

**NEW ZEALAND MIDWIVES' MANAGEMENT OF PERINEAL TRAUMA DURING CHILDBIRTH:
A SURVEY OF PRACTICE**

By

Robin Cronin

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Abstract

Background: Perineal trauma is the most common complication of vaginal birth and how this is treated has an impact on the incidence and duration of pain and dysfunction. Responsibility for the management of women's perinea after uncomplicated births in New Zealand ordinarily rests with midwives although this is a little known aspect of practice. This study aimed to identify how midwives assess and manage second degree perineal trauma, the level to which their practice reflects best evidence, and what influences midwives' decision-making.

Methods: A descriptive approach using an online survey of 75 questions was used to access the population of 2910 New Zealand midwives. Inclusion criterion was current perineal management. Quantitative data were collected and associations examined using chi-square and Fisher's exact test. Interval data were analysed with a two-sample *t*-test.

Results: 818 midwives returned a questionnaire, 744 (25% of the midwifery population) met the inclusion criteria. Evidence-based suturing material for repair of the last second degree tear was used by 96%. Correct suturing technique throughout all layers of repair was 42%. Rectal examination during assessment was performed by 45% increasing to 86% after repair. Confidence to repair was directly related to years since midwifery qualification ($p<.001$) and self-employment ($p<.001$). The tear was left unsutured by 7% and associated with reduced confidence with repair ($p<.001$), lack of recent experience with repair ($p<.001$), and home birth ($p=.002$). Unsutured tears were shorter than sutured tears (vaginal/perineal length, $p<.001$; depth, $p=.004$) and associated with delayed healing ($p=.034$). Care to six weeks postpartum was provided by 377 midwives. Perineal analgesia included oral medication (76%), pelvic floor exercises (44%), cooling (38%), and suppositories (31%). Visual assessments of healing were performed by 84% of midwives, 49% of women, and 7% of support people. Complications of infection (2%), pain (2%), and healing delay (3%) were uncommon.

Conclusions: This research has added a New Zealand midwifery practice perspective to the existing literature on second degree perineal care. Potential for reductions in perineal morbidity were identified, even though New Zealand midwifery care already has a low rate of complications compared to international studies.

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Glossary

<p>Core midwife</p> <p>54% of midwifery workforce</p> <p>Previously known as a hospital-based midwife</p>	<p>-A core midwife is employed in a hospital facility and works shifts to provide 24 hour maternity care when women are inpatients.</p> <p>-Core midwives may be predominantly rostered in one maternity setting or rotate throughout.</p> <p>-A small number have a caseload of women for the antenatal and/or postnatal care period only, excluding labour and birth, however, this is not considered to be continuity of care in the New Zealand context.</p>
District Health Board (DHB)	DHBs are responsible for providing and funding New Zealand health and disability services.
Hospital facilities: primary, secondary, and tertiary	<p>-Primary facilities care for low risk women anticipating uncomplicated births; they do not have 24 hour on-site availability of specialist services or caesarean section facilities.</p> <p>-Secondary facilities provide 24 hour on-site availability of specialists for women with pre-existing health conditions, medical or obstetric complications and include caesarean section facilities. They may provide primary care.</p> <p>-Tertiary facilities are major referral centres for women with complex conditions requiring consultation and transfer of care to a multidisciplinary specialist team with caesarean section and intensive care facilities. They may provide primary/secondary care.</p>
<p>Lead Maternity Carer (LMC)</p> <p>46% of midwifery workforce</p> <p>Self-employed midwives provide LMC care</p>	<p>-The LMC is the health professional responsible for the coordination of maternity care for the individual woman throughout pregnancy, labour, and birth, to six weeks postpartum.</p> <p>-Over 78% of LMCs are midwives. The majority are self-employed working in community-based midwifery group practices and 4% are employed by DHBs or private employers. Some are simultaneously employed as core midwives.</p> <p>-LMC midwives provide continuity of care from the same caregiver (or small team of known caregivers)</p> <p>-The term LMC may be interchanged with continuity of care in the New Zealand midwifery context.</p>
Midwifery Council of New Zealand (MCNZ)	MCNZ is the regulatory authority for midwives. Its function is to ensure that a midwife meets competencies for practice.
New Zealand College of Midwives (NZCOM)	NZCOM is the professional organisation for midwives, representing nearly 90% of practising midwives in New Zealand.
Ministry of Health (MOH)	MOH is the organisation governing New Zealand's health and disability system with overall responsibility for management and development.

Chapter One: Introduction

The most common complication of vaginal birth is perineal trauma. This trauma is associated with pain and dysfunction. How the perineum is assessed and treated has an impact on the incidence and duration of these morbidities. The responsibility for management of perineal trauma after a spontaneous birth in New Zealand ordinarily rests with midwives.

Midwifery research has the capacity to improve outcomes for birthing women. In particular research with midwives as autonomous practitioners is of interest. However, research into midwifery practice has tended to focus on labour and birth and there is less known about midwives' management of perineal trauma. This thesis reports on a descriptive study using a survey to take a snapshot of practice of New Zealand midwives' management of perineal trauma during childbirth and produces an analysis of their practice. This chapter introduces the research question, aims, and objectives. The background about the motivation for this study and how the research question originated is discussed. The setting and design is outlined, key terms are introduced, and an overview of the thesis is provided.

Research question

New Zealand midwives' management of perineal trauma during childbirth: What is their current practice?

Aim and objectives

This study examines midwives' management of perineal trauma from the time of birth to six weeks postpartum. Data was collected over a six week period in 2013. The findings may be used as a reference point for future midwifery education, research, and policy on perineal management.

The broad objective was to describe current New Zealand midwifery perineal practice:

- Confidence with perineal assessment and repair and influencing factors
- The impact of experience, employment, and place of birth on perineal treatment
- Guidelines and training on which midwives base their perineal practice

- Treatment of second degree perineal trauma (assessment, repair, non-suturing)
- Analgesia provided after second degree perineal trauma
- Healing of second degree perineal trauma to six weeks after birth

Secondary objectives were to:

- Evaluate New Zealand midwives' perineal practice against evidence-based guidelines
- Examine similarities and differences between the perineal practice of self-employed and employed midwives and between midwives' management of sutured and unsutured second degree tears

This study is part of a larger study on midwifery perineal practice, using the same sample and survey tool. The larger study also examined midwives' confidence with episiotomy, perineal cleansing, vaginal swabs, and maternal-newborn skin-to-skin contact during repair. These findings will be reported separately in publicly-available publications.

Background

The perineum encompasses a diamond-shaped area from the pubic arch to the coccyx and is subdivided into anterior (urogenital) and posterior (anal triangle) sections (Royal College of Obstetricians and Gynaecologists [RCOG] 2004). Perineal trauma may be caused by a spontaneous tear or a deliberate incision (episiotomy) and seminal research identified that it affects up to 85% of women who have a vaginal delivery (Albers, Garcia, Renfrew, McCandlish, & Elbourne, 1999; McCandlish et al., 1998; Sleep et al., 1984). Up to three quarters of the perineal trauma sustained by birthing women requires repair (Albers et al., 1999; McCandlish et al., 1998; Sleep et al., 1984).

Anterior trauma includes injury to the anterior vagina, labia, urethra, and clitoral area; which usually heal well with minimal concerns. Posterior perineal tears are the cause of most perineal morbidity and include trauma to the posterior vaginal wall and perineal muscles and may extend down to the anal sphincter. The official classification of perineal tears was developed by Abdul Sultan, a United Kingdom (UK) obstetrician, in 1999 (Table 1) and is the standard used in professional UK guidelines (National Collaborating Centre for Women's and Children's Health [NICE], 2006; 2007; Royal College of Midwives [RCM], 2012a; 2012b; Royal College of Obstetricians and Gynecologists [RCOG], 2004; 2007). The extent of the tear and the number of tissue layers define the categories (Kettle & Fenner,

2007) and are predictive of the magnitude of difficulty of repair and postpartum morbidity (RCOG, 2007).

Table 1: Classification of perineal trauma

Degree of perineal trauma	Tissues involved
First degree tear	Perineal skin and subcutaneous tissue of anterior or posterior perineum and vaginal mucosa
Second degree tear Episiotomy	Perineal skin, superficial perineal muscles, and perineal body
Third degree tear	Anal sphincter - 3a: less than 50% of external anal sphincter (EAS) thickness torn - 3b: more than 50% of EAS - 3c: both EAS and internal anal sphincter (IAS) torn
Fourth degree tear	Anal sphincter complex (EAS and IAS) and anal epithelium

First degree tears, ranging from 1.5% (Thiagamoorthy, Johnson, Thakar, & Sultan, 2014), to 16% (NZCOM, 2013), are not routinely repaired, although clinicians are advised to suture if edges are not well aligned (NICE, 2007; RCM, 2012b; RCOG, 2004). Third and fourth degree tears following a vaginal birth are uncommon, between 1% (RCOG, 2007) and 2.9% (Thiagamoorthy et al., 2014), and the repair of these tears remains the domain of skilled obstetric specialists. The incidence of second degree tears ranges from 31% (NZCOM, 2013; Thiagamoorthy et al., 2014) to 62% (Ismail et al., 2013), making these tears the most common form of perineal trauma requiring repair. A deliberate episiotomy incision involves the same tissues as a second degree tear and requires the same repair technique, although these account for only 8.6% of midwifery managed perineal trauma in New Zealand (NZCOM, 2013).

Consequences of perineal trauma and repair include bleeding, bladder and bowel dysfunction, dyspareunia, and pain (Andrews, Thakar, Sultan, & Jones, 2008; Glazener et al., 1995; Green, Coupland, & Kitzinger, 1998; Kettle et al., 2002; MacArthur & Macarthur, 2004; McCandlish et al., 1998). Pain, in particular, may affect the new mother's functioning - extending from her physical and sexual relationships, to psychological health and infant care (Glazener, 1997; Glazener et al., 1995; Sleep, 1991). Assessment and management of perineal trauma has considerable bearing on these outcomes (Elharmeel et al., 2011; Kettle, Dowswell, & Ismail, 2010; Kettle, Hills, & Ismail, 2007).

New Zealand context

Midwifery practice takes place within a historical, socio-political, and cultural context. In New Zealand this is predicated on the philosophical belief that childbirth is a normal physiological life event with an autonomous midwifery profession providing woman-centred continuity of care for childbearing women. Underlying this is the theoretical framework of partnership between the midwife and the woman, which acknowledges both parties have equal status within a reciprocal relationship (Guilliland & Pairman, 1995). This partnership is discussed and agreed between the midwife and woman, employing the concepts of informed consent, trust, shared responsibility, continuity, and empowerment. Midwives are also expected to work collaboratively with other health professionals in order to provide care that is appropriate and regardful of the woman's individuality and needs (New Zealand College of Midwives [NZCOM], 2008).

There were 58,717 live births in New Zealand in 2013 (Statistics New Zealand, 2014); almost all had a midwife in attendance. A small number of women (14.3%) receive their entire maternity care from a medically led team of hospital-employed doctors and core midwives who do not provide continuity of care. However, the majority of women (85.7%) have a self-employed Lead Maternity Carer (LMC) (Ministry of Health [MOH], 2012d). Of these LMCs, 91.6% are midwives and 8.4% are doctors (MOH, 2012d). Midwife LMCs carry a caseload of women and provide continuity of care for these women throughout pregnancy, labour, and birth, to six weeks postpartum. They are supported by the 45% of midwives (MCNZ, 2013a) who are employed to work shifts as core midwives to provide 24 hour cover in hospital facilities, and care for the women with complex pregnancies in conjunction with hospital medical staff. Perineal management after spontaneous vaginal birth, 68% of all New Zealand births (MOH, 2012d), is usually the responsibility of the LMC or core midwives (NZCOM, 2008).

New Zealand midwifery students receive perineal education from lecturers as well as hands-on clinical placements with practising midwives (James, 2010). A review of undergraduate midwifery education by the Midwifery Council of New Zealand (MCNZ) reported inconsistencies in education and differing expectations in skill acquisition resulting in a requirement for achievement of specified competencies on graduation including perineal management (MCNZ, 2007). This review was accompanied by a

significant boost in education hours to “increase both confidence and competence” (Pairman, Tracy, Thorogood, & Pincombe, 2010, p. 51). An increase in reporting of second degree trauma by midwives belonging to the Midwifery and Maternity Providers Organisation (MMPO) suggests, in the absence of other known influences, that these educational changes may have improved midwives’ perineal assessment skills and their ability to classify perineal trauma. The 2005 MMPO data described only 19.5% of 11,692 women (25% of all New Zealand births) diagnosed with a second degree tear (NZCOM, 2009b). In contrast, by 2011 this figure had increased to 31.0% of 24,590 women (51.9% of all New Zealand births) with a second degree tear (NZCOM, 2013), equating with the UK rate (Thiagamoorthy et al., 2014).

Litigation concerns about perineal morbidity have resulted in education and guidelines in evidence-based perineal management gaining recognition in the UK (Bick et al., 2012; Ismail et al., 2013). Similar concerns were seen in Australia where it was stated that a reduction in perineal morbidity was the motivation behind the development of hospital perineal repair policies (Upton et al., 2002). Furthermore 18% of Australian midwifery respondents in a small survey reported that when witnessing midwives performing perineal repair, over half were poorly done (Dahlen & Homer, 2008).

NZCOM is the professional midwifery organisation responsible for setting standards for New Zealand midwives, with midwives expected to have skills in perineal assessment and repair (NZCOM, 2008). The NZCOM midwifery education advisor recommended that, due to the complexity of factors involved in decisions about perineal repair, “confidence, knowledge and practice experience are crucial” (Gray, 2010, p. 120). In addition, New Zealand midwives have a number of standards governing their practice that may influence their perineal management, including the *Code of Health and Disability Services Consumers’ Rights* (Health and Disability Commissioner [HDC], 1996) and *Standards of Practice* (NZCOM, 2008) which includes decision points for midwifery care and service requirements defined in the *Primary Maternity Services Notice 2007* (MOH, 2007).

Midwives are required by the MCNZ (2005) to be competent in basic midwifery skills to retain their annual practicing certificate. The need for postgraduate perineal education in New Zealand was recognised in 2005 with perineal suturing incorporated into the first three year cycle of compulsory “Technical Skills” workshops required for recertification

(Davies, 2008). Perineal care is a continuing educational priority in the “NZCOM Proposed Continuing Education Strategy 2013-2015” (Gray, 2012, p. 1) and elective education in perineal management is currently available in around half the 25 New Zealand District Health Board (DHB) regions (MCNZ, 2014).

Personal experience

As a New Zealand midwife in the 1980s, I was not authorised to provide maternity care unless under medical supervision (Papps & Olssen, 1997) and perineal repair was strictly the dominion of doctors. I subsequently moved to a large urban hospital with a shortage of doctors and a high birth rate, where employed core midwives were trained to assess and suture perineal trauma under the supervision of senior midwives who had acquired these skills from doctors. In 1990 a law change, the Nurses Amendment Act, provided midwives with professional autonomy and the choice of self-employment (Guilliland & Pairman, 2010b) and this meant perineal management became a necessary midwifery skill.

I have worked as a self-employed midwife since 1993, providing continuity of care from the antenatal period, through labour and birth to six weeks postpartum for up to 70 women annually with many opportunities for perineal assessment and repair. My perineal management skills were enhanced by direct verbal and visual feedback on outcomes of this treatment during the six week postpartum follow-up and sometimes for women in subsequent pregnancies. An annual professional midwifery review, requiring reflections on practice statistics and written anonymised feedback from women, facilitated contemplation on how my care affected women’s physical and emotional outcomes.

My interest was further stimulated by attending births as a support midwife in a range of settings and witnessing wide variations in perineal management. Curiosity about practice implications of these perineal management decisions motivated me to turn to the midwifery literature. I found limited overseas research and nothing in the New Zealand context. This led me to question what New Zealand midwives were doing in regard to perineal management and how they were doing it.

Significance of study

The majority of midwifery research available on management of perineal trauma has come from the UK and Australia. While UK midwives are comparably responsible for the care of women during normal vaginal births and undertake perineal repair (Ismail et al., 2013), there are differences in midwifery culture and models of care compared to New Zealand (Davies, 2008). Similar trans-Tasman disparities were identified by the Australian College of Midwives (2013). These differences may limit the transfer and applicability of this research, although support for the uptake of midwife-led continuity of care during childbirth continues to grow in the UK and Australia (Hartz, Foureur, & Tracy, 2012; Page, 2013; Sandall, Soltani, Gates, Shennan, & Devane, 2013; Tracy et al., 2014).

A New Zealand midwifery study on perineal care became available in 2011 (Gray, 2010). Gray's focus was on influences on decision-making in midwifery management of spontaneous perineal trauma at time of birth. How these decisions shaped practise was not explored.

There are no New Zealand midwifery guidelines or standards to inform or measure perineal practice. This leaves midwives two options. The first is evidence-based recommendations from the *Midwifery: Preparation for Practice* textbook written for Australian and New Zealand midwives (Pairman et al., 2010), which is required reading for New Zealand midwifery students and includes a chapter on "Perineal Care and Repair" by Australian midwife Hannah Dahlen (2010). The second option is utilising UK guidelines (RCOG, 2004; NICE, 2007; RCM, 2012b).

