten forms will not be accepted.***
- ***Double clicking on the check boxes enables you to change them from not-checked to checked.***
- ***The completed form, signed by the student and the primary supervisor, should be submitted to the appropriate Faculty Postgraduate Office when the thesis/exegesis is lodged for examination. If the application is approved by the Faculty Postgraduate Committee, the form will be signed by the Dean and sent to the University Postgraduate Centre for insertion into the print copies deposited. For more information consult the Postgraduate Handbook.***

Student ID No	1002657	**Name**	Sarah Ballard
Faculty	Health and Environmental Sciences	**School/Dept**	Midwifery
Programme	Master of Health Practice	**Date of submission for examination**	28 February 2017
Research Output	**Thesis** ☐ **Dissertation** ☐	**Exegesis** ☒	**Points Val** 60 poin Practic Project
Thesis Title	'Birthplace –Your Choice'. iOS application and exegesis		

EMBARGO TIMEFRAME

An embargo is requested on the public availability of the print and digital copies of the above thesis/exegesis from the date of submission for examination (maximum normally 36).

36 **months**

EMBARGO CATEGORIES

The thesis/dissertation/exegesis contains confidential or sensitive information which if publicly available may ***(Tick all that apply)***

☒ Jeopardise the future intellectual property rights of the author (e.g. a patent application or publication)
In addition, Application is for women. Consultation with appropriate women's groups and/or further development outside scope of project may be required before the application can be made publicly available.

☐ Breach a prior contractual arrangement with an external organisation *(Please attach a copy of the relevant agreement(s))*

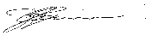
☐ Infringe or endanger the right to privacy or cultural respect of an individual or group

The embargo would apply to

☐ The complete thesis/dissertation/exegesis

☒ A portion of the work (specify) : The 'Birthplace – Your Choice' App only

Signatures

Student	Sarah Ballard	**Signature**		**Date**	20th Feb 2017
Primary Supervisor	Jackie Gunn	**Signature**		**Date**	21 November 2016
Secondary Supervisor		**Signature**		**Date**	
Additional Supervisor/Mento		**Signature**		**Date**	

RESTRICTED ACCESS APPROVED BY FACULTY DEAN(or delegate)

Signature ..... **Date** .....

Appendix III

Participant Information Sheet

20th April 2016

'Place of Birth – Your Choice'

Would you like to learn more about your chosen Place of Birth? Sarah Ballard, midwife and current Masters of Health Practice candidate would like to invite you to participate in testing a computer based Application (App) being developed that aims to provide women with information on labour and birth outcomes at different birth locations: hospital, midwifery-led unit and at home.

This project will involve 5-7 women answering two written questionnaires and using the Place of Birth App. Participation is voluntary and you are able to withdraw at any time prior to the completion of data collection on September 20th 2016. Whether you choose to participate or not will not disadvantage the midwifery care that you will receive during your pregnancy.

What is the purpose of this research?

This project will develop and test an App called 'Place of Birth- your choice'. It aims to improve womens' knowledge about the benefits and risks of birth at a hospital, a midwifery led unit or at home using New Zealand specific research findings. It is hoped that this information might assist women to make an informed choice about where to birth and to have confidence that the decision they make is best for themselves and their baby.

The findings of this project intend to be presented at a conference and written as a journal article. The release of the App has the potential to make information about how Place of Birth relates to the health of women and their babies available to a larger number of women and the wider community.

How was I identified and why am I being invited to participate in this research?

For this project, Auckland midwives were asked to Approach any woman who might be interested in giving feedback on the development of a web-based electronic computer Application that provides information about choosing where to give birth. To participate you must be well and healthy, be pregnant for the first time, carrying only one baby, be able to use a computer, and speak English as a first language. Because you meet these criteria, your midwife has discussed your participation in this project.

What will happen in this project?