New Zealand national datasets are restricted to quantification of third and fourth degree tears, intact perineae, and episiotomies (MOH, 2012d). Thus there is a lack of information on second degree tears, despite the high incidence of this trauma. In addition, although perineal trauma managed by many self-employed midwives is reported annually by the NZCOM (2013), the data encompasses only half of New Zealand births and reports only the proportion and classification.

To portray midwives' perineal management required the collection, description, and analysis of a large volume of data from a defined population of working midwives using an approach that encompassed a midwifery perspective. The process had to be inviting

and accessible to midwives. The chosen methodology of the online survey enabled identification of normal contemporaneous midwifery perineal management and provided measurable evidence.

The findings describe midwifery perineal practice and provide a reference point in time. They also report on the similarities and differences between New Zealand practice and overseas evidence-based guidelines, as well as midwives' practice regarding sutured and unsutured second degree tears. The study provides an opportunity to evaluate, validate, and build on education, research, and policy on perineal repair in the New Zealand midwifery context. However, the study was not designed to evaluate whether one model of care is better than another or why and how midwives make practice decisions. Providing evidence of conventional midwifery practice places the study within the international midwifery movement to protect normal birth.

Overview of the thesis

This thesis consists of five chapters which collectively aim to describe New Zealand midwives' management of perineal trauma during childbirth. This first chapter describes the clinical problem and an overview of the New Zealand maternity system. The research question, aims, and objectives of the study are stated. Chapter Two presents a review of the literature about midwifery management of perineal trauma and sets the context. Chapter Three is the research design chapter outlining the methodological underpinnings of the study; methods, analysis, rigour, and ethics are described. Chapter Four presents the findings of the study, examining the data as a whole, as well as examining any association between midwives' employment statuses and sutured or unsutured second degree tears. Chapter Five discusses the findings, puts them in the context of the current literature and reflects on the study limitations and implications for midwifery practice and future research.

Chapter Two: Literature Review

Introduction

A literature search relating to midwifery care of the perineum during childbirth was undertaken to see what was known in New Zealand and internationally in order to identify gaps in current knowledge. International literature located was assessed for relevance to the New Zealand setting. This chapter presents this review and begins with an overview of midwifery perineal care during childbirth in order to provide a framework to examine midwives' management of perineal trauma during childbirth. It explores confidence, guidelines, and education, as well as specific midwifery practice in regard to perineal assessment, treatment, and postpartum care. Significance of the topic from the perspective of midwives' employment statuses and sutured and unsutured second degree tears was a focus. Gaps in the literature are identified in the conclusion, paving the way for the focus of this thesis.

Search strategy

A search was conducted at the outset of this study in 2010, and updated in 2014. Two significant studies were published between the initial and final review (Bick et al., 2012; Ismail et al., 2013). The review included the Cochrane Database of Systematic Reviews, Medline (U.S. National Library of Medicine), and CINAHL (Cumulative Index to Nursing and Allied Health). No date limits were used, enabling retrieval of seminal and historical studies, although research within the last 10 years was preferred and studies were restricted to English.

Keywords included perineal trauma, perineal pain, perineal suturing, perineal care, postnatal care, and midwifery practice. Maternity guidelines and textbooks were also examined. Reports published by health services, women's health agencies, and government agencies assisted in creating a picture of practice. Reference lists of retrieved documents were used to identify any additional articles of interest. Literature from countries with similar demographics, such as the UK and Australia, was preferred.

General overview

Perineal care has been described as the "poor cousin" of postnatal care, which has, in turn, been considered to have the lowest status in maternity care (Dahlen, 2010, p. 557).

It has also been said that perineal care is characterised by “strong opinions and sparse data” (Renfrew, Hannah, Albers, & Floyd, 1988, p. 143). There has been limited research as to the best care of the perineal tears and even the most recent information has conflicting recommendations (Kettle, 2006). The result is perineal practice based more on traditional or *ad hoc* therapies than research (Jones, 2011a).

What is known about perineal care is that how a perineum is managed in regard to assessment, repair, and follow-up care may have significant and long-term effects for women (Bick, MacArthur, & Winter, 2008). Following vaginal birth almost all women experience some perineal pain (Albers et al., 1999; Andrews et al., 2008; Brown & Lumley, 1998; Glazener et al., 1995; Klein et al., 1994; MacArthur & Macarthur, 2004; Sleep, 1991; Sleep et al., 1984). However, for some women the consequences of pain, infection, dehiscence, dyspareunia, and incontinence can lead to long-term health problems (Albers et al., 1999; Draper & Newell, 1996; Glazener, 1997; McCandlish, 2001; Sleep & Grant, 1988b; Sleep et al., 1984). Furthermore, the wellbeing of new mothers affects their ability to feed and parent their infants (Albers & Borders, 2007).

Three surveys on midwives’ management of perineal trauma during childbirth were located (Bick et al., 2012; Dahlen & Homer, 2008; Gray, 2010). The surveys provided information to inform several key areas in this literature review. Table 2 summarises the method, participants, findings, and relevance to this study.

Confidence with assessment and repair

Examination of the perineum after birth is an important but undervalued and often poorly-performed component of practice (Kettle, 2006). Incomplete assessment may lead to inconsistent classification and under-reporting of perineal trauma (Albers et al., 1999; Metcalfe et al., 2002; Ullman, Yiannouzis, & Gomme, 2004). More importantly, a sub-optimal perineal assessment may result in a missed diagnosis of anal sphincter injury and this is considered the reason why faecal incontinence is more common after second degree perineal trauma than an intact perineum (Benifla et al., 2000; Lal, Mann, Callender, & Radley, 2003). Indeed, in the UK almost 10% of 607 midwives disclosed that they were not trained in perineal assessment and recognition of anal sphincter trauma (Trochez, Waterfield, & Freeman, 2011).

Table 2: Summary of surveys of midwifery management of perineal trauma

Author	Method	Respondents and Setting	Research Aim	Findings in Relation to this Study
Bick et al. (2012) UK	Descriptive cross sectional study Postal questionnaire	<ul style="list-style-type: none"> - 1000 randomly selected midwives currently undertaking perineal assessment and repair - Accessed via RCM - Jan-May 2007 - 405 returned the survey and 338 (83.5%) met inclusion criteria. 	To identify how midwives assessed and repaired perineal trauma and whether practice reflected evidence-based guidance.	<ul style="list-style-type: none"> - Compliance with evidence was poor in relation to suturing techniques for perineal repair, routine rectal examination for perineal trauma assessment, and non-suturing of second degree tears - Confidence with assessment and repair of perineal trauma was lower than expected - Midwives with over 20 years of experience were most likely to report confidence and evidence-based management
Gray (2010) New Zealand	Descriptive cross sectional study Postal questionnaire	<ul style="list-style-type: none"> - 400 randomly selected NZCOM midwives - Accessed via NZCOM - May-June 2009 - 216 (54%) met inclusion criteria 	To describe the specific factors that influenced midwives' decisions to either suture or not suture spontaneous perineal tears following normal birth.	<ul style="list-style-type: none"> - Midwives were influenced in their decisions to suture or not suture by the clinical features of a second degree tear - Other influencing factors were experience, confidence, research evidence, the women's physical wellbeing and preferences, years in practice, and main work type - Place of birth, time, and peer pressure did not influence practice
Dahlen and Homer (2008) Australia	Descriptive study using convenience sample Provided questionnaire	<ul style="list-style-type: none"> - 111 midwives attending a one-day perineal care seminar - May 2007 - 106 (95%) met inclusion criteria 	To determine the views of midwives towards perineal repair and the most effective way to teach and support midwives in developing this skill.	<ul style="list-style-type: none"> - Continuity of care is the main motivation for midwives to learn to undertake perineal repair - Consistency in education for perineal repair would be assisted by setting of standards - Education programmes combining midwives and doctors are preferred by midwives - The trend for midwives to not suture some perineal trauma requires further evidence-based research

However, despite Trochez et al. (2011) reporting 10% of UK midwives had no training in perineal assessment, Bick et al. (2012) found that all midwives were confident with assessment and 93% reported confidence with repair. In the same survey, one third of respondents reported confidence with perineal assessment 'all' of the time, although this decreased to just over one fifth of midwives reporting confidence with repair 'all' the time. The findings of Bick et al. were more positive than the Australian survey, which reported only one fifth of midwives being 'very' confident with perineal repair and another fifth 'not at all' confident (Dahlen & Homer, 2008). In New Zealand, Gray (2010) found confidence in the assessment of a perineal tear had an important influence on the management decisions of 71% of midwives, while confidence in repair had a strong influence on the decisions of 39% of midwives to suture a tear.

The number of years since midwifery qualification was related to UK midwives' confidence with assessment and repair (Bick et al., 2012): midwives qualified for over 20 years were the most confident 'all' of the time (assessment 45%, repair 27.9%) and midwives qualified five years or less were the least confident 'all' the time (assessment 8%, repair 4%). Similarly, New Zealand research found increasing years of practice increased confidence with perineal repair, with 48.9% of midwives with over 15 years of experience 'very' confident with repair decreasing to 23.5% of midwives practising for less than five years (Gray, 2010). Likewise, increased confidence with perineal repair was relative to years of performing repairs for Australian midwives (Dahlen & Homer, 2008). Furthermore, Gray reported midwives' main work type was significantly related to confidence in perineal repair with self-employed and LMC midwives the most confident compared to employed midwives who were not LMCs.

Inclusion criterion for Bick et al.'s (2012) survey was that midwives had to be providing assessment and repair of perineal trauma. Notwithstanding this specification, around a third of respondents had not performed any perineal repairs within the previous six months. Moreover, most midwives who had performed a repair had only sutured between one and four perineal tears. The researchers were unsure why these numbers were low and postulated this could be why some UK midwives lack confidence in perineal management. They suggested the lack of confidence may be a result of lack of requirements for midwives to perform a defined number of repairs in order to maintain clinical competency. Indeed, low confidence in perineal repair reported by 41% of

Australian midwives (Dahlen & Homer, 2008) who had not sutured a perineum for years, or had never performed a repair, may have contributed to the finding of strong support for accreditation in perineal management.

The theory that rural or urban location may impact on midwifery confidence in perineal practice sounds plausible and was investigated in Scotland, resulting in contradictory findings (Harris et al., 2010; Hundley et al., 2007). Bick et al. (2012) reported no association between confidence in repair and location amongst UK midwives. Gray's (2010) results for New Zealand urban and rural midwives also found no influence from the practice setting in midwives' decisions to perform a perineal repair.

The SUTURE or Not SUTURE (SUNS) trial, comparing outcomes of suturing and non-suturing of first and second degree tears, reported some midwives may have been motivated to avoid perineal repair because they lacked confidence, consequently influencing women's decisions against suturing (Fleming, Hagen, & Niven, 2003). This is consistent with a formative long-term follow-up study in the UK finding that not only did 30% of women feel they were not given a choice by the midwife about how their tear was managed, but the majority of women who were given a choice reported that the midwives' advice significantly influenced the women's decisions (Clement & Reed, 1998).

Guidelines, competency, and training in perineal management

A lack of evidence-based knowledge in perineal care was described by midwives in a UK grounded theory study as being the "norm" necessitating them to rely on "professional judgement, clinical experience and observations of peers" (Spendlove, 2005, p. 48). Conversely, the RCM (2012b, p. 1) states that "policies, protocols, and a powerful fear of litigation" have undermined the confidence of midwives in understanding what is normal, suggesting that midwives and women may benefit from the space to critically evaluate options outside those set by institutions. Bick et al. (2012) reported 82.8% of midwives had access to an appropriate guideline or protocol, with 42.3% generated by the employing maternity facility and 35.5% reporting access to facility and RCOG guidelines. More recently, access to national guidelines for the management perineal trauma has increased in the UK as a result of the PERineal Assessment and Repair Longitudinal Study (PEARLS) (Ismail et al., 2013).

Some New Zealand maternity facilities have developed their own perineal management guidelines, although these largely focus on medically managed severe tears (Auckland District Health Board [DHB], 2012). Gray (2010) found that a minority of midwives in her study reported considerable influence from midwifery guidelines (45%) and hospital policies (40%) on their decisions to suture a perineal tear. However, she also found that employed midwives reported being significantly more influenced by hospital policies than self-employed midwives and suggested that this may be because employed midwives feel they have to conform to maternity facility policies. In contrast, Gray reported that evidence from research was influential for the majority (65%) of New Zealand midwives in regard to decisions about perineal management, although only half reported “considerable knowledge” of research about perineal repair.

Bick et al.'s (2012) survey showed that competency in perineal assessment was formally evaluated in less than half (45.9%) of UK midwives and in perineal repair for just over half (54.1%). This was possibly a factor in the apprehension expressed about quality and outcomes of suturing performed by midwives (Andrews, Sultan, Thakar, & Jones, 2006; Robinson & Beattie, 2002; Tohill & Metcalfe, 2005; Toohey, 2003). Certainly it has been questioned whether midwives can ever develop competence in experiences that occur infrequently (2007) as midwifery competence is considered to be based on previous accomplishments (1994).

Just under half of 75 midwives in a 1995 UK survey considered their education in perineal anatomy, assessment, and repair to be of good standard (Sultan, Kamm, & Hudson, 1995). A decade later, another UK study assessing the outcome of a perineal repair course also reported that most respondents felt their prior perineal repair training had been inadequate (Andrews, Thakar, Sultan, & Kettle, 2005). This inadequacy has led to midwives describing pressure to replicate the sub-optimal perineal management of their peers (Spendlove, 2005).

Post-registration training in perineal management has been shown to improve midwives' understanding and confidence in evidence-based perineal trauma management (Andrews et al., 2005; Ismail et al., 2013; Kettle et al., 2002; Wilson, 2011). Nearly two thirds of 338 UK midwives reported access to structured training on management and repair of perineal trauma was available from their employer and over half had access to updated

training (Bick et al., 2012). Furthermore, half these midwives had received this training within the last two years and the rest between three and 10 years earlier. Another UK study reported midwives were clear that experience, time for practice and support “on the job” is regarded as vital for acquisition of perineal repair skills (Wilson, 2011, p. 7).

The recently-completed PEARLS study was the first RCT to assess the outcome of midwifery education on the practical application of evidence-based perineal treatment (Ismail et al., 2013). While the primary outcome of improving the proportion of women with postnatal perineal pain was insignificant, the secondary clinical outcomes of suture removal and perineal wound infection were significantly better. Furthermore, use of evidence-based perineal repair materials and techniques had improved and the authors recommend on-going updates in perineal education to sustain and optimise this improvement.

The NZCOM midwifery advisor in charge of continuing education for midwives considers that any future education on perineal care for midwives should be holistic (Gray, 2010). Gray suggests that this should include perineal assessment and trauma repair from the midwives’ and the women’s perspective. She advises inclusion of evidence-based information that can be utilised by midwives to aid perineal management decisions.

Decision to suture or not suture

In the last three decades there has been a change towards midwives leaving second degree tears to heal naturally without suturing (Clement & Reed, 1998; Dahlen & Homer, 2008; Finn, 2008; Fleming et al., 2003; Head, 1993; Langley, Thoburn, & Barton, 2006; Layton, 2004; Leeman, Rogers, Greulich, & Albers, 2007; Lewis, 1995; Lundquist, Olsson, Nissen, & Norman, 2000; Metcalfe, Bick, Tohill, Williams, & Haldon, 2006). Bick et al.’s (2012) nationwide UK survey described 58% of midwives reporting that they did not repair all second degree tears and this finding was irrespective of years since registration, location of practice, or experience. However, a recent survey of 215 of 265 UK maternity units in 12 months to January 2010 reported only 5.4% of second degree tears were left unsutured (Thiagamoorthy et al., 2014).

Advice on the decision to suture or not suture second degree tears remains confusing and viewed by some as poorly informed (Metcalfe et al., 2002; Mutema, 2007; Robinson

& Beattie, 2002; Sultan et al., 1995; Ullman et al., 2004). Indeed, a maternity hospital in a major New Zealand city in 2004 reported that some women had second degree tears coded as unsutured, saying, “This is surprising, as it is usual practice to suture second degree tears, this may reflect incorrect classification, a coding error, a data entry error or clinical practice” (Soh, 2004, p. 34).

The UK RCM practice guidelines (2012b) counsel that research on non-suturing of second degree tears has conflicting results about perineal healing. NICE (2007) guidelines instruct against non-suturing due to concern about delayed healing. The debate continues after a Cochrane review by Elharmee et al. (2011) based on two RCTs (Fleming et al., 2003; Lundquist et al., 2000) concluded there was insufficient evidence to suggest either suturing or non-suturing is superior to the other with regard to healing and recovery in women with first and second degree perineal trauma.

It has been suggested that some midwives may avoid performing perineal repair if they lack faith in their suturing ability (Fleming et al., 2003; Spendlove, 2005). This is supported by research by Spendlove (2005) suggesting skilled and unskilled midwives make different decisions about perineal treatment when faced with the same choices. Of the seven midwives interviewed by Spendlove, those who lacked suturing skills felt both suturing and non-suturing perineal trauma were equally valid options and this contrasted with those competent with perineal repair who supported suturing. Alternatively, non-suturing may be in response to consumer demand, as UK women described perineal repair as the worst thing about giving birth (Green et al., 1998). A Swedish study found that women were very relieved when they were informed that suturing was not required (Lundquist et al., 2000). In New Zealand it was reported that midwives have tended to leave ‘minor’ second degree perineal tears to heal naturally due to awareness that women can suffer when sutured (HDC, 2002b).

Gray (2010) found that New Zealand midwives’ employment influenced their perineal treatment decisions. She reported that self-employed midwives were more confident than employed midwives in the decision to suture and less influenced by fear of litigation in their decision to leave a tear unsutured. Employment also appeared to affect the decisions of UK midwives: three quarters of independent UK midwives surveyed by Bick et al. (2012) left second degree tears to heal naturally, compared with 67.7% of midwives

from midwifery-led units and 52.6% from consultant-led facilities. Australian studies agree that continuity of carer may influence midwives' perineal management decisions (Cioffi et al., 2008; Dahlen & Homer, 2008).

Furthermore, despite the fact that half the New Zealand midwives in Gray's study reported continuity of carer had little influence on their decisions to suture, midwives' work types impacted on the extent that fear of litigation had on midwives' decisions to leave a tear unsutured. This led Gray to suggest that the continuity of care model gave midwives confidence that unsutured tears would heal well, thus reducing their litigation fears. Gray also pointed out that continuity of care midwives have the entire pregnancy to debate perineal care options with women, so they may be more likely to be guided by the woman's choices, especially in the decision to not suture. In contrast, employed midwives providing fragmented care may only meet women during labour, so their perineal management has less opportunity to be influenced by the women.

Assessment of perineal trauma

Second degree tears may be as diverse as shallow splits in the superficial perineal muscle or deep forked tears that challenge the assessment skills of even the most experienced practitioner (Metcalf et al., 2002; Ullman et al., 2004). This may result in a third degree anal sphincter tear being incorrectly labelled as a second degree tear. However, RCOG (2007) warns that failure to recognise obstetric anal sphincter injuries (OASIS) and to refer for appropriately for treatment may be considered substandard care. OASIS occurs in over 1% of women who have a vaginal delivery (RCOG, 2007) with a 2008 systematic review indicating that true incidence may be as high as 11% (Dudding, Vaizey, & Kamm, 2008). It remains unclear if some women who have occult sphincter damage that can only be diagnosed via ultrasound or whether OASIS was missed during assessment of perineal trauma and erroneously categorised as less severe tear (Abramowitz et al., 2000; Andrews et al., 2006; Groom & Paterson-Brown, 2002; Metcalf et al., 2002; Mutema, 2007; Sultan et al., 1995; Sultan, Kamm, Hudson, Thomas, & Bartram, 1993).

The New Zealand MOH acknowledges that "assessing and identifying the degree of lower genital tract damage remains a complex process" (MOH, 2012c, p. 25). This may be a factor in the marked contrast in the incidence of perineal trauma reported from New Zealand facilities, ranging from 88% to 35% for women expected to have similar

outcomes (MOH, 2012c). An illustration of issues with assessment was seen in a New Zealand maternity hospital staff audit of knowledge of muscles involved in perineal trauma: only 7% of 71 maternity staff surveyed (including 3 of 41 midwives) answered correctly, leading researchers to state “we need to lift our game” (Robinson & Beattie, 2002). Medical and midwifery educators retorted that “getting the names wrong did not prove practitioners were performing the procedure incompetently” (Johnson, 2002, para.9), although during a UK trial of a perineal trauma measurement tool some midwives misclassified a tear during perineal assessment through lack of knowledge of the tissues involved (Metcalf et al., 2002).

A UK prospective observational study found that with increased vigilance of an experienced staff member during assessment of perineal trauma, it was possible to improve on the classification of trauma and clinical diagnosis of OASIS by 40% (Groom & Paterson-Brown, 2002). A UK prospective intervention study also found classification of perineal tears and detection of OASIS increased significantly from 11% to 24.5% when perineal trauma was re-assessed by an experienced doctor (Andrews et al., 2006). Furthermore, diagnosis of more OASIS than expected coincided with optimisation of assessment, diagnosis, and treatment in some Australian hospitals (Baghurst, 2012).

Collegial support with assessment of perineal trauma to improve diagnosis of OASIS has been beneficial in New Zealand. In 2003, a major teaching hospital reported that with the introduction of a programme for all perineal tears to be assessed by a senior midwife or doctor, the pick-up rate for OASIS increased significantly (Toohey, 2003). Nevertheless optimal assessment and diagnosis of OASIS may bring the stigma of shame and punitive questioning for the clinician (Sultan & Kettle, 2007). This stigma was surprisingly seen in a repeat audit of primiparae at the same New Zealand teaching hospital nine years later, which again concluded the rate of OASIS diagnosis was higher than expected (Tomlinson, Smallldridge, & McIver, 2012). However, this time the high rate prompted questions about the midwifery delivery skills.

Bick et al. (2012) reported 42.4% of surveyed UK midwives performed a rectal examination ‘all’ of the time during a routine assessment of perineal trauma, 13.1% ‘most’ of the time, 27.2% ‘some’ of the time, and 17.3% ‘never’ performed a rectal examination. This is less than expected from NICE (2007) guideline’s recommendation for

routine digital rectal examination for OASIS during assessment of perineal trauma. In contrast, a New Zealand investigation concluded that “a digital rectal examination at the time of a perineal repair (immediately after delivery) is not a routine or expected standard of care” (HDC, 2005, p. 33).

After completing a repair, NICE (2007) guidelines recommend repeating the rectal examination with the aim of assessing that no suture material has penetrated the rectal mucosa. This second rectal examination at completion of suturing was performed by most UK midwives surveyed by Bick et al. (2012) with 85.6% reporting ‘all’ the time, 10.1% ‘most’ of the time, and only 4.2% ‘some’ of the time or ‘never’.

Midwifery practice requires midwives to make clinical decisions drawn from observations and many are “are based on tradition and intuition without validation” (Hill, 1990, p. 162). It has been said that assessment of second degree tears is subjective, making perineal assessment difficult to teach in the absence of a method of measurement. Therefore a measuring tool ‘Peri-rule’ was developed in the UK to enhance accuracy of data collection for teaching and research (Tohill & Metcalfe, 2005). A trial involving five UK maternity units testing the Peri-rule found midwives were able to accurately distinguish between small, medium, and large tears with a strong level of agreement between midwives (Metcalfe et al., 2002).

Of the 91 second degree tears measured in the trial by Metcalfe et al. (2002), the mean measurement of the smallest tear was 1.9cm in depth and 2.2cm in length, while the mean measurement of the largest tear was 3.0cm in depth and 3.4cm long. Langley et al. (2006) reported shorter and shallower measurements from 200 measured second degree tears, with the mean measurement of the smallest tear being 1.2cm in depth and 1.6cm in length and the largest at 1.5cm in depth and 1.9cm long. Australian midwives described tears using ordinal descriptions (Cioffi, Swain, & Arundell, 2010) despite no clinical measurements being performed, with short tears reported as being less than 2cm in length and long tears estimated to be over 2cm.

No midwives in the research by Gray (2010) used linear measurement to assess the size of second degree perineal tears, although they reported that length and depth influenced their decision-making about repair. Most midwives (84%) stated length had a considerable influence on leaving a tear unsutured, while 72% reported length was a

considerable influence on the decision to repair. Gray reported the depth of the tear was even more significant, with 92% describing depth as an influence to repair and 95% as an influence to leave unsutured.

Perception of severity of perineal trauma appeared to be influenced by the more detailed examination required during the act of suturing in two studies, with sutured second degree tears found to be longer and deeper than tears left unsutured (Langley et al., 2006; Metcalfe et al., 2002). This was put down to the comprehensive assessment and handling of perineal tissues required during the repair. Another study reported that unsutured tears were shorter in length but not depth (Metcalfe et al., 2006), although less than one quarter were measured, and this was considered to be due to midwives' belief that their estimation of size was superior to physical measurement. Certainly accuracy of midwives' estimation abilities was seen during evaluation of a perineal trauma assessment tool (appraising bruising and oedema) using photographs and a visual non-touch little finger width (estimated at 1cm) which reported reliability and consistency between midwives (Steen & Cooper, 1997).

Repair of perineal trauma

Birth setting appears to impact on perineal management both in New Zealand and overseas. Bick et al. (2012) reported midwives surveyed from midwifery-led units were more likely to leave a second degree tear unsutured (67.7%) than those based in more medicalised units (52.6%). A recent UK prospective observational study on incidence and risk factors for perineal trauma found marked differences with perineal management after a singleton vaginal birth associated with planned birth setting (Smith, Price, Simonite, & Burns, 2013). The study found no second degree tears sutured after 111 home births, 6% after 288 births in free standing midwifery-led units and 90% after 2355 hospital births. Smith et al. felt this may be due to lack of confidence with repair by UK midwives based on the findings of Bick et al. (2012) and Sultan et al. (1995). Alternatively a small qualitative UK survey suggested workplace expectations may influence midwives' decision to suture or not suture a perineum (2005).

A 2008 New Zealand study of 80 women booked to birth at home demonstrated they were less likely to have perineal tears sutured when they successfully birthed at home (50% sutured) compared to birthing in hospital (66.7% sutured) (Miller, 2008). This was

put down to midwives tending to hand perineal tear management over to doctors when the women birthed in hospital. This finding challenges the belief that birth setting had minimal influence on New Zealand midwives' decisions to suture a second degree perineal tear (Gray, 2010).

NICE guidelines advise that "repair of the perineum should be undertaken as soon as possible to minimise the risk of infection and blood loss" even though "there is no high level evidence on timing of perineal repair following childbirth" (2007, p. 192). RCM guidelines advocate perineal repair "without unreasonable delay after the birth" (2012b, p. 2) based on a 1985 study identifying that women preferred midwives to perform their perineal repair to reduce time spent waiting for the doctor (Ho, 1985) and a 1998 study finding a delay in perineal repair caused anxiety and discomfort and was a common cause of complaint (Green et al., 1998). Yet in a 1997 UK audit, less than half of 884 women underwent perineal repair within half an hour of birth (range 3-12 hours) and the most common reason for the delay was that some mothers wished for a "period of rest and time with their partner and new baby before undergoing the sometimes distressing ordeal of perineal repair" (Odibo, 1997, p. 692).

One of New Zealand's busiest maternity hospitals recommends midwives perform perineal repair as soon as possible after birth (Auckland District Health Board, 2012), although the time frame is not specified. In contrast, an expert witness investigating a delay in perineal repair after a complaint in New Zealand stated "it is quite common for the events of childbirth to lead to a delay of up to one hour before a perineum is sutured" (HDC, 2002a, p. 5).

Positioning the woman in lithotomy to maximise perineal visualisation, enabling thorough assessment of the extent of a perineal tear and perineal repair, was recommended by NICE (2007). Others (Bick et al., 2008; Kettle & Raynor, 2010) suggest that lithotomy may cause some women to recall memories of sexual abuse or genital mutilation and an alternative position, where women self-support their legs, may be preferred. Certainly, perineal assessment with a woman semi-recumbent with a rolled towel under her buttocks has been described as common practice in New Zealand (HDC, 2002b).

Midwives providing birth care do not always perform perineal repair when it is required. A 1997 UK audit of 884 births found there were 257 women considered suitable for a

midwife to suture (Odibo, 1997). Of these women, 71.6% were sutured by the midwives. The other 28.4% were sutured by doctors due to complexity, haemorrhage, midwives being too busy or a woman's request. Nevertheless, women in a UK study preferred to be sutured by the same professional who assisted with the birth, to reduce waiting on the repair (Ho, 1985) and because they felt the same professional had more understanding (Hume & Greenshields, 1993). This was reinforced in a study suggesting woman's pain and stress during perineal repair may be influenced by the empathy of the person performing the procedure (Salmon, 1999).

A UK qualitative study provided accounts of severe pain experienced by women during perineal repair (Salmon, 1999). A later survey of 210 UK maternity units (Sanders, Peters, & Campbell, 2005) revealed that all units advocated use of local anaesthetic before perineal repair, although types and doses of anaesthetics varied widely. NICE (2007) are the only guidelines located that specifically recommend pain relief during assessment of perineal trauma, with inhalational analgesia suggested. NICE also state there is no high level evidence on the appropriate use of analgesia during perineal repair; however they recommend effective analgesia using lignocaine (plus epidural or spinal anaesthesia if necessary).

A range of lignocaine doses and administration for perineal repair was evident in 210 (97%) of UK maternity units (Sanders et al., 2005). More recently, up to 20ml of 1% lignocaine for suturing is a NICE (2007) recommendation. In contrast, a large Australian hospital suggests an individualised approach to enable women over 70kg to receive sufficient pain relief and women under 70kg to avoid the risk of overdose by advising "Lignocaine 1% is infiltrated as local anaesthesia to the perineum. A maximum amount of 3mg/kg (e.g., 20ml in a 70kg woman) may be administered within a one-hour period" (Royal Women's Hospital, 2012).

The addition of sodium bicarbonate to help relieve the pain of lignocaine infiltration is supported by a Cochrane review, stating that non-intravascular injections of lignocaine containing an increased pH reduced pain perception (Cepeda et al., 2010). Adrenaline added to lignocaine is also suggested to reduce bleeding and to prolong the anaesthetic effect (Colacioppo & Riesco, 2009), although adrenaline previously came with the warning that it may not appropriate for everyday use by midwives due to the "risk of inadvertent

intravenous injection” (Sanders, Campbell, & Peters, 2002, p. 159). This may be why only one of 210 UK units later surveyed (Sanders et al., 2005) used local anaesthetic with adrenaline.

A Cochrane systematic review of perineal suturing materials (Kettle et al., 2010) from 18 trials determined that standard synthetic sutures were superior to catgut, with decreased pain up to three days after birth, with up to 10 days of decreased analgesia. However, synthetic stitches, such as polyglycolic acid/Dexon and polyglactin 910/Vicryl, sometimes needed removal due to delay in absorption (120 days for Dexon and up to 90 days for Vicryl), whereas this was less likely with rapidly absorbing material such as Vicryl Rapide (usually absorbed by 42 days). A monofilament absorbable synthetic suture material (e.g., Monocryl) is sometimes used for perineal repair and is absorbed between 90-110 days, although one trial comparing this suture material with polyglycolic sutures reported minimal difference in outcomes (Dencker, Lundgren, & Sporrang, 2006).

NICE (2007) and RCOG (2004) guidelines recommend rapidly absorbable synthetic suture material be used to suture the perineum (such as Vicryl Rapide) due to its superiority over other suture material with rapid absorption, decreased short-term pain, and reduced re-suturing required within three months postpartum. Both guidelines cited Kettle et al. (2002), while RCOG (2004) also cited McElhinney, Glenn, Dornan, and Harper (2000) who found less dyspareunia at six weeks with Vicryl Rapide. Vicryl Rapide has become the favoured suturing material within the NHS (Bick et al., 2012) and in major New Zealand hospitals (Auckland District Health Board, 2012).

Suturing technique has changed over the years, but the primary goal is unchanged; closing ‘dead’ space, supporting and strengthening wounds to allow healing, minimising bleeding and infection, and achieving a pleasing result (Hale, 2005). A Cochrane systematic review of perineal suturing techniques (Kettle et al., 2007) compared continuous versus interrupted sutures for repair of episiotomy or second degree tears. It concluded that a continuous suturing technique was superior to interrupted sutures as this technique results in decreased short-term pain. NICE (2007) guidelines have incorporated Cochrane reviews, and for second degree trauma NICE recommends that the muscle be sutured to aid healing and asserts that this should be with a continuous non-locked technique for the vaginal wall, muscle, and perineal skin, as this causes less

pain than using a locked or interrupted technique (Kettle et al., 2007; Kettle et al., 2002). If after suturing the muscle, there is good apposition of skin edges, there is no need to suture the skin as this causes less short-term pain and reduced dyspareunia at three months (Gordon et al., 1998; Obaro, Tabowei, & Loto, 2003). If the skin edges require suturing, a continuous subcuticular technique results in less pain than interrupted sutures (Kettle et al., 2007).

There are cost savings from non-suturing of second degree perineal tears and perineal skin (Petrou et al., 2001). A RCT comparing two suture techniques found leaving perineal skin unsutured was cost effective and faster (Kindberg, Stehouwer, Hvidman, & Henriksen, 2008), with savings from reductions in anaesthesia, suture materials, analgesia, and hospitalisation. Kindberg et al. also reported economies in the health professional's time not required for suturing, assessment of perineal stitches, and postnatal fewer visits required due to reduced perineal morbidity. Using a tissue adhesive for perineal skin closure has shown advantages over suturing in speed and possible reduction of pain and dyspareunia (Bowen & Selinger, 2002; Mota et al., 2009; Rogerson, Mason, & Roberts, 2000). Bick et al. (2012) found only 6% of midwifery respondents were using evidence-based suturing techniques throughout perineal repair, even though this is known to reduce perineal morbidity (Ismail et al., 2013).

It had been reported that unsutured birth trauma may not be recorded at all. A UK perineal care study found that in many circumstances midwives omitted to record data about their perineal treatment including the size of the tear, type of suture material, and technique used for repair. Furthermore, a lack of documentation about the decision making process in the SUNS trial (Fleming et al., 2003) raised suspicions that the midwife may have swayed women at the time of birth, as some women, who had previously consented to suturing during pregnancy, changed their minds following birth and chose not to be sutured.