In this project 5-7 women will have an individual meeting with the project midwife where they will complete the first written questionnaire before using the Place of Birth App. The purpose of the first questionnaire is to identify what you already know about your choice in birthplace and your general thoughts on birth. Each woman will then be asked to use the Place of Birth App which has information on how birth locations differ, which location suits what women, what type of care is typical in each location and includes outcomes for mother and baby at hospital, midwifery-led units or at home. Observation notes about ease of use, any difficulties encountered, any comments or questions asked etc. will be made during this time.

At the end of the visit a second questionnaire with a self-addressed envelope provided for its return. This is to be completed one week later to enable time for each woman to consider the information provided and will explore what information was obtained from the App. It will also ask questions on use of the App itself such as was the App useful and easy to use? Would you share the information family/whanau? etc.

Feedback about both the App and its information will help refine the App's accessibility and usefulness.

What are the discomforts and risks and how will these be alleviated?

We anticipate involvement in the project will pose no significant risk or discomfort. Women will be seated in a private space when completing the questionnaire and using the App with the whole process estimated to take no longer than one and a half hours. Depending on the stage of a woman's

pregnancy, she may find sitting for this length of time uncomfortable. Therefore, seating will be made as comfortable as possible; breaks will be used when needed and water and toilet facilities will be available.

At all times confidentiality of details and any information provided will be maintained. Each woman's details will only be known to the supervisor and Sarah Ballard. Once a woman has agreed to participate she will be allocated a number that will be used to identify their feedback questionnaires, gather and interpret data. All information obtained will be transcribed by Sarah Ballard only. At no time will a women's name be mentioned in any work that is published from this study.

Should the maximum number of women have already been recruited by the time an Application of interest is received, a woman decides not to participate when contacted or chooses to withdraw during the project any identifiable details will be destroyed using document destruction services.

On completion of the study all data will be destroyed after 6 years. Participants can request to have sent to them the final report from the project either by hard copy or email.

What are the benefits?

Participating in this research will help in the development of the Place of Birth App and potentially improve women's knowledge about birth place. Currently, there is little published up-to-date information that is specific to the New Zealand maternity system which is available to assist women with this decision. Having this information readily accessible and in an easy-to-understand format may help healthy women become confident in considering the range of birthplace options available.

This project allows women's knowledge about birthplace locations to be explored. It is hoped that they might feel more knowledgeable and informed on their birthplace decision after using the Place of Birth App and this has been shown to improve overall birth satisfaction.

Completion of this project will assist the project midwife in her pursuit of a Masters in Health Practice. Furthermore, sharing of the research findings at conferences and in publications may contribute to the current global discussion on birthplace information sharing and decision-making.

How will my privacy be protected?

Each participant will be provided with a number that will be used to ensure anonymity for data collection. Participants will only be known to S. Ballard and J. Gunn (supervisor). All paper data will be stored confidentiality in a locked office at AUT and will be stored for 6 years before being destroyed by document destruction services.

What are the costs of participating in this research?

Participants will receive a Koha of a $20 petrol or garden voucher. Personal travel expenses will be kept to a minimum where possible through the use of facilities closest to the woman's home.

Participating in the project will require a time commitment of Approximately 1.5 hours for the Appointment to test the App and Approximately 15 minutes to complete the second questionnaire. Travel will differ depending on the woman's location.

What opportunity do I have to consider this invitation?

Participant invitations will close on November 30th. It is hoped that all women will have at least one week to consider the commitment involved.

How do I agree to participate in this research?

Should you wish to participate in this project please return the consent form in the self-addressed envelope provided. You will be contacted by Sarah Ballardand any questions you have answered. The time and location of your Appointment will also be organised at this time.

Will I receive feedback on the results of this research?

On the consent form is an option to be sent the final report via email or hard copy.

What do I do if I have concerns about this research?

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, Jackie Gunn, jgunn@aut.ac.nz, 021474133.