As a requirement of practice, a New Zealand midwife works in partnership with a woman throughout her maternity experience and one of the decisions made in partnership is perineal management (Gray, 2010). This decision is expected to be recorded on a care plan, a copy of which is given to the woman (NZCOM, 2008). This is also an expectation in the UK (NICE, 2006). Documentation of perineal trauma during childbirth has been

subject to examination in cases of complaint with the expectation of thorough documentation of informed consent and treatment (HDC, 2002b, 2006, 2014).

Postpartum care: analgesia and healing

Most women feel perineal pain after vaginal birth (Albers et al., 1999; Andrews et al., 2008; Brown & Lumley, 1998; Glazener et al., 1995; Klein et al., 1994; MacArthur & Macarthur, 2004; Sleep, 1991; Sleep et al., 1984) and the level of pain is directly correlated with increasing degrees of perineal trauma (East, Sherburn, Nagle, Said, & Forster, 2012; Leeman et al., 2009). Many UK women reported an unexpected depth of perineal pain, intensified by inadequate analgesia (Greenshields, Hulme, & Oliver, 1993; Way, 2012). For one quarter of UK women (Albers et al., 1999; Sleep et al., 1984) pain was still an issue two weeks postpartum, sometimes continuing up to a year (Glazener et al., 1995; Sleep et al., 1984; Williams, Herron-Marx, & Hicks, 2007). Perineal pain and morbidity affects women both mentally and physically and may impact on their adaption to motherhood (Greenshields et al., 1993). If unresolved, it may negatively affect infant bonding and breastfeeding success (Rajan, 1994).

Perineal analgesia

East, Sherburn, et al. (2012) found most of 215 Australian women interviewed in a postnatal ward within 72 hours of a vaginal birth used combined postpartum perineal analgesic treatments, including cooling (69%), oral medication (75%), NSAID suppositories (25%) and narcotics (4%). Indeed, it has been put forward that women have varied personal preferences for self-care and their choices for perineal care may be equally individual and diverse (Wickham, 2000). Literature comparing postpartum perineal pain scores between sutured and unsutured second degree tears did not find differences (Fleming et al., 2003; Langley et al., 2006; Leeman et al., 2007; Lundquist et al., 2000; Metcalfe et al., 2006). However, Lundquist et al. (2000) reported the type of pain differed between the groups, with sutures more likely to be the source of discomfort after repair while burning, pulling, and stinging were reported by those left unsutured. Furthermore, women were more likely to use analgesia if their tears were repaired (Langley et al., 2006; Leeman et al., 2007; Lundquist et al., 2000) and this tended to be paracetamol (Langley et al., 2006).

The desire to avoid potential harm is a reason given by many midwives supporting complementary and alternative medicine (CAM) for perineal analgesia, furthermore, CAM is seen to be related to professional autonomy and women-centred care (Adams, 2006; Hall, McKenna, & Griffiths, 2010). CAM therapy is regarded by some midwives as an important component of their practice, while others view CAM as a woman's choice (Harding & Foureur, 2009). Indeed some women may not wish take medications for perineal pain due to concern about side-effects and transmission of drugs through breast milk (Chou, Abalos, Gyte, & Gulmezoglu, 2010). A literature review of midwives' use of CAM in industrialised countries reported that the practice is extensive (Hall et al.). Yet, the uptake of evidence-based practice, combined with limited research on midwives use of CAM, means that CAM therapy may be regarded with suspicion (Harding & Foureur, 2009; Tiran, 2003).

CAM techniques for perineal pain in New Zealand were reported as moving from the realm of home birth midwives into mainstream midwifery use by mid-1990 (Vague, 2003). A popular birthing book from this era, *A Guide to Healthy Pregnancy and Childbirth* (Auckland Home Birth Association, 1993), contains comprehensive advice on perineal healing. Suggestions included showers, salt baths, jugs of water poured over the perineum, rubber rings, pelvic floor exercises, and homemade ice packs. Homeopathic and herbal remedies put forward were arnica, bellis perennis, hypericum, comfrey, and calendula cream. More recently, Harding and Foureur (2009) found 15.8% of Canadian and New Zealand midwives reported using CAM therapy for postpartum healing, and this use is endorsed by NZCOM for midwives who have received education in CAM (NZCOM, 2000).

Rectal medication has been shown to be faster acting and more effective in postoperative analgesia (Nissen, Jensen, & Öhrström, 1992). A Cochrane review of postpartum rectal pain relief (Hedayati, Parsons, & Crowther, 2003) reported that non-steroidal anti-inflammatory drug (NSAID) rectal suppositories given after perineal suturing reduced pain and the need for additional analgesia up to 24 hours after birth. This finding has been supported by more recent research from Australia, Thailand, and Turkey (Acharyapota & Titapant, 2008; Dodd, Hedayati, Pearce, Hotham, & Crowther, 2004; Yildizhan, Yildizhan, Sahin, & Suer, 2009). Although acceptability of rectal medication has to be considered, Australian women expressed a favourable reception for postpartum rectal pain relief due

to their satisfaction with the level of analgesia (Dodd et al., 2004). This was possibly due to these women being asked for their informed consent (Vyvyan & Hanafiah, 1995) and supplied with information about potential benefits of rectal administration (Gilman, 1990; Nissen et al., 1992; Scott & Jennings, 1997). Rectal opioids have not been proven useful for postpartum perineal analgesia (Srimaekarat, 2011).

Oral medication is the most common postpartum analgesia (East, Sherburn, et al., 2012; Ghosh, Mercier, Couaillet, & Benhamou, 2004; Sleep & Grant, 1988b; 2005). Of oral medications, paracetamol (acetaminophen) is the most popular, with a systematic review concluding it was effective at reducing perineal pain (in a single dose of 500-1000mg) with few side-effects. Many studies advise that paracetamol should be the first choice of oral medications and if additional analgesia is required, a non-steroidal anti-inflammatory drug (NSAID) is recommended in the absence of contraindications (Chou et al., 2010; East, Sherburn, et al., 2012; Hyllested, Jones, Pedersen, & Kehlet, 2002; Sachs, 2005; Sleep & Grant, 1988b). NSAIDs only may also be used for perineal pain (Facchinetti, Luisa Casini, Costabile, Malavasi, & Unfer, 2005; Kamondetdech & Tannirandorn, 2008; Ong, Lirk, Tan, & Seymour, 2007; Peter, Janssen, Grange, & Douglas, 2001). However, a combination of paracetamol and NSAID, compared to either medication alone (Ong, Seymour, Lirk, & Merry, 2010), offers superior analgesia.

A systematic review examining post-surgical pain (Nauta, Landsmeer, & Koren, 2009) found a paracetamol-NSAID combination provided equivalent analgesia with fewer side-effects than codeine-paracetamol combination. Where NSAID are contraindicated, the addition of codeine and other oral opioids to single dose oral paracetamol were effective in reducing severe pain postoperatively (Toms, Derry, Moore, & McQuay, 2009) and oral opioids were often used to treat perineal pain in the past (Sleep & Grant, 1988b). Nevertheless, only 3.7% of women in an Australian study reported using oral opioids for perineal pain (East, Sherburn, et al., 2012), perhaps due to concern about side-effects of constipation and drowsiness (Steen, 2005). Furthermore caution has been advocated following the death of a two week old breastfed baby whose mother was taking oral codeine and later found to be in the 10% of the population who are ultra-rapid metabolisers of oral codeine, converting it to abnormally high levels of morphine in her breast milk (Koren, Cairns, Chitayat, & Leeder, 2006).

Heating and cooling therapies to manage perineal pain have been described in literature since the 1920s (Rhode & Barger, 1990). It is thought that vasoconstriction from local cooling therapy may result in “numbing the tissues” (Sleep & Grant, 1988b) with reduced perineal bruising, oedema, inflammation, and muscle spasticity leading to reduced pain (Droegemueller, 1980; Steen, Briggs, & King, 2006). Meanwhile, heat is thought to reduce perineal pain by promoting circulation through vasodilation (Ramler & Roberts, 1986).

Cooling was second only to oral paracetamol use in two formative UK perineal care studies (Hume & Greenshields, 1993; Sleep & Grant, 1988b). Cooling has customarily been in the form of handmade ice packs prepared by midwives or women themselves (Bick et al., 2008; East, Sherburn, et al., 2012; Harris, 1992; Petersen, 2011; Sinclair, 1962; Steen, Cooper, Marchant, Griffiths-Jones, & Walker, 2000). These handmade ice packs include fingers of latex gloves or condoms which have been filled with water then tied off and frozen, crushed or solid ice wrapped or applied directly, frozen saline sachets, and frozen sanitary pads previously soaked with tap water (or herbal infused water). It is noted that concerns have been expressed about these handmade icepacks being a vector for infection from contamination during their creation (Petersen, 2011) and that they may increase the risk of ice burns and delay healing (Harris, 1992). However, there was no evidence of adverse effects as a result of perineal cooling in the Cochrane review by East, Begg, Henshall, Marchant, and Wallace (2012); possibly because the commonly used methods were found to be ineffective at significantly reducing the temperature of the perineal tissues.

Sixty percent of Australian women reported using icepacks during hospitalisation within 72 hours after birth (East, Sherburn, et al., 2012). These ice packs were handmade by hospital staff and East, Sherburn, et al. noted that manufactured gel pads were not widely used. However, research indicates that the comfort of manufactured gel pads is preferred over ice packs or no treatment (Navvabi, Abedian, & Steen-Greaves, 2009; Steen et al., 2000; Steen & Marchant, 2007), thus low use may be related to the high cost of manufactured cooling gel pads in Australia (Petersen, 2011).

East, Begg, et al. (2012) assessed local cooling (solid or crushed ice packs, cold gel pads, cold/iced baths) to reduce perineal pain after birth compared with no treatment, witch hazel, pulsed electromagnetic energy, Epifoam, oral Paracetamol or warm baths. One

(Steen & Marchant, 2001) RCT in the review, reported women using ice packs had reduced pain 24-72 hours postpartum compared to no treatment. It was also noted that women preferred the more comfortable manufactured gel pads over solid or crushed ice packs or no treatment. The overall conclusion by East, Begg, et al. was that there was limited supporting research for local cooling to alleviate perineal pain.

Heat therapy for perineal analgesia may be in the form of dry heat (heat lamps, airing, sunshine, hair dryers) or moist heat (baths, showers, sitz baths, water poured from jug/bottle, heat packs) (Rhode & Barger, 1990). However, dry heat has been a less favoured form of perineal analgesia since the 1980s due to concern about burns and the discomfort of dry sutures (Rhode & Barger, 1990), and was discouraged in a recent article on postnatal perineal care (Bick & Bassett, 2013) in favour of moist wound healing. A single study was located comparing dry and moist heat for postnatal perineal wounds; this was an Indian RCT (Kaur, Rana, & Suri, 2013) evaluating moist heat (sitz baths) and dry heat (hairdryer) for perineal analgesia and healing and concluded that dry heat was more effective. Only one study investigating postpartum heat packs was located (Hill, 1989); this study compared warm and cold chemically activated packs and warm sitz baths and found no differences in perineal healing or pain. However, the use of hot compresses and warm sitz baths was observed in a Brazilian study looking at types of perineal pain relief after vaginal deliveries (Hasegawa & Leventhal, 2009) and reported heat was less favoured by women than cooling.

Bathing for perineal analgesia also remains part of perineal care in Australia and the UK (Swain & Dahlen, 2013; Way, 2012), although it may be underreported. A 1988 influential survey of perineal pain management found only 24% of UK maternity units mentioned bathing as a treatment, although 90% of surveyed mothers reporting bathing relieved perineal discomfort (Sleep & Grant, 1988b). This underreporting may be because midwives consider bathing more for hygiene than analgesia (Bick, 2010; Fox, 2011 ; Steen, 2001). Women may have a different view; Way (2012) found that women in her qualitative study described bathing or showering in warm water to ease perineal discomfort rather than as a hygiene measure.

Cold baths were advocated for the relief of perineal pain in the 1980s (Droegemueller, 1980). However, a survey of women trialling warm and cold sitz baths to relieve perineal

discomfort found both reduced pain, although cold baths were more effective in the immediate postpartum period (Ramler & Roberts, 1986). That being said, half the women in Ramler's and Roberts' study refused to have a cold sitz bath, with the authors concluding that pain management strategies need to be acceptable to the users. Another 1980s study (LaFoy & Geden, 1989) which assessed oedema, bruising, sensation intensity, and pain found that both hot and cold baths had comparable results, although cold baths were more successful in reducing oedema. A 1988 study challenged the use of salt baths for perineal pain by demonstrating that bathing relieved pain irrespective of the addition of salt or Savlon solution (Sleep & Grant, 1988a). A comparison of a bath with added Betadine, compared to plain tap water for perineal healing after episiotomy, also reported no significant differences (Zahrani, Akbari, & Valaie, 2002).

Homeopathy is a popular childbirth therapy. Nineteen UK women who used a homeopathic kit in a study by Calvert and Steen (2007) perceived positive benefits during the postpartum period. Arnica montana is one of the most commonly used homeopathic remedies in the postpartum period in the UK used in varying dosages, frequency, and length (Carter & Aston, 2012), with an incidence of 12% from 229 postpartum women surveyed awaiting discharge from a UK hospital. This is despite insufficient evidence to enable positive recommendations for its use in clinical practice outside the placebo effect, combined with concern that the use of homeopathics may prevent users from accessing more effective treatments (Ernst, 2005).

Herbs recommended for midwifery perineal care include aloe vera, comfrey, calendula (marigold), St John's Wort (*hypericum perforatum*), and witch hazel (*hamamelis*), although there is insufficient evidence of efficiency (Clark, 2005). Witch-hazel compresses were one of the earliest treatments for perineal pain used in UK hospitals (Rhode & Barger, 1990) and were first line care in a survey of 50 UK maternity units in the 1980s (Sleep & Grant, 1988b). That being said, witch hazel compresses were found no more effective than tap water (Spellacy, 1963) and less effective than sitz baths, but more effective than heat lamps (Barclay & Martin, 1983) for perineal pain relief, with no differences in women reporting no or mild pain relief from treatment with either ice packs or witch hazel compresses (Moore & James, 1989). No research was able to be found on *hypericum* and *calendula* for perineal wounds despite popularity amongst midwives (Crompton, 2012); although a review of antibacterial activity of *hypericum*

concluded that the plant extracts have shown activity against bacteria (Saddiqe, Naeem, & Maimoona, 2010).

A systematic review (Ernst & Huntley, 2004) of the topical application of tea tree oil (*Melaleuca alternifolia*) for dermatological conditions concluded there was no compelling evidence of efficacy but there was risk of allergy. A review of antimicrobial and anti-inflammatory effects of tea tree oil also advised that there was little clinical evidence of these effects and warned about local or systemic reactions (Carson, Hammer, & Riley, 2006). Local reaction of perineal skin in response to tea tree oil may have contributed to the suggested association between infection of second degree tears and use of tea tree oil (Fox, 2011). Fox reported that Irish women with second degree tears had been encouraged to bath twice a day in water containing up to 10 drops of tea tree oil dissolved in a tablespoon of milk, however, after cessation of the oil (but continuation of baths) the infection rate on the fifth day postpartum reduced from 5.9% to 3.9%.

Olive oil added to a sitz bath was found to reduce post-episiotomy perineal pain up to 10 days postpartum compared to distilled water (Behmanesh, Aghamohammadi, Zeinalzadeh, & Khafri, 2013). Lavender oil added to a sitz bath also reduced post-episiotomy pain scores at four hours and five days compared to Betadine (Sheikhan et al., 2011) and provided equivalent pain relief with less redness compared to Povidone-iodine after 10 days of post-episiotomy sitz baths (Vakilian, Atarha, Bekhradi, & Chaman, 2011). Moreover, midwives felt women were less “sore” in their perineal area after a “bubble bath” containing lavender oil (Mousley, 2005). Despite its popularity, midwives were advised there was little substantiated evidence that lavender oil effectively relieved perineal discomfort (Jones, 2011a). Furthermore the RCT by Dale and Cornwell (1994) demonstrated no advantage in lavender oil over synthetic lavender or an inert substance.

Rigorous promotion of postnatal exercises reduced perineal pain in the previous week (Sleep & Grant, 1987). These exercises reduce oedema and enhance circulation (Rhode & Barger, 1990). More recently, pelvic floor exercises have been advocated to promote healing of perineal trauma (Fox, 2011). A desire for enhanced healing may be why women in a UK RCT with unsutured second-degree tears were found more likely to perform pelvic floor exercises at 10-28 days postpartum compared to sutured women (Langley et al., 2006).

Ring and donut cushions are used to protect the perineum from painful pressure from sitting on hard surfaces (Rhode & Barger, 1990). A UK survey from 1992 found 24% of 69 maternity staff surveyed reported a ring cushion was one of their preferred treatments for the relief of postpartum perineal pain (Harris, 1992). Ring cushions later fell out of favour due to concerns about reduction in venous return and increase in oedema and risk of thrombosis (Church & Lyne, 1994) and midwives were cautioned about this risk in a 1989 edition of the popular *Effective Care in Pregnancy and Childbirth* book (Grant & Sleep, 1989). It has since been established that the research on which this statement was based had been performed in an infirm and elderly population and lacked relevance to healthy postnatal women (Church & Lyne, 1994; Harris, 1992).

Perineal healing assessment

Postnatal care has historically been founded on physical assessments of the mother and baby in order to prevent morbidity and mortality from infection (MacArthur, 2003). Most studies evaluating postpartum perineal healing have used visual and verbal assessment (Fleming et al., 2003; Gordon et al., 1998; Kaur et al., 2013; Langley et al., 2006; Lundquist et al., 2000; McGuinness, Norr, & Nacion, 1991; Metcalfe et al., 2006; Morano et al., 2006; Santos, Oliveira, Nobre, Aranha, & Alvarenga, 2012; Sleep et al., 1984). One study assessed symptoms of infection by phone (Johnson, Thakar, & Sultan, 2012) and all women in an Irish audit diagnosed with a perineal wound infection described symptoms of severe pain (Fox, 2011). In addition, perineal healing assessment tools relying solely on visualisation via photographs (Steen & Cooper, 1997) and visualising the physical perineum (REEDA: redness, oedema, ecchymosis, discharge and approximation) (Davidson, 1974) are primarily for the purposes of research and have limitations for practical application (Hill, 1990). The REEDA tool has been reported in use in New Zealand (Gray, 2010)

NICE (2006, p. 15) guidelines take a minimalist approach by recommending health professionals ask about perineal wound discomfort at each postnatal visit, but to “offer” a physical assessment only if women complain of “pain or discomfort”. In contrast, experienced UK community midwives reported evaluating perineal healing in a traditional manner by physically evaluating the perineum, while simultaneously keeping the women’s perception of their own perineal healing at the core of their clinical judgement

(Jones, 2011b). This led to Jones's suggestion that with optimal knowledge of women's circumstances it may be appropriate for a midwife to defer to women's self-assessment and self-perception of healing, rather than have them undergo routine visualisation of the perineum by the midwife. Certainly, it has been put forward that unless women have concerns it may be an "unnecessary invasion of privacy to insist on examining the perineum" (Dymond, 1999, p. 226).

The frequency of perineal assessment may be influenced by midwifery autonomy bringing independence to judge women's individual needs (Jones, 2011b). However, practice variations in visual inspection of the perineal were also seen in an audit of 59 employed UK midwives, with 24% visualising every perineum regardless of repair, 65% only checking sutured perinea and 70% assessing only if the woman expressed discomfort (Dymond, 1999). Individualised rather than routine perineal inspection care was also described by midwifery employees at an Australian hospital (Gilmour & Twining, 2002).

The effect of protocol-based midwifery-led individualised care to 28 days postpartum compared to routine postnatal follow-up to 10-14 days postpartum was investigated in the UK (MacArthur et al., 2003). Women received four and six home visits. The findings reported no differences in physical morbidity measured between four months and one year postpartum, although psychological health was improved for women receiving individualised care. More recently it was revealed that postnatal care in some areas of the UK had reduced to as few as one to three visits which were not always from a midwife (Barker, 2013), limiting opportunity for perineal care.

A New Zealand MOH survey of maternity satisfaction found 10% of women were "quite" or "very dissatisfied" with postpartum "physical checks of you", leading to a recommendation that maternal physical checks were "a priority area for improvement" (MOH, 2012b, p. 63). However, it is not known whether the dissatisfied women were amongst the quarter of respondents who did not receive the required (MOH, 2007) minimum five home visits over six weeks from their midwife. The NZCOM decision points (2008, p. 41) advocate a flexible individualised approach for physical perineal assessment, stating that these should be within the first 24 hours then every 24 to 48 hours "if appropriate" and continue "until the woman feels comfortable in her home environment" through to the final check at the last postnatal visit. This means a midwife following

NZCOM decision points would provide a minimum of two visual perineal assessments. Two or more assessments would extend over the expected range for perineal healing; from one week (Dixon, 2010) for well aligned uncomplicated tears, through to six weeks or longer for tears that are unsutured (Fleming et al., 2003). Thus the dissatisfaction expressed in the MOH survey may be due to midwives not following MOH requirements for home visits, misalignment between women's expectations and NZCOM decision points, or other factors.

The most common time for the emergence of symptoms of postnatal wound infection is four to five days after birth (Bick, 2010). This is confirmed by an Irish audit of 3341 postpartum women where referral for perineal wound complications in 119 women occurred before five days in 65.5%, six to 10 days in 29.4% and 11 days or later for 5% (Fox, 2011). Yet, there is no evidence on the optimal time for perineal assessment. Many studies report only two assessments for perineal healing after birth; one to two days after birth then again around one to two weeks (Fleming et al., 2003; Gordon et al., 1998; Kaur et al., 2013; Kindberg et al., 2008; Langley et al., 2006; McGuinness et al., 1991; Metcalfe et al., 2006; Morano et al., 2006) and others add a third assessment between four and eight weeks (Fleming et al., 2003; Kindberg et al., 2008; Langley et al., 2006; Lundquist et al., 2000).

Most women who sustain a second degree perineal tear experience postpartum perineal morbidity. This includes poor wound healing, infection, pain, and bladder and bowel incontinence (Andrews et al., 2008; Glazener et al., 1995; Green et al., 1998; Kettle et al., 2002; MacArthur & Macarthur, 2004; McCandlish et al., 1998). Appropriate treatment of perineal complications is important to optimise maternal wellbeing and it is generally agreed that women should be invited to express perineal concerns and receive timely referral to a doctor and treatment if required (Bick, 2010; Glazener, 2005; Herron-Marx, Williams, & Hicks, 2007; Johnson et al., 2012; NICE, 2006). However, women may defer to midwives providing their care (Bluff & Holloway, 1994) and become falsely reassured by midwives' reassurances into erroneously thinking that complications with perineal healing are normal (Salmon, 1999). Conversely, women receiving postnatal care by a known midwife may experience enhanced exchange of information in regard to perineal trauma (Austin, 2003) and so receive more appropriate and timely treatment for concerns than women who do not have a relationship with their care provider.

Following a second degree tear, 6.2% of women had wound gaping at eight weeks postpartum in a Swedish RCT of 48 women comparing suturing of first and second degree tears to non-suturing (Lundquist et al., 2000). These results are comparable to the more recent PEARLS study (Ismail et al., 2013) of 22 UK maternity units that reported poor perineal healing 10-12 days after birth in second degree tears treated by midwives, ranging from 3.9% after a multi-professional training program to support implementation of evidence-based perineal management, to 6.1% prior. Poor wound approximation at six weeks after birth was also significantly associated with unsutured second degree tears in the UK RCT by Fleming et al. (2003). The possibility of slower wound healing for unsutured tears up to eight weeks postpartum was described in a Cochrane review (Elharmeel et al., 2011). Furthermore, problems with 8% of sutures falling out three days after second degree tear repair were described by Lundquist et al. (2000).

Perineal pain, poor healing, and wound dehiscence are linked with infection (Williams & Chames, Johnson et al., 2012; 2006). Wound infection was noted to be the most important consequence for women interviewed in the PEARLS study (Ismail et al., 2013), although women with episiotomies were included and this is known to increase the risk of wound infection (Johnson et al., 2012). The background frequency of perineal infection after vaginal birth derived from literature (Glazener, 2005) indicates a risk of 2-6%. A higher infection rate of 11% of all sutured perineia was reported in a UK telephone survey of 341 women at 21 days postpartum (Johnson, 2012). However, looking solely at second degree tears, an Irish midwifery audit recorded an infection rate of 5.9% which reduced to 3.9% after implementation of evidence-based care (Fox, 2011). The benefit of evidence-based staff education in perineal management was also seen in the PEARLS study where infection of perineal trauma requiring antibiotics at 10-12 days postpartum reduced from 6.9% to 3.9% post-intervention.

Postpartum perineal pain on day 10 was reported by two thirds of women with second degree tears in the UK (Metcalf et al., 2006). The PEARLS study reported 23-32% of women with second degree perineal tears had taken analgesia in the last 24 hours (Ismail et al., 2013). For some women who have undergone perineal repair this may be related to discomfort from sutures. One study reported 13% of women had sutures requiring removal by eight weeks (Lundquist et al., 2000), however less than 4% of women required suture removal at 10-12 days in the PEARLS study. In regard to severe perineal pain,

three RCT trials comparing suturing materials and techniques (including episiotomy, first and second degree tears) had comparable results. Less than 2% of women reported severe perineal pain at day 10 in the Danish study by Kindberg et al. (2008), similarly only 2-3% experienced severe pain at day 10 in the Spanish RCT of Valenzuela et al. (2009), while less than 1% described severe pain at six weeks in Australia (Upton et al., 2002).

Complications of urinary incontinence are common after vaginal birth. A Norwegian systematic review of 33 studies reported mean prevalence of daily and weekly urinary incontinence was around 31% in the first three months postpartum after vaginal birth, compared to 15% in the women who had a caesarean (Thom & Rortveit, 2010). A UK study found 26% of women with second degree tears reported incontinence in the first postpartum month (Layton, 2004).

However, literature comparing the incidence postpartum urinary incontinence between sutured and unsutured second degree tears did not find significant differences. Leeman et al. (2007) reported around 15% of women in both groups had incontinence affecting their quality of life at three months postpartum. Langley et al. (2006) found no difference at 10 days after birth, although noted a trend towards sutured women suffering more leakage. Metcalfe et al. (2006) also reported no difference between groups for urinary stress incontinence which was 21% at 10 days postpartum.

The seminal study by Sultan et al. (1993) reported the 10% of 127 women who had faecal urgency and incontinence six weeks after vaginal birth had symptoms linked to OASIS. Thus bowel incontinence is unexpected after a second degree tear unless OASIS is undiagnosed (Abramowitz et al., 2000; Andrews et al., 2006; Sultan & Kettle, 2007). Nevertheless faecal incontinence, including flatulence, was reported by 4-6% of women at 10 days after birth with a second degree tear, decreasing to 2-6% by three months (Metcalfe et al., 2006) with no significant differences between sutured and unsutured tears.

Summary and areas for further research

International evidence about midwives' management of second degree perineal tears is increasing. Yet, apart from Gray's (2010) study of influences on New Zealand midwives' decision making in relation to suturing and non-suturing of spontaneous perineal tears

following normal birth, there is little known about New Zealand midwives' current perineal practice. In particular, there is a gap in knowledge in relation to midwives confidence with perineal management, utilisation of guidelines, and education in perineal management. However, it is known that all these factors influence the practice of overseas midwives.

There is also a lack of evidence about New Zealand midwives' practice in regard to perineal assessment and repair, patterns of perineal analgesia, and evaluation of perineal healing. This is despite overseas research demonstrating that use of evidence-based practice reduces the expense of repair and decreases perineal morbidity. Moreover, the practical implications and outcomes of the association between New Zealand midwives' employment statuses and their decision to suture or not suture second degree tears, remains unknown. Yet the midwifery model in New Zealand, with an autonomous midwifery profession providing woman-centred continuity of care for childbearing women, is known to affect midwives perineal decision making (Gray, 2010). The aim of this research was therefore designed to take a six week snapshot of New Zealand midwives' management of perineal trauma during childbirth in 2013.

This chapter has highlighted that information on midwifery management of perineal trauma is limited, and that there is a scarcity of literature on this topic in the New Zealand context. This review identified that midwives' employment statuses may influence midwives perineal practice. Furthermore, the decision to leave a second degree tear unsutured may be influenced by confidence in perineal repair and, in turn, may affect postpartum perineal management and morbidity. The next chapter, describing the methodological framework, ethical implications, and methods, addresses these knowledge gaps.

Chapter Three: Methodology

Introduction

The research question addressed in this study was ‘New Zealand midwives’ management of perineal trauma during childbirth: What is their current practice?’ The objective was to describe practice, compare this practice to evidence-based guidelines, and identify any association in relation to midwives’ employment and perineal management. Eligible respondents were midwives currently undertaking perineal assessment and repair. Quantitative, descriptive, cross-sectional research via an online survey was chosen as the method. This chapter presents the rationale justifying this methodological framework. The ethical implications, data collection process, and methods of data analysis utilised in this study are described.

Research method and approach

Personal experience often provides a major stimulus for a research question (Bryman, 2004). In turn, the research question provokes the study design and the methodology (Schneider, Elliott, & Whitehead, 2007). The methodology providing both a scientific approach for evidence-based practice and to justify practice is quantitative research, where the variables are measurable and results are quantifiable and able to be coded as statistical data (Schneider et al.). Consequently quantitative descriptive research was chosen for this study as being most appropriate due to paucity of information about New Zealand midwives’ perineal management. Nevertheless the researcher is mindful that the reductionist nature of quantitative research, with its focus on measurable and usually clinical outcomes, may be at the expense of women’s perspectives in maternity care and in particular perineal care (Walsh, 2007).

The survey has been described as the most well-liked mode of enquiry for exploration of midwifery practice with the advantage of multiple modes of access (Brindle, Douglas, van Teijlingen, & Hundley, 2005). Surveys are appropriate for descriptive research where they are used to observe and gather data in order to assess specific factors in an easily identified and accessed target population and to describe associations (Kelley, Clark, Brown, & Sitzia, 2003; Wagstaff, 2006). They are relatively quick, inexpensive, and accessible to large wide-spread populations (Punch, 2003), thus can be used to make generalisations about the wider population (Bryman, 2004) and standardised for later

comparison (Brindle et al., 2005). Preliminary analyses on collected data can be undertaken while waiting for the responses to accrue (Brindle et al., 2005; Wright, 2005) and analysis can be performed via spread sheets, online survey tools (Qualtrics Inc, 2012) or entered into statistical software.

Identifying and replicating an appropriate pre-existing survey is a recommended research strategy with the advantage of the survey being proven for the purpose (Douglas et al., 2005). Thus the three surveys on midwifery perineal management located (Bick et al., 2012; Dahlen & Homer, 2008; Gray, 2010) were used as foundation for the development of survey questions and a guide for data analysis. Furthermore, it is known to double survey response rates if questions are particularly relevant to the respondents (Edwards et al., 2009) and midwives' interest in previous perineal care surveys were considered to have resulted in better than expected response rates (Bick et al., 2012; Dahlen & Homer, 2008; Gray, 2010; Sanders et al., 2005).

An online technique was chosen as the mechanism for the survey distribution. Online surveys have a rapid return compared to a postal approach (Akl, Maroun, Klocke, Montori, & Schünemann, 2005) with more complete responses (Bowling, 2005), reduced cost (Braithwaite, Emery, De Lusignan, & Sutton, 2003), tight control of the order in which questions are viewed (Braithwaite et al., 2003), and ability to reach large numbers in all locations while allowing automated data collection (Wright, 2005). Other benefits are that data are more complete and of higher quality, that the approach is environmentally friendly and that it enables the use of closed populations which facilitates generalisations (Truell, Bartlett, & Alexander, 2002). An online survey also helps to decrease researcher bias by avoiding verbal or visual clues to influence responses while allowing freedom to take part at a time that best suits the respondent (Bowling, 2005). Previously reported lower response rates for online surveys (Manfreda et al., 2008) are not an issue where respondents are defined and motivated (Hunter, 2012).

Reasons for bypassing the online mode in Gray's (2010) survey were her concerns about low response rate, potential errors, lack of computer expertise, and barriers to access for rural midwives. However, this online approach was successfully used in 2002 in New Zealand in accessing practising midwives with a 44.6% response rate (Harding & Foureur, 2009). Furthermore New Zealand midwives are an ideal population for online survey

research. They are experienced in the mode as they have been required to complete an online application and annual workforce survey to obtain an annual practicing certificate since 2011 (MCNZ, 2013a). They are a defined population, easily targeted, and are required to be literate in written English (MCNZ, 2013b). The nature of shift work for employed midwives and on-call work of self-employed midwives also meant that a survey method that was fast, accessible at any time or day, and did not require additional effort such as mailing, travel, or an interview was important.

The online survey could be accessed by opening an emailed invitation containing a link, which is a combination approach that has been used successfully since 1997 (Truell, 2003). To facilitate setting up an online survey, Victoria University provides a software package: the Qualtrics Research Suite (Qualtrics Inc, 2012). Qualtrics is a web service that has tools to create, administer, and analyse data from surveys. It is user friendly, offers multiple options for presentation and enables response tracking and export of data to statistical software packages. A required answer feature is provided, which notifies the respondent if they have not answered questions and prompts them to indicate whether they wish to answer or continue. Qualtrics does not allow over-selection of answers or deviation from selected parameters.

Survey design

To ensure content validity with survey question design, it is recommended involving experts (Kelley et al., 2003). Professor Hannah Dahlen from Australia and Doctor Debra Bick and Catriona Jones from the UK were consulted, with Dr Bick sharing the survey design from Bick et al. (2012). It was suggested that perineal research was welcome and the New Zealand midwifery LMC continuity of care model was of interest overseas. This led to the formulation of questions about employment and management to six weeks postpartum.