Concerns regarding the conduct of the research should be notified to the Executive Secretary of AUTEC, Kate O'Connor, ethics@aut.ac.nz , 921 9999 ext 6038.

Whom do I contact for further information about this research?

Please keep this Information Sheet and a copy of the Consent Form for your future reference. You are also able to contact the research team as follows:

Researcher Contact Details:
Sarah Ballard
021474133
c/o Midwifery Department, Office ME106
School of Clinical Sciences
Auckland University of Technology
Work: 9219999 x 2601 cell: 0212279212

Project Supervisor Contact Details:
Jackie Gunn, jgunn@aut.ac.nz,

Approved by the Auckland University of Technology Ethics Committee on 1st June 2016, AUTEC Reference number 16/158R.

Appendix IV

Consent Form

Project title: ***'Place of Birth – Your Choice"***
Project Supervisor: ***Jackie Gunn***
Researcher: ***Sarah Ballard***

○ I have read and understood the information provided about this practice project in the Information Sheet dated 31st March 2016

○ I have had an opportunity to ask questions and to have them answered.

○ I understand that I will complete two questionnaires and that this information will be collected.

○ I understand that I will be observed by S Ballard while using the "Place of Birth – Your Choice" App and that she will take notes on how easy I find it to use, any questions I ask or problems I encounter. This is to help future development of the App

○ I understand that I may withdraw myself or any information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way

○ If I withdraw, I understand that all relevant information will be securely stored and destroyed after 10 years.

○ I agree to take part in this practice project and understand that participation will not affect the maternity care I receive

○ I wish to receive a copy of the report from the project (please tick one): Yes○ No○
Would you like it sent to: the address below Yes○
: an email address Yes○
Please write the email address here:
_____

Participant's signature:
.....
Participant's name:
.....
Participant's Contact Details:
……..
……..
phone number……
cell phone number …….
Date:

Approved by the Auckland University of Technology Ethics

Committee on 1st June 2016 AUTEC Reference number 16/158

Appendix V

"Place of Birth – Your choice" Questionnaire one Participant #: _____

Birth Place decision:

1. Have you decided where you would like to birth? If Yes, where is this?
   ☐ No ☐ Yes ☐ Hospital
   ☐ Midwife led unit eg Birthcare, Papakura
   ☐ At home

2. When did you decide to birth here?
   _____
   _____

3. Who was involved in this decision with you?
   _____
   _____
   _____

4. Did they support your choice or would they prefer that you birth somewhere else?
   _____
   _____
   _____
   _____

5. What are the main reasons that made you choose to birth here?
   _____
   _____
   _____
   _____

6. What do you think are some advantages of birthing here?
   _____
   _____
   _____
   _____

7. Are there any disadvantages that you know of birthing here?
   _____
   _____
   _____
   _____

8. Did your midwife discuss birthplace choices with you? ☐ No ☐ Yes
   If yes what did s/he advise:
   _____
   _____
   _____

9. Do you know of any other places you can birth in your area?
   ☐ Yes List here: _____
   ☐ No

10. Why do you feel these were not an option for you?

_____
_____
_____
_____

11. When you think about your chosen birthplace how important are the following for you?:

I want to have freedom to move and do what I want in labour
☐ Very important ☐ Important ☐ Not important

I want to have my chosen support people present
☐ Very important ☐ Important ☐ Not important

I want to have the option of pain relief
☐ Very important ☐ Important ☐ Not important

I want to be able to make decisions and have my voice heard
☐ Very important ☐ Important ☐ Not important

I want to have obstetricians present in case they are needed
☐ Very important ☐ Important ☐ Not important

I want to be in an environment that supports normal birth
☐ Very important ☐ Important ☐ Not important

I want to birth with a care provider that I know
☐ Very important ☐ important ☐ Not important

Beliefs on Labour and Birth: Questions 12-16

12. I feel confident about my ability to labour and give birth?
☐ Always ☐ Often ☐ Sometimes ☐ Never
Comment:

_____
_____
_____

13. I feel excited when I think about my labour and birth?
☐ Always ☐ Often ☐ Sometimes ☐ Never
Comment:

_____
_____

14. I feel anxious when I think about my labour and give birth?
☐ Always ☐ Often ☐ Sometimes ☐ Never
Comment:

_____
_____
_____

15. I feel scared when I think about my labour and give birth?
☐ Always ☐ Often ☐ Sometimes ☐ Never
Comment:
_____
_____
_____

16. I feel that the actual process of labour and birth is important for myself and baby?
☐ Strongly agree ☐ Agree ☐ Neither agree or disagree ☐ Disagree ☐ Strongly Disagree
Comment: _____
_____
_____

General questions

17. Is there anything else you would like to say about how you feel about giving birth?
☐ No ☐ Yes If Yes, Please comment below
_____
_____
_____

18. Is there anything else you would like to say about your choice of where you wish to birth? ☐ No ☐ Yes If Yes, Please comment below
_____
_____
_____

Appendix VI

"Place of Birth – Your choice": Questionnaire two **Participant #:**

THE PLACE OF BIRTH APP:
Please indicate your choice for the following statements:

1. I found the Place of Birth app easy to use
   ☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree

2. It was easy to move through the information
   ☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree

3. The design of the App was appropriate
   ☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree

4. The information presented was clear and easy to understand
   ☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree

5. The App provides believable information
   ☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree

6. The App provides relevant information
   ☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree

7. The App provides information at the right level of detail
   ☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree

8. The App provides information in an appropriate format
   ☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree

9. I felt nervous using the App
   ☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree

10. The App was intimidating to me
    ☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree

11. I found the App useful in learning about Place of Birth options in Auckland
    ☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree

12. Using the App would help me learn about birthplace options more quickly
    ☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree

13. I think this App would make it easier for me to talk to my midwife/obstetrician about my Birthplace options
    ☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree

14. The App would help me to reach a decision on the Birthplace location that is right for me
    ☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree

15. I know what birthplace options are available to me
    ☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree

16. I know the benefits of each birthplace option
☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree

17. I know the risks of each birthplace option
☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree

18. I am clear about which benefits matter most to me
☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree

19. I am clear about which risks matter most to me
☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree

20. I am clear about the best birthplace option for me
☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree

21. I feel sure about what birthplace option to choose
☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree

22. The decision on birthplace location is easy for me to make
☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree

Please add any extra comments that you wish to make:

_____
_____
_____

23: Please comment on what you did or did not like about the:

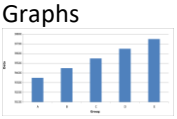
Written information

_____
_____
_____

Pictures

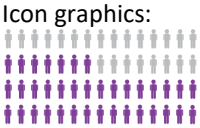
_____
_____
_____

Graphs



_____
_____
_____

Icon graphics:



_____
_____
_____

24. What did you like best about using the app?

_____
_____
_____

25. What do you feel could be improved?

_____
_____
_____

26. Did your choice of where you would like to birth change after using the Place of Birth app?

☐ No Please go to question 27

☐ Yes Where would you like to birth now?

☐ Hospital

☐ Midwife led unit eg Birthcare, Papakura, Warkworth

☐ At home

27. If you answered Yes to question 25 what has made you want to birth there?

_____
_____

28. What did you learn about your chosen birthplace?

_____
_____
_____

29. How will this knowledge be useful to you?

_____
_____
_____

30. Has the information provided in the App increased your confidence that the birthplace you have chosen is the best for you and your baby? Please explain why it has or has not.