In the New Zealand context, Gray (2010) provided recommendations for future midwifery perineal research, including investigating how midwives classify perineal trauma, and the exploration of the impact of hospital policies, tear measurement, peer support, and skin-to-skin contact of perineal management decisions. Auckland obstetricians specialising in perineal repair, Doctors Tomlinson and Smalldridge (Tomlinson et al., 2012; Toohey, 2003) were also approached for their perspectives. They suggested questions about midwives' knowledge of perineal anatomy and assessment of trauma.

Opinion and practice questions may result in contradictory answers (Douglas et al., 2005). Thus, midwives were asked 'to recall the last woman who had a second degree perineal tear they treated' rather than ask what midwives 'usually' did. Practice related questions are also known to increase survey response rates (Edwards et al., 2009). Furthermore, Bick et al. (2012) was clear that midwives with current experience in perineal management were essential to enable confidence that data provided was contemporaneous. This was a limitation in the survey design noted by Gray (2010), who reported it was unknown when the midwives who participated in her survey on perineal care decisions, last undertook perineal assessment. Gray was concerned that midwives last repair may not be reflective of their current practice if the repair happened at a considerable earlier period. Consequently this research asked not only whether midwives currently provided perineal management, but also the number of second degree tears they had sutured or left unsutured over the previous six months.

The final survey design consisted of nominal and an ordinal closed forced-choice questions. Closed questions are easy to code and analyse and give all respondents the same options (Douglas et al., 2005). They are also less time consuming, increasing survey response by more than one half (Edwards et al., 2009). At the same time, closed questions restrict choice, so the survey provided the option of free-text answers if midwives did not wish to choose the answers provided.

Likert-like scales were utilised to enable respondents to rank their attitudes (Bryman, 2004; Douglas et al., 2005) and an even number of points forced a stance to be taken (Douglas et al., 2005). Ranking responses by ordering preferences from a defined list of answers, while considered a more accurate method expression of views, are less user friendly (Douglas et al., 2005) so not used. Construction of each question was considered to avoid embedding assumptions. Some questions were split, with the first half of the question asking for a yes or no answer. If the reply was affirmative then the next question would seek more information.

The final survey consisted of 78 questions divided into four logically coherent sections, each designed to follow on from the previous section.

1. About You: Demographics and Midwifery Characteristics
2. Your Management of the Last Second Degree Perineal Tear You Treated

3. Postnatal Perineal Pain Management
4. Postnatal Perineal Healing Assessment

Midwives were able to be screened and channelled using the survey software options (Qualtrics Inc, 2012). This meant that if the midwives were ineligible because their role did not currently require them to undertake perineal assessment and repair, this was identified with a screening question, their survey was skipped to the end, and they were thanked for their participation. The software also had the advantage of eligible midwives being able to bypass questions that were not relevant to their practice. This allowed employment questions to be restricted to employed midwives, while midwives who left tears unsutured automatically bypassed the questions on repair. Midwives who did not provide perineal pain relief did not view pain relief options and those who did not provide continuity of care to six weeks postpartum period were not offered the section on perineal healing. The minimum number of questions was 11 and the maximum number was 70.

The survey began with demographic questions as some researchers suggest this may gain respondents' attention and encourage them to complete the survey (Douglas et al., 2005). Although a Cochrane review found no evidence of this effect (Edwards et al., 2009), it was also reported that response rates increased significantly when the easiest questions were presented first. The time frame specified for recall of perineal treatment was six months, which is the recommended maximum interval to optimise accuracy (Scheuren, 2004). The questions were set out in an easy to read text with a visually appealing format as this is known to increase the rate of return (McColl et al., 2001). The same answer scale was used for similar questions (Schneider et al., 2007). A white background was included, which has been found to increase online survey response by over a quarter (Edwards et al., 2009). Midwives were thanked for participating in the research both in the invitation and at the completion of the survey as advised by Douglas et al. (2005).

Fifteen minute duration prompts the highest response for online surveys (Marcus, Bosnjak, Lindner, Pilischenko, & Schütz, 2007). Consequently this survey was planned for an average of 15 minutes assuming one minute for every five to six closed questions (Zoomerang Survey Coach, 2006). Advising how long it might take to complete the survey

was suggested to increase response (Douglas et al., 2005); therefore a 'worm' graph giving feedback on progress was included.

The ability to save a partially completed form increases returns (Edwards et al., 2009) thus Qualtrics software, which allows saving of incomplete responses was advantageous. Respondents were asked to complete the survey within a six week period, as suggested in a previous New Zealand midwifery survey (Gray, 2010), and by a specified date, which has been known to increase the online survey response (Edwards et al., 2009).

Information on factors influencing survey response rates from a Cochrane review by Edwards et al. (2009) was incorporated. The review suggested a university sponsorship increased responses by more than one quarter (Edwards et al., 2009) so the Victoria University of Wellington logo was utilised with Qualtrics survey software. A small non-monetary incentive almost doubled the return rate of electronic surveys (Edwards et al., 2009); consequently a midwifery textbook draw was offered. Odds of response increased by nearly half when the survey invitation contained an offer of results; so it was explained findings would be shared via journal articles and conferences. Response increased by up to one third if a picture is included with the survey (Edwards et al., 2009) which led to a photo of a pregnant woman (with permission) being added to the invitation.

Warning that once the survey has been returned it cannot be changed strongly supports the benefits of careful planning and piloting (van Teijlingen & Hundley, 2001). Informal discussion groups were held with practising midwives from main centres throughout New Zealand, similar to my target population. The midwives were keen for knowledge about 'what other New Zealand midwives do' in regard to perineal management. The discussions also highlighted that concerns about perineal pain and healing were guiding influences for midwives in regard to managing perineal trauma.

The next step, once ethical approval had been obtained, was to pilot the survey. This was initially performed with a midwifery colleague, who offered extensive feedback which was incorporated into the design. The survey was then piloted on paper with six midwives and their feedback was requested. Some questions were identified as ambiguous and these were clarified before finalising the survey. One question on the age of midwives was seen as irrelevant and was removed. The question on estimated length and depth of tears was adjusted from independent categories (<2, 2-3, >3-4, >4-5, >5) to

overlapping categories (<2cm, 2-3cm, 3-4cm, 4-5cm, >5cm) as midwives said this was how they estimated measurements.

A few months later, questions taken from the UK survey of perineal practice (Bick et al., 2012) were added with the authors permission, and duplicated exactly to ensure validity was not compromised (Douglas et al., 2005). A group of six midwives piloted the revised survey online by clicking on a survey link embedded into an email invitation. To circumvent potential problems with the display effects of midwives' computers, the invitation containing the embedded link to the online survey was included in the body of the email as well as in a Portable Document Format (PDF) attachment. The midwives feedback was incorporated in the final version of the survey.

Both pilot groups of midwives were working night shifts, which enabled their question comprehension to be assessed under trying circumstances. The midwives reported the estimated 15 minute duration of the survey was appropriate and recalling their perineal management in the previous six months was undemanding. The online version was preferred by the midwives, primarily because it was faster and they could save their answers and complete the survey at a later time. The similarity in results between the first paper survey and the second online survey was reassuring in regard to reliability.

Accessing the study population

Eligible respondents were midwives currently undertaking perineal assessment and repair, so access to practising midwives was required. As NZCOM represent nearly 90% of working midwives in New Zealand, a request to access the membership database was submitted to the national NZCOM committee in February 2012. The committee initially declined the application. However, it was agreed that the request could be resubmitted to a newly formed database access governance group, and this was successful in October 2012. The invitation was emailed to members of the NZCOM database in February 2013.

Following a mail-out of a perineal survey with reminders has been used successfully by Gray (2010). She reported an initial response of 10%, with the first follow-up increasing the response by 27%, and second follow-up by 17%. Gray's total response was 54% (216 of 400), which was 15.7% of 2547 of practising New Zealand midwives (MCNZ, 2010). Accordingly, two reminders were planned for this research. The inclusion of a statement

about others' participation in reminders increased response by half in online surveys (Edwards et al., 2009), so updated information on responses was included in reminder emails for this survey. To maximise response, midwifery contacts throughout New Zealand were also approached by a personalised email and asked to forward the survey invitation to their midwifery colleagues.

Ethical and cultural considerations

A survey administered to midwives on a national scale required expedited Multi-region Ethics Committee (MREC) approval (Appendix A). The invitation (Appendix B) explained that the survey had NZCOM approval and that its purpose was Master of Midwifery research with Victoria University. Contact details of the research supervisor and researcher were provided. The invitation stated that it was optional to take part and that consent would be assumed by completion. Respondents were informed that on completion of the research the results would be published and presented at conferences.

Confidentiality was an important consideration for this research. Research that stimulates questions about midwifery practice runs the risk of being viewed negatively through the lens of the dominant medical model of healthcare (Grigg & Tracy, 2013). Consequently, with a relatively small New Zealand midwifery community (MCNZ, 2012), over 16 times smaller than the nursing population (Nursing Council of New Zealand, 2012), it was imperative that respondents and geographical areas were not able to be identified and targeted. It is also known that anonymity offered in surveys increases response rates (Oppenheim, 1992); decreases social desirability biases (Wiersma, 2012) and increases truthfulness of replies (Wagstaff, 2006). Consequently the invitation for this research reassured respondents that they would be given a unique ID and that no data would be presented in any way that would allow identification of participants.

The research process recognises that all health research carried out in Aotearoa is of relevance to Māori. Any research process should be guided by the three central principles of the Te Tiriti O Waitangi (Treaty of Waitangi); that of partnership, participation, and protection. Throughout the research process I have undertaken to respect these principals. My understanding is that it is important for any health research to have respect for Māori rights, control over research processes, and reciprocity within research. In addition, midwives and birthing women are privileged that the Treaty of

Waitangi has been a core influence on midwifery and shaped the concepts of cultural safety and the midwifery partnership model (Guilliland & Pairman, 2010a).

As non-Māori it is not appropriate for me to present my findings on behalf of Māori. Thus I have undertaken consultation as appropriate to ensure all aspects of the process incorporate the cultural safety and the needs of the Māori. The pilot group for the proposed survey included midwives who identified as Māori (n=3, 50%) and their feedback was incorporated in to the survey. This included a request not to prioritise ethnicity, as it was felt that prioritisation conceals diversity. The ethnicity categories in this survey are optional and based on the MCNZ (2013a) workforce survey which classifies ethnicity according to the government statistical standard for ethnicity (MOH, 2004). The ethics application for this research stated that ethnicity information supplied by respondents would be restricted to the comparison of the sample to the population of New Zealand midwives.

Data analysis

Statistical support was obtained from a Victoria University statistician for sample size, survey design, and data analysis. As the New Zealand midwifery population totalled 2910 midwives with an APC in 2012 (MCNZ, 2012), it was suggested that it would increase validity of the research if the entire population was sampled. Research assessing what percentage of the population and sample size was 'enough' to allow meaningful conclusions to be drawn from an online survey was investigated over 15 years ago (Hill, 1998) and remains relevant today (Denscombe, 2010). Ten percent of the sampled population was considered satisfactory for descriptive research (Gay & Diehl, 1992). Conversely, to ensure sufficient cell numbers in the cross-tabulations required to analyse results when the total sample is subdivided into sub-samples for comparison, the larger the sample the better (Schneider et al., 2007). A table providing a sample size given a finite population was produced by Krejcie and Morgan (1970). Using these guidelines, and confirmed via online calculation (National Statistical Service, 2013), the statistician confirmed that the minimum sample size for this survey would be 340 midwives from a total population of 2910, for a margin of error of 5% and a confidence interval of 95%. However, a larger sample size would allow sub-sample data analysis.

Descriptive research methods can only describe the data collected and relate one variable to another; they cannot determine cause and effect (Schneider et al., 2007). However, cross-sectional studies are useful to determine prevalence and identify associations (Mann, 2003). Using the Qualtrics survey program to collect data enabled questions to be pre-coded for data entry and analysis. Results were able to be downloaded directly into programs such as Statistical Package for Social Sciences (SPSS) version 20.0.

Generated data were mainly nominal and ordinal answers to the closed forced-choice questions. Frequency distributions of the variables were initially performed, which enabled checking of the distribution of data and identification of data outside the expected range, as well as errors in data entry. Inferential statistical techniques were used to provide generalisations from the sample to the population. Inference focuses on determining whether patterns in the findings have come about by chance or whether they reveal real features, and is useful in deciding appropriate presentation of survey results.

As there was one independent variable (the midwifery sample) with two or more levels (e.g., employment status, practice years, qualification, place of work and perineal treatment), the associations between categorical characteristics and outcomes of interest were able to be explored using a nonparametric Pearson chi-squared test. A two-sided significance level of 5% was used. Where the expected count was less than five in more than 20% of cells, categories were combined. Fisher's exact test was used for a 2x2 table where the expected count was less than five. To aid analysis, the small group of midwives who worked simultaneously as employed and self-employed, were placed into the self-employed category based on the strategy used previously by Gray (2010). This meant employment statuses of New Zealand midwives could be categorised into two similarly proportioned groups; employed and self-employed.

Interval data on perineal measurement was analysed with the two-sample *t*-test. A *p*-value of <0.05 was considered to be significant and Cohen's guidelines for interpreting effect sizes were used to measure the strength of the association and for determining practical significance independent of the level of statistical significance for non-parametric measures (Morgan, Reichert, & Harrison, 2002). However, the result may still have clinical value.

Respondents were advised via an online 'pop-up' if they failed to answer a question and were prompted to indicate whether they wished to answer or continue without answering. These survey software showed that of the 744 eligible respondents, 645 (86.7%) actively answered and/or viewed questions to the end of the survey. It subsequently appeared that many of the midwives, who selectively chose not to answer some questions (the maximum number of selectively unanswered questions was three) and continued the survey to the end, had taken a support role with the perineal repair or had handed the repair to another clinician so were unable to answer some questions. These midwives responses were included as 'not answered'. The missing data from the 99 midwives who were shown to have discontinued the survey partway through was not used in the analysis. This means the sample size changes between questions and reduces as the survey progresses and this is clearly identified.

Options were provided for multiple answers where appropriate; although this added complexity to data analysis as the sub-groups were not independent. Where midwives had practices that were not offered in the options provided they could select 'other (please specify)' and describe their answer with free text. Final comments were invited at the end of the survey and some used this option to express their views. The free text answers also enabled the researcher to identify questions that caused confusion and report this in the findings.

The survey software allowed non-response patterns to be documented. When more midwives than expected (33.1%) did not select a geographical region or urban-rural location, this enabled diagnosis of a programming error where self-employed respondents (n=204) were not able to view these questions for the first 16 days (53%) of the data collection period. Additionally, 42 employed midwives chose not to answer the geographical and location questions. Thus these data were not used in analysis due to potential for inaccuracy from an incomplete data set and to avoid identifying respondents in regions with low numbers. Given that 30% of midwives accessed the survey between 6pm and 6am, flexibility of time to complete the survey appeared to be helpful.

Rigour

Validity refers to the survey representing what it states it represents. Thus for this survey it was required to demonstrate it measured New Zealand midwives current perineal

practice. Internal validity refers to how accurately the survey measures the concepts it intended to measure while external validity refers to the ability of the survey to extend beyond the study population and across settings (Wiersma, 2012). The validity was managed by using a research approach that would maximise the response rate and decrease the risk of selection bias.

A major obstacle for early online surveys was external validity in obtaining a representative sample (Braithwaite et al., 2003), although with online access available in four out of five New Zealand homes in 2012 (Statistics New Zealand, 2013), this has been largely overcome. Demographic questions are an important part of midwifery perineal care surveys (Bick et al., 2012; Dahlen & Homer, 2008; Gray, 2010) and were included to enable comparisons of the respondents with the population of interest and consideration of the applicability of research findings for similar populations. Another threat to the validity of the online mode is difficulty in controlling who is accessing the survey, although sending the invitation from an annually updated professional midwifery database would make this unlikely.

After the data had been received and imported to the SPSS database, it was cleaned and checked for aberrant answers. Qualtrics' answer parameters decreased potential for incorrect answers with the number of characters able to be defined and also restricted to either text or numbers. Where a free text answer conflicted with the tick box answer, the text was assumed to be accurate and corrections were made.

As with any study, there was the potential for recall bias in this research. Respondents were recruited prospectively, although recollection of practice was retrospective. The inclusion of only the midwives who indicated that they currently undertake perineal assessment and repair was to enable a degree of confidence that the data were contemporaneous.

Summary

This chapter has presented the methodological framework guiding this research that was informed by the identified gaps in knowledge highlighted by the literature review. The chapter began by revisiting the aims and objectives of the research. The rationale for choosing quantitative descriptive research via an online survey tool for data collection was provided. Advantages of using previous studies as a foundation for the research

were discussed. The survey design was outlined, including consultation with experts, construction of questions, and decisions around flow and timing to optimise responses. The planning phases of the research involving piloting the survey, submitting applications for ethical approval and access to the research population were discussed. Finally the process of conducting the research was presented and included explanations of how data was collected, cleaned and analysed. The survey tool is included as appendices via a CD-ROM. The following chapter provides the results of the analysis of the survey.

Chapter Four: Findings

Introduction

The findings of the survey, which explores New Zealand midwives' management of perineal trauma during childbirth, are presented, commencing with a description of the sample. This is followed by the presentation of results in two sections, reflecting the order of questions in the survey. The first section reports the overall perineal practice and the second section reports the responses where midwives recalled their management of the last second degree tear they treated. Where appropriate, the sample has been analysed by employment status, the decision to suture or not suture the last second degree tear, and in relation to evidence-based guidelines.

Response rate

The six week data collection period commenced during February 2013 and is displayed in Table 3. Thirty one closed the survey link immediately, leaving 818 midwives who commenced the survey questions, of which 744 were eligible. Most (85.1%) took less than 30 minutes to complete the survey with the mean of 9.25 minutes (range 1-240). Those taking less than five minutes (9.0%) had been ineligible so were skipped to the end of the survey. Those taking over 30 minutes (14.9%) were likely to have commenced the survey, saved their answers, and completed the survey later.

Table 3: Sample and midwifery population in 2012

Opened survey link embedded in email	Sample N=849 (%)	Midwives with 2012 APC N=2910 (%)
Initial Invitation (11.02.13)	348 (40.9)	348 (12.0)
First reminder (25.02.13)	179 (21.0)	179 (6.2)
Second reminder (11.03.13)	322 (37.9)	322 (11.0)
Eligible respondents (25.03.13)	N=744 (%)	744 (25.6)
Completed survey	645 (86.7)	645 (22.2)
Postpartum care to 6 weeks*	377 (50.7)	377 (13.0)

*All midwives who provided postpartum care to six weeks after birth completed the survey

Description of the sample

The 744 eligible midwives who commenced the survey constituted 25.6% of the New Zealand midwifery population with a 2012 practising certificate (MCNZ, 2012). The

margin of error, previously calculated at 5% for 339 respondents, was improved to 3.1% with 744 respondents. Thus the findings have a 95% chance that estimates from the sample are within 3.1% of the true percentage.

Of the eligible midwives, 99 (13.3%) had ceased the survey before the final postpartum section. This left 645 midwives, 22.2% of the New Zealand midwifery population (MCNZ, 2012), to complete the survey. Over half of these remaining 377 midwives provided full continuity of care to six weeks postpartum, which remained within the original calculated minimal sample size of 340 and calculated margin of error at 4.71%.

Representativeness of the sample

The sample compared to the population of New Zealand midwives who obtained an annual practising certificate (APC) in 2012 (MCNZ, 2012) is displayed in Table 4. The sample was more likely to report self-employment than the MCNZ workforce (55.5% vs 36.3%).and to be LMCs providing continuity of care (61% vs 36.2 %).

Table 4: Characteristics of sample and midwifery population in 2012

Characteristic	Value	Sample N=744 (%)	Midwives with 2012 APC N=2910 (%)
Employment	Self-employed (any)	413 (55.5)	1055 (36.3)
	Employed (only)	331 (44.5)	1841 (63.3)
	Not answered	0	14 (0.4)
LMC status	Core midwives-not LMC	290 (39.0)	1577 (54.2)
	Self-employed LMC	395 (53.0)	1132 (32.3)
	Employed LMC	59 (8.0)	201 (3.9)
Employer* (Up to three)	Primary facility	115 (25.7)	457 (15.7)
	Secondary facility	152 (34.0)	661 (22.7)
	Tertiary facility	152 (34.0)	630 (21.6)
	Other midwifery	28 (6.3)	544 (18.7)
First midwifery qualification	NZ Qualified	473 (63.5)	1923 (60.1)
	Overseas Qualified	271 (36.5)	987 (33.9)
Practice years	> 16 years	336 (45.2)	1242 (42.7)
	6-15 years	228 (30.6)	920 (31.6)
	< 5 years	180 (24.2)	748 (25.7)
Ethnicity* (Up to three)	Māori	70 (9.4)	236 (8.1)
	NZ European	491 (66.0)	2037 (70.0)
	Other European	200 (26.8)	863 (29.7)
	Other	67 (9.0)	257 (8.8)

*Percentages add up to more than 100% as some selected more than one value

LMC midwifery was not synonymous with self-employment as 8.0% of LMC midwives were employed by DHB's or another employer (non-government organisations or other midwives). Primary, secondary, and tertiary employed midwives were over-represented in the sample compared to the MCNZ workforce and midwives with other employment were under-represented. Similar proportions (35%) of employed midwives in the sample and the MCNZ workforce worked as a midwife for more than one employer. Years of midwifery practice, countries of first midwifery qualification, and ethnicities were similar in the sample compared to the MCNZ workforce survey.

Section One: Overall perineal practice

Confidence with assessment and repair

Confidence 'all' or 'most' of the time was reported by 91.9% of 692 midwives for perineal assessment and 81.0% for perineal repair. Confidence in assessment and repair is assessed using four variables in Tables 5 and 6. Confidence 'all' the time was associated with increasing length of midwifery qualification and self-employment.

Midwives qualified longer than 20 years reported the most confidence in assessment (χ^2 (8, $N=692$) =116.351, $p<.001$, $V= .290$) and repair (χ^2 (12, $N=692$) =68.969, $p<.001$, $V=.182$). Self-employed midwives were more confident than employed midwives in assessment (χ^2 (2, $N=692$) =46.654, $p<.001$, $V=.260$) and repair (χ^2 (3, $N=692$) =29.728, $p<.001$, $V=.207$).

The midwives' decisions to repair the last second degree tear were not associated with confidence with assessment but were associated with increased confidence with repair (χ^2 (3, $N=660$) =35.750, $p<.001$, $V=.233$). Midwives who performed an assessment of the last second degree tear in a tertiary setting were less confident than those who assessed the tear at a home birth, in a primary facility, or a secondary facility (χ^2 (6, $N=679$) =16.865, $p=.010$, $V=.111$). This was not found with repair.

Table 5: Confidence with perineal assessment

	All of the time n(%)	Most of the time n(%)	Some of the time n(%)	Never n(%)	Total N(%)
Years of practice*	N=692				
≥21 years	133 (53.6)	87 (22.4)	5 (8.9)	0	225 (32.5)
16-20 years	34 (13.7)	55 (14.2)	2 (3.6)	0	91 (13.2)
11-15 years	19 (7.7)	60 (15.5)	9 (16.4)	1 (100)	89 (12.9)
6-10 years	33 (13.3)	79 (20.4)	7 (12.5)	0	119 (17.2)
≤5 years	29 (11.7)	107 (27.6)	32 (57.1)	0	168 (24.3)
Employment*	N=692				
Self-employed	164 (66.1)	214 (55.2)	9 (16.4)	0	387 (55.9)
Employed	84 (33.9)	174 (44.8)	46 (83.6)	1 (100)	305 (44.1)
Treatment	N=660				
Last tear sutured	229 (95.0)	341 (92.4)	42 (85.7)	1 (100)	613 (92.9)
Last tear unsutured	12 (5.0)	28 (7.6)	7 (14.3)	0	47 (7.1)
Birth setting*	N=679				
Home	20 (8.2)	27 (7.1)	1 (1.9)	0	48 (7.1)
Primary	55 (22.4)	92 (24.1)	5 (9.6)	1 (100)	153 (22.5)
Secondary	102 (41.6)	120 (31.5)	21 (40.4)	0	243 (35.8)
Tertiary	68 (27.8)	142 (37.3)	25 (48.1)	0	235 (34.6)

*Statistically significant at $p \geq 0.05$. 'Some' of the time' and 'never' were combined for statistical testing.

Table 6: Confidence with perineal repair

	All of the time n(%)	Most of the time n(%)	Some of the time n(%)	Never n(%)	Total N(%)
Years of practice*	N=692				
≥21 years	53 (55.2)	155 (33.3)	14 (12.8)	3 (13.6)	225 (32.5)
16-20 years	14 (14.6)	66 (14.2)	10 (9.2)	1 (4.5)	91 (13.2)
11-15 years	7 (7.3)	61 (13.1)	15 (13.8)	6 (27.3)	89 (12.9)
6-10 years	13 (13.5)	79 (17.0)	22 (20.2)	5 (22.7)	119 (17.2)
≤5 years	9 (9.4)	104 (22.4)	48 (44.0)	7 (31.8)	168 (24.3)
Employment*	N=692				
Self-employed	62 (64.6)	279 (60.0)	40 (36.7)	6 (27.3)	387 (55.9)
Employed	34 (35.4)	186 (40.0)	69 (63.3)	16 (72.7)	305 (44.1)
Treatment*	N=660				
Last tear sutured	95 (99.0)	419 (94.8)	86 (82.7)	13 (72.2)	613 (92.9)
Last tear unsutured	1 (1.0)	23 (5.2)	18 (17.3)	5 (27.8)	47 (7.1)
Birth setting	N=679				
Home	9 (9.4)	31 (6.8)	6 (5.6)	2 (10.5)	48 (7.1)
Primary	25 (26.0)	106 (23.2)	20 (18.5)	2 (10.5)	153 (22.5)
Secondary	39 (40.6)	156 (34.2)	39 (36.1)	9 (47.4)	243 (35.8)
Tertiary	23 (24.0)	163 (35.7)	43 (39.8)	6 (31.6)	235 (34.6)

*Statistically significant at $p \geq 0.05$

Guidelines, competency, and training in perineal management

Access to a guideline on the management and repair of perineal trauma was reported by 35.6% of 331 employed midwives, however 23% reported their employer had not provided access and 41.4% did not know if their employer had guidelines. The 118 employed midwives with guidelines reported that they were from the maternity facility (94.9%), NICE (3.4%), RCOG Green-Top guidelines (0.8%), or 'other' guidelines (0.8%). Half (52.8%) the employed midwives were routinely offered structured training on perineal management and repair by their employer, of which 69.5% were informed of a guideline during this training. Routine employer updates in perineal management and repair were offered to 42.3% (n=105).

Competency in perineal assessment had never been formally evaluated for 36.6% of 692 midwives. Similarly, competency on perineal repair had never been formally evaluated for 37.3%. Most (74.6%) midwives were knowledgeable about the tissues involved in second degree tears, although 24 (3.4%) incorrectly indicated involvement of the anal sphincter.

Table 7 describes midwives' last training in perineal management by employment. This was two years or less for over half the midwives (54.3%). Another third (34.2%) had training within the previous three to five years, leaving 11.5% with no training for over six years. No significant differences were associated with employment or self-employment.

Table 7: Last training in perineal management by employment

	Self-employed n=380 (%)	Employed n=301 (%)	Total N=681 (%)	p
<1 Year	87 (22.9)	74 (24.6)	161 (23.6)	
1-2 Years	122 (32.1)	87 (28.9)	209 (30.7)	
3-5 Years	130 (34.2)	103 (34.2)	233 (34.2)	
6-10 Years	33 (8.7)	24 (8.0)	57 (8.4)	
>10 Years	8 (2.1)	13 (4.3)	21 (3.1)	.473

Sutured and unsutured tears treated by midwives in the last six months

Midwives reported that they had undertaken 3965 perineal repairs and left 470 tears unsutured in the last six months (Table 8). One fifth (19.4%) had not repaired any tears and 58.2% had performed less than four. Nearly three quarters of midwives (72.4%) had

not left any second degree tears unsutured in the previous six months, 26.7% had left between one and nine tears, while five (0.7%) had left 10 or more tears unsutured.

Table 8: Numbers of tears treated during previous six months

No. tears treated by midwives	No. midwives reporting sutured tears N=692 (%)	No. midwives reporting unsutured tears N=692 (%)
0	134 (19.4)	501 (72.4)
1	70 (10.1)	82 (11.8)
2	85 (12.3)	49 (7.1)
3	58 (8.4)	22 (3.2)
4	56 (8.1)	14 (2.0)
5	42 (6.1)	11 (1.6)
6	46 (6.6)	3 (0.4)
7	12 (1.7)	1 (0.1)
8	22 (3.2)	3 (0.4)
9	4 (0.6)	1 (0.1)
10	55 (7.9)	4 (0.6)
11 or more	108 (15.5)	1 (0.1)
Total sutured tears		Total unsutured tears
Sum	3965 (89.4)	470 (10.6)
Mean (SD)	5.72 (6.57)	0.68 (1.57)
Median (IQR)	3.0 (1-8)	0 (0-1)
Range	0-40	0-15

When asked if they currently leave some second degree tears to heal without suturing, 40.2% of midwives answered in the affirmative. However, the number of repairs (n=3965, 89.4%), compared to the number of second degree tears left unsutured (n=470, 10.6%) over the last six months, indicates that nearly nine out of every 10 perineal tears were sutured. There was wide variation in practice as indicated by the standard deviation being greater than the mean for both sutured and unsutured tears. This is due to 134 midwives not having undertaken any repairs in the last six months and 501 midwives not having left any tears unsutured; this is illustrated by the median being well below mid-range.

Self-employment was associated with an increased likelihood of both suturing (χ^2 (1, $N=692$), $p<.001$, $\Phi=.283$) and leaving tears unsutured (χ^2 (1, $N=692$), $p<.001$, $\Phi=.288$) (Table 9). Nearly one third (32.1%) of employed midwives had not sutured any second degree tears in the previous six months compared to 9.6% of self-employed midwives, however, only 13.1% of employed midwives had left tears unsutured compared to 39% of

self-employed midwives. Working as an LMC in the previous six months was associated with an increased likelihood of suturing tears (χ^2 (1, $N=692$), $p<.001$, $\Phi=.150$), however not with leaving tears unsutured.

Table 9: Factors influencing treatment of tears during previous six months

Sutured tears		Nil sutured	1 or more sutured	Total N=692(%)	p
Employment	Self-employed	37 (27.4)	350 (62.8)	387 (55.9)	<.001
	Employed	98 (72.6)	207 (37.2)	305 (44.1)	
LMC	LMC	53 (39.3)	377 (67.7)	430 (62.1)	<.001
	Not LMC	82 (60.7)	180 (32.3)	262 (37.9)	
Confidence	Considerable	67 (49.6)	492 (88.7)	561 (81.1)	<.001
	Low	68 (50.4)	63 (11.3)	131 (18.9)	
Last tear treated*	Sutured	102 (85.0)	511 (94.6)	613 (92.9)	.001
	Unsutured	18 (15.0)	29 (5.4)	47 (7.1)	
Unsutured tears		Nil unsutured	1 or more unsutured	Total N=692(%)	p
Employment	Self-employed	236 (47.1)	151 (79.1)	387 (55.9)	<.001
	Employed	265 (52.9)	40 (20.9)	305 (44.1)	
LMC	LMC	272 (54.3)	158 (82.7)	430 (62.1)	<.001
	Not LMC	229 (45.7)	33 (17.3)	262 (37.9)	
Confidence	Considerable	408 (81.4)	153 (80.1)	561 (81.1)	.745
	Low	93 (18.6)	38 (19.9)	131 (18.9)	
Last tear treated*	Sutured	465 (98.1)	148 (79.6)	613 (92.9)	<.001
	Unsutured	9 (1.9)	38 (20.4)	47 (7.1)	

*N=660 for last tear treated

Considerable confidence in perineal repair (midwives who reported confidence 'all' and 'most' of the time) was associated with an increased likelihood of suturing (χ^2 (1, $N=692$), $p<.001$, $\Phi=.395$), however not with leaving tears unsutured. Leaving the last second degree tear treated unsutured (7.1% of midwives) was associated with a reduced likelihood of suturing tears in the last six months (χ^2 (1, $N=660$), $p=.001$, $\Phi=.395$) and an increased likelihood of leaving tears unsutured (χ^2 (1, $N=690$) $p<.001$, $\Phi=.015$).

Section Two: Management of the last second degree tear

This section reports on how midwives managed the last second degree tear they treated. It commences with a description of the ethnicity and birth setting of the woman with the last tear (Table 10). Seven percent of the women in the sample identified with more than one ethnicity and more women reported 'other (including European)' ethnicities in

comparison to the 2010 New Zealand birthing population. In the sample, twice the percentage birthed at home and in primary units compared with the New Zealand births, but a smaller proportion birthed in a tertiary unit.

Table 10: Ethnicity and birthing setting of woman with last tear

	Sample N=660 (%)	NZ births 2010 N=64,485 (%)
Ethnicity*		
Māori	121 (17.8)	16,348 (25.4)
Other (including European)	481 (72.8)	28,821 (44.7)
Pacific	52 (7.7)	7536 (11.7)
Asian	64 (8.9)	6966 (10.8)
Birth setting		
Home birth	48 (7.1)	2060 (3.2)
Primary unit	153 (22.5)	6982 (10.8)
Secondary unit	243 (35.8)	26,222 (40.7)
Tertiary unit	235 (34.6)	28,821 (44.7)
Not answered	0	400

*Percentages add up to more than 100% as some selected more than one ethnicity

Table 11 describes three factors influencing treatment of the last second degree tear. There were significant differences associated with birth setting (χ^2 (3, N=660) =14.482, p =.002, V=.148), with unsutured tears associated with home birth. There were no significant differences associated with midwives' employment or LMC statuses.