_____
_____
_____

31. Did you learn anything about other birthplace locations?

_____
_____
_____

Did you learn anything new about the following items in questions 31-35:

32. Vaginal birth? ☐ Yes ☐ No

_____
_____
_____

33. Giving birth with the use of forceps, ventouse or caesarean section? ☐ Yes ☐ No

_____
_____

_____

34. The use of an epidural? ☐ Yes ☐ No

_____
_____
_____

35. Postpartum haemorrhage? ☐ Yes ☐ No

_____
_____
_____

36. How birthplace location may affect your baby at/after birth?

_____
_____
_____

Overall

37. Was there any information that surprised you or that you found interesting?
☐ Yes ☐ No
Comment:_____
_____
_____

38. Was there any information that you did not agree with or found confusing?
☐ Yes ☐ No
Comment:_____
_____
_____

39. Will you share any information you have learned with other women? ☐ Yes ☐ No
Your midwife? ☐ Yes ☐ No
If yes, please explain what you would share.

_____
_____
_____

40. Is there anything else you would like to comment on?

_____
_____

41. Do you have any concerns or issues that you would like to discuss with Sarah Ballard, the project midwife which you would prefer to do via a phone ☐ Yes ☐ No
Please include a contact phone number if appropriate:

_____

Questions 1-24 are modified from the work of Dolan, Veazie and Russ, with permission (2013)

Appendix VII

Place of Birth App- Participant Observation

Date: **Participant #:**

Did participant ask any questions to clarify how to use app while using it?

☐ Yes ☐ No

What were these:

_____

_____

_____

Did participant struggle with navigation through the app?

☐ Yes ☐ No

Comment:

_____

_____

_____

Did the participant make any comment/s out loud to themselves while using the app?

☐ Yes ☐ No

List:

_____

_____

_____

At the end did the participant make any comment/s on the app?

☐Yes ☐ No

List:

_____

_____

_____

How long did it take to complete the app? _____

Any other notes:

_____

_____

_____

Appendix VIII

Table 3. IPDAS Patient Decision Aid Checklist for Users

I. Content: Does the patient decision aid …

Provide information about options in sufficient detail for decision making?

- ✓ describe the health condition 2.1
- ✓ list the options 2.2
- ☐ ~~list the option of doing nothing~~ 2.3
- ☐ ~~describe the natural course without options~~ 2.4
- ✓ ~~describe procedures~~ 2.5
- ✓ describe positive features [benefits] 2.6
- ✓ describe negative features of options [harms / side effects / disadvantages] 2.7
- ✓ include chances of positive / negative outcomes 2.8

Additional items for tests

- ☐ ~~describe what test is designed to measure~~ 2.9
- ☐ ~~include chances of true positive, true negative, false positive, false negative test results~~ 2.10
- ☐ ~~describe possible next steps based on test result~~ 2.11
- ☐ ~~include chances the disease is found with / without screening~~ 2.12
- ☐ ~~describe detection / treatment that would never have caused problems if one was not screened~~ 2.13

Present probabilities of outcomes in an unbiased and understandable way?

- ☐ ~~use event rates specifying the population and time period~~ 3.1
- ✓ compare outcome probabilities using the same denominator, time period, scale 3.2, 3.3, 3.6
- ☐ describe uncertainty around probabilities 3.4
- ✓ use visual diagrams 3.5
- ✓ use multiple methods to view probabilities [words, numbers, diagrams] 3.7
- ☐ allows the patient to select a way of viewing probabilities [words, numbers, diagrams] 3.8
- ✓ allow patient to view probabilities based on their own situation [e.g. age] 3.9
- ☐ place probabilities in context of other events 3.10
- ✓ use both positive and negative frames [e.g. showing both survival and death rates] 3.13

Include methods for clarifying and expressing patients' values?

- ✓ describe the procedures and outcomes to help patients imagine what it is like to experience their physical, emotional, social effects 4.1
- ☐ ask patients to consider which positive and negative features matter most 4.2
- ✓ suggest ways for patients to share what matters most with others 4.3

Include structured guidance in deliberation and communication?

- ☐ provide steps to make a decision 6.1
- ✓ suggest ways to talk about the decision with a health professional 6.2
- ☐ include tools [worksheet, question list] to discuss options with others 6.3

II. Development Process: Does the patient decision aid …

Present information in a balanced manner?

- ✓ able to compare positive / negative features of options 9.1
- ✓ shows negative / positive features with equal detail [fonts, order, display of statistics] 9.2

Have a systematic development process?

- ✓ includes developers' credentials / qualifications 1.1
- ✓ finds out what users [patients, practitioners] need to discuss options 1.2, 1.3
- ☐ has peer review by patient / professional experts not involved in development and field testing 1.8a, 1.8b
- ✓ is field tested with users [patients facing the decision; practitioners presenting options] 1.4, 1.5

The field tests with users [patients, practitioners] show the patient decision aid is:

- ✓ acceptable 1.6, 1.7
- ✓ balanced for undecided patients 9.3
- ☐ understood by those with limited reading skills 10.6

Use up to date scientific evidence that is cited in a reference section or technical document?

- ✓ provides references to evidence used 11.1
- ☐ report steps to find, appraise, summarise evidence 11.2
- ☐ report date of last update 11.3
- ☐ report how often patient decision aid is updated 11.4
- ☐ describe quality of scientific evidence [including lack of evidence] 11.5a, 11.5b
- ✓ uses evidence from studies of patients similar to those of target audience 11.6

Disclose conflicts of interest?

- ☐ report source of funding to develop and distribute the patient decision aid 7.1, 7.2
- ☐ report whether authors or their affiliations stand to gain or lose by choices patients make after using the patient decision aid 7.3, 7.4

Use plain language?

- ✓ is written at a level that can be understood by the majority of patients in the target group 10.3
- ☐ is written at a grade 8 equivalent level or less according to readability score [SMOG or FRY] 10.4
- ☐ provides ways to help patients understand information other than reading [audio, video, in-person discussion] 10.5

Table 3. IPDAS Patient Decision Aid Checklist for Users

Meet additional criteria if the patient decision aid is Internet based

- ✓ provide a step-by-step way to move through the web pages 8.1
- ☐ allow patients to search for key words 8.2
- ☐ ~~provide feedback on personal health information that is entered into the patient decision aid~~ 8.3
- ☐ ~~provides security for personal health information entered into the decision aid~~ 8.4
- ☐ ~~make it easy for patients to return to the decision aid after linking to other web pages~~ 8.5
- ☐ permit printing as a single document 8.6

~~Meet additional criteria if stories are used in the patient decision aid~~

- ☐ use stories that represent a range of positive and negative experiences 5.2
- ☐ reports if there was a financial or other reason why patients decided to share their story 7.5
- ☐ state in an accessible document that the patient gave informed consent to use their stories 5.5

III. Effectiveness: ~~Does the patient decision aid ensure decision making is informed and values based?~~

Decision processes leading to decision quality. The patient decision aid helps patients to ...

- ☐ recognise a decision needs to be made 12.1
- ☐ know options and their features 12.2, 12.3
- ☐ understand that values affect decision 12.4
- ☐ be clear about option features that matter most 12.5
- ☐ discuss values with their practitioner 12.6
- ☐ become involved in preferred ways 12.7

Decision quality. The patient decision aid ...

- ☐ improves the match between the chosen option and the features that matter most to the informed patient 12.8

Note: numbers behind items correspond to endorsed criteria in Table 2.

Instuctions for Downloading 'Birthplace – Your Choice' App:

1: Search Google App Store for AEM preflight and upload to your phone
2. Once uploaded, tap to open AEM preflight which will open to a homepage
3. Tap on 'Sign in'
4. Log in using your Adobe ID and Adobe ID password
5. AEM preflight should open to 'Birthplace – Your Choice' launch page
6. Tap to open 'Birthplace – Your Choice'