Table 11: Factors influencing treatment of last tear

	Sutured n=613 (%)	Unsutured n=47 (%)	Total N=660 (%)	<i>p</i>
Birthing place				
Home birth	38 (6.2)	9 (19.1)	47 (7.1)	.002
Primary unit	135 (22.0)	14 (29.8)	149 (22.6)	
Secondary unit	224 (36.5)	14 (29.8)	238 (36.1)	
Tertiary unit	216 (35.2)	10 (21.3)	226 (34.2)	
LMC				
No	227 (37.0)	15 (31.9)	242 (36.7)	.483
Yes	386 (63.0)	32 (68.1)	418 (63.3)	
Employment				
Self-employed	345 (56.3)	30 (63.8)	375 (56.8)	.361
Employed	268 (43.7)	17 (36.2)	285 (43.2)	

Assessment and repair

The method of assessment of the length and depth of the last second degree tear is described in Table 12. Most (96.1%) midwives observed to the apex of the tear or beyond to the cervix. Ninety percent of midwives visually estimated the length and depth of the last tear independently, while some (23%) did this in conjunction with another clinician. Of the 20 (3%) midwives who chose 'other', 12 midwives reported using touch and feel in their assessment.

Table 12: Method of assessment of last tear

	Total N=660 (%)
Method of assessment of trauma*	
Look without touch	3 (0.4)
Look just inside vagina	11 (1.6)
Look to apex of tear	447 (66.6)
Look up to cervix	198 (29.5)
Other clinician assessed	12 (1.8)
Method of length and depth calculation*	
Visual estimation	604 (90.0)
With another clinician	155 (23.0)
Other	20 (3.0)

*Percentages add up to more than 100% as some selected more than one method

Table 13 describes the estimated length and depth of the last second degree tear. Vaginal length was less than 3cm for 65.4%. Most (69.7%) sutured tears were estimated over 2cm in vaginal length, while in contrast, most (61.7%) unsutured tears were less than 2cm. Perineal length was less than 3cm for 76.7%. Most (52.2%) sutured tears were estimated over 2cm in perineal length; conversely most (68.1%) unsutured tears were less than 2cm.

The depth of the tear was less than 3cm for 81.2% of tears. Nearly half the sutured tears were estimated both over and under 2cm in perineal depth, however most (72.3%) unsutured tears were less than 2cm. Around one in seven midwives (14.9%) were unable to estimate one (n=22), two (n=12), or all three (n=67) length and depth measurements.

There were significant differences in the estimated length and depth of the last second degree tear associated with the tear being sutured or left unsutured: vaginal length, χ^2 (2, N=574) =56.680, $p<.001$, V=.314; perineal length, χ^2 (2, N=585) =16.847, $p<.001$, V=.170;

perineal depth, χ^2 (2, $N=571$) =11.308, $p=.004$, $V=.141$. Longer and deeper tears were associated with repair.

Table 13: Estimated length and depth of last tear

	Sutured n=613 (%)	Unsutured n=47 (%)	Total N=660 (%)	<i>p</i>
Vaginal Length				
<2cm	107 (17.5)	29 (61.7)	136 (20.6)	<.001
2-3cm	289 (47.1)	7 (14.9)	296 (44.8)	
3-4cm	107 (17.5)	3 (6.4)	110 (16.7)	
>4cm	31 (5.1)	1 (2.1)	32 (4.9)	
Unable to estimate	79 (12.9)	7 (14.9)	86 (13.0)	
Perineal Length				
<2cm	222 (36.2)	32 (68.0)	254 (38.5)	<.001
2-3cm	243 (39.4)	9 (19.1)	252 (38.2)	
3-4cm	63 (10.3)	2 (4.3)	65 (9.8)	
>4cm	15 (2.5)	1 (2.1)	16 (2.5)	
Unable to estimate	70 (11.4)	3 (6.4)	73 (11.1)	
Perineal Depth				
<2cm	290 (47.3)	34 (72.3)	324 (49.1)	.004
2-3cm	206 (33.6)	6 (12.8)	212 (32.1)	
3-4cm	29 (4.7)	2 (4.3)	31 (4.7)	
>4cm	5 (0.8)	0 (0.0)	5 (0.8)	
Unable to estimate	83 (13.5)	5 (10.6)	88 (13.3)	
	Mean (SD)	Mean (SD)		
Vaginal length	1.84 (1.022)	1.19 (.851)		.001
Perineal length	1.56 (.910)	1.28 (.743)		.037
Perineal depth	1.53 (.645)	1.32 (.796)		.073

Tears '>4cms' and '3-4cm' were combined for inferential testing. Those 'unable to estimate' were excluded.

The midpoint of the length and depth measurements for each category was used to enable further analysis (<2cm=1.5cm, 2-3cm=2.5cm, 3-4cm=3.5cm, 4-5cm=4.5cm) as values were distributed evenly throughout the interval. Four tears were estimated over 5cm and were combined with the 4.5cm category. An independent group's *t*-test was used to test the effect of vaginal and perineal tear length and perineal depth on the last second degree tear being sutured or left unsutured. This revealed the vaginal and perineal length of sutured tears was significantly greater than those left unsutured for vaginal length ($t(658) = 4.261$, $p<.001$, $d=.669$) and perineal length ($t(658) = 2.090$, $p<.037$, $d=.337$). However, the perineal depth of sutured tears was not significantly greater than those left unsutured ($t(658) = 1.795$, $p<.073$, $d=.289$).

Table 14 describes assistance, position, and analgesia used for assessment and repair. Approximately three quarters of midwives did not require assistance to assess or repair the last second degree tear. However, assistance with assessment was provided by another clinician for 24.2% and this assistance was twice as likely to be from a midwifery colleague as a doctor. All of the assisting clinicians supervised, assisted, or took over the repair.

Table 14: Assistance, position, and analgesia used for last tear

	Assessment N=679 (%)	Repair N=660 (%)
Assistance*		
Midwifery colleague	114 (16.4)	113 (17.1)
Doctor	54 (7.8)	54 (8.2)
Assistance not available	6 (0.9)	0
No assistance required	521 (76.7)	493 (74.7)
Maternal position		
Semi-sitting or supine	271 (40.3)	107 (16.2)
Semi-sitting-bottom elevated	101 (15.0)	83 (12.6)
Lithotomy	286 (42.6)	416 (63.0)
Unsutured tears	n/a	47 (7.1)
Other	14 (2.1)	7 (1.1)
Not answered	7	7
Pain relief*		
Nil	112 (16.7)	11 (1.8)
Epidural	108 (16.1)	83 (13.7)
Lignocaine	272 (40.5)	528 (87.0)
Nitrous oxide	332 (49.4)	227 (37.4)
Unknown-repaired by other	0	4 (0.6)
Unsutured tear	n/a	47 (7.0)
Other	9 (1.3)	5 (0.8)
Not answered	7	7

*Percentages add up to more than 100% as some selected more than one type

Six midwives (0.9%) wished for assistance with assessment but found none available; one left the tear unsutured, two handed the tear over to a doctor to repair, and three independently repaired the tear. Eight (17.0%) of the 47 midwives who left tears unsutured had assistance with assessment from another midwife (n=7) or doctor (n=1).

Over half the women were semi-sitting or supine (55.3%); of these women, 15% had their bottoms elevated on towels or pillows to aid visualisation. Lithotomy position increased between assessment (42.6%) and repair (63.0%). Midwives who selected 'other' for

assessment described women in modified lithotomy (n=9), hands and knees (n=2), lateral (n=2), and squatting (n=1). All 0.9% who selected 'other' for repair reported a modified lithotomy position.

No pain relief during assessment was reported by nearly one fifth of midwives (17%), although this was uncommon (1.6%) during repair. A few (3.7%) women with an effective epidural during assessment required augmentation of analgesia for repair. Lignocaine use doubled between assessment (40.5%) and repair (78.6%). Of the midwives using lignocaine during repair, most (68.9%) administered 15mls or less of 1% lignocaine (85.4%), via injection (95.3%), and additive free (98.7%). A few (1.4%) midwives reported a lignocaine additive and this was adrenaline.

Nitrous oxide use halved between assessment (33.8%) and repair (15.6%). 'Other' pain relief was uncommon (1.5%) and confined to those who sutured the tear; warm compresses, icepack, oral medication, and Remifentanyl. The 47 midwives who left the tear unsutured used a combination of nitrous oxide (n=25), epidural (n=5), and lignocaine (n=1) during assessment, while 17 used no pain relief.

Table 15 describes the timing of repair of the last second degree tear. This was within 30 minutes of completion of the third stage for 68.4%, rising to 93.3% by 60 minutes.

Table 15: Time from third stage to repair of last tear

	Total N=613 (%)
<15 minutes	164 (26.8)
15-30 minutes	255 (41.6)
31-60 minutes	153 (25.0)
>60 minutes	36 (5.9)
Unable to recall	5 (0.8)

Rectal examination is depicted in Table 16. Although 58.8% of the midwives reported performing a routine rectal examination during assessment of perineal trauma 'all' or 'most' of the time, only 46.2% performed a rectal examination during assessment of the last tear. Furthermore, despite only 11 women declining a rectal examination during assessment of the last tear (eight of the sutured women and three of the unsutured women), midwives who left the last second tear unsutured were significantly less likely to perform a rectal examination during assessment of this tear (χ^2 (2, N=660) =25.763,

$p<.001$, $V=.198$). They were also significantly less likely to report that rectal examination was part of their routine procedure for perineal trauma assessment (χ^2 (3, $N=660$) =16.983, $p<.001$, $V=.160$).

Table 16: Rectal examination - routine and for last tear

	Sutured n=613 (%)	Unsutured n=47 (%)	Total N=660 (%)	p
Routine for perineal trauma				
All of the time	222 (36.2)	7 (14.9)	229 (34.7)	.001
Most of the time	150 (24.5)	9 (19.1)	159 (24.1)	
Some of the time	191 (31.2)	21 (44.7)	212 (32.1)	
Never	50 (8.2)	10 (21.3)	60 (9.1)	
During assessment of last tear	Sutured n=613 (%)	Unsutured n=47 (%)	Total N=660 (%)	p
Yes	300 (48.9)	5 (10.6)	305 (46.2)	<.001
No	313 (51.1)	42 (89.4)	355 (53.8)	
After repair of last tear	Sutured n=598 (%)			
Yes	529 (88.5)	n/a	-	
No	64 (10.7)	n/a	-	
Unknown-other repaired	4 (0.8)	n/a	-	

Meanwhile, the midwives who performed a rectal examination during assessment of the last tear evaluated more than one factor. Three quarters (75.7%) of midwives evaluated if there was extension to the anal margin, half (50.2%) checked for tearing inside the anus and over a third (39.0%) assessed whether the woman could squeeze her anus around their finger. Thickness of the perineum and anal sphincter was gauged by 27.5% and 27.9% respectively. A check for retraction of anal sphincter ends as the woman squeezed her sphincter (11.8%) and anterior anal puckering (12.1%) was less common. Most (88.5%) midwives who sutured the last tear performed a rectal examination after repair to check there was no suture material in the rectum, although eight women declined this examination.

Table 17 describes material and technique used for repair of the last second degree tear. Recommended suture material of Vicryl Rapide was selected for repair of the vaginal and muscle layer by 96.2% and for perineal skin layer by 91.6%. The skin layer was left unsutured by 2.5% of midwives after repair of the vaginal and muscle layer. Three midwives (0.5%) reported 'other material' and 'other technique' for the skin layer, stating that this was intact skin.

Material was changed between layers by 35 (5.9%) midwives. Twenty two midwives changed from Vicryl Rapide to either Vicryl 3/0 or 4/0, while 13 changed from other material (Vicryl 3/0 or 4/0, chromic catgut, Monocryl or Dexon) to Vicryl Rapide. Tissue adhesive was not reported as being used.

Table 17: Material and technique used for repair of last tear

	Vaginal/muscle layer N=598 (%)	Perineal skin N=598 (%)
Suture material		
Vicryl Rapide*	575 (96.2)	548 (91.6)
Vicryl other	12 (2.0)	24 (4.0)
Dexon	1 (0.2)	0
Monocryl	2 (0.3)	1 (0.2)
Chromic catgut	2 (0.3)	1 (0.2)
Skin layer left unsutured*	n/a	15 (2.5)
Unknown-repaired by other	6 (1.0)	6 (1.0)
Other material	0	3 (0.5)
Suture technique		
Interrupted	86 (14.4)	69 (11.5)
Continuous non-locked*	297 (49.7)	51 (8.5)
Continuous locked	185 (30.9)	0
Subcuticular interrupted	n/a	31 (5.2)
Subcuticular continuous*	n/a	410 (68.6)
Skin layer left unsutured*	n/a	26 (4.3)
Unknown-repaired by other	9 (1.2)	8 (1.3)
Other technique	21 (2.8)	3 (0.5)

*Recommended evidence-based suturing technique

A continuous non-locked evidence-based suturing technique was used to repair the vaginal and muscle layer by 49.7%. 'Other techniques' (2.8%) identified by free text for the vaginal and muscle layer, were a combination of interrupted and continuous. Evidence-based techniques used to repair the perineal skin (72.9%), included subcuticular continuous technique (68.6%) and skin layer left unsutured (4.3%). However, as the numbers using the correct technique changed between layers, the use of evidence-based suturing techniques throughout (including intact or unsutured perineal skin) was reported by only 251 midwives (42.0%).

Using evidence-based suturing techniques throughout the repair was associated with the last reported training in perineal management. Midwives reporting the most recent training, significantly more likely to use the correct technique for all layers (55.3% who

received training less than a year ago compared to 38.9% trained more than 10 years ago) ($\chi^2 (4, N=588) = 19.974, p=.001, V=.184$).

Documentation of a description of the last second degree tear was reported by most (86.7%) midwives (Table 18). Around half also recorded consent for treatment, discussion about care of the tear, and haemostasis. Over one third drew a diagram of the tear.

Table 18: Documentation of perineal management for last tear

	Sutured n=598 (%)	Unsutured n=47 (%)	Total N=645 (%)	p
Description of tear	516 (86.3)	43 (91.5)	559 (86.7)	.312
Consent	317 (53.0)	39 (83.0)	356 (55.2)	<.001
Discussion about care	318 (53.2)	37 (78.7)	355 (55.0)	.001
Haemostasis of tear	316 (52.8)	29 (61.7)	345 (53.5)	.241
Diagram of tear	204 (34.1)	17 (36.2)	221 (34.3)	.775
Rectal exam prior to repair	110 (18.4)	5 (10.6)	115 (17.8)	.181
Suture material	539 (90.1)	n/a	-	
Anaesthetic used	496 (82.9)	n/a	-	
Rectal examination post repair	410 (68.6)	n/a	-	
Suturing technique	337 (56.4)	n/a	-	
Count of swabs	238 (39.8)	n/a	-	
Count of needles	207 (34.6)	n/a	-	
Other clinician repaired	11 (1.8)	n/a	-	
Other	26 (4.3)	2 (4.3)	28 (4.3)	n/a

*Percentages add up to more than 100% as some selected more than one method

The majority of midwives who performed a repair documented suturing material (90.1%), anaesthetic (82.9%), rectal examination post-repair (68.6%), and suturing technique (56.4%). 'Other' documentation (4.3%) varied depending on the decision to suture or leave unsutured. For sutured tears this included level of pain, analgesia, and appearance of the tear after repair. For unsutured tears, one midwife reported providing information about healing and another commented that no information about the tear was documented.

There were significant differences in midwives' documentation associated with the last second degree tear being repaired or left unsutured. Midwives who left the tear unsutured were more likely to document consent ($\chi^2 (1, N=645) = 15.825, p<.001, V=.157$) than those who repaired the tear. They were also more likely to document that they had a discussion about care of the tear ($\chi^2 (1, N=645) = 11.492, p=.001, V=.133$).

Postpartum: analgesia and healing

Care to six weeks postpartum was provided by 377 midwives (50.7% of the sample); 84.6% self-employed and 15.4% employed. Table 19 describes postpartum perineal analgesia used by these midwives. Approximately one tenth (11.7%) did not provide medication or CALM therapies for perineal pain relief, although many other midwives provided more than one type of analgesia (n=982).

There were significant differences in the use of analgesia associated with the last second degree tear being sutured or left unsutured for pelvic floor exercises (χ^2 (1, $N=377$), $p=.032$, $\Phi=.114$) and heat therapy (χ^2 (1, $N=377$), $p=.003$, $\Phi=.182$). Pelvic floor exercises were more likely to be used for sutured tears while heat therapy was more likely to be used for unsutured tears. Rectal suppositories were exclusive to the sutured tears.

Table 19: Perineal analgesia for last tear

	Sutured n=348 (%)	Unsutured n=29 (%)	Total N=377 (%)	p
Nil	40 (11.5)	4 (13.8)	44 (11.7)	.762
Oral	269 (22.7)	18 (37.9)	287 (76.1)	.072
Pelvic floor exercises	158 (45.4)	7 (24.1)	165 (43.8)	.032
Cooling therapy	132 (37.9)	10 (34.5)	142 (37.7)	.843
Rectal medication	115 (33.0)	0	115 (30.5)	n/a
Homeopathic-herbal	110 (31.6)	10 (34.5)	120 (31.8)	.836
Salt additive in bath	34 (9.8)	6 (20.7)	40 (10.6)	.106
Heat therapy	23 (7.8)	8 (27.6)	35 (9.3)	.003
Oil treatment	10 (2.9)	3 (10.3)	13 (3.4)	.069
Ring/donut cushion	10 (2.9)	3 (10.3)	13 (3.4)	.069
Other therapy	8 (2.3)	0	8 (2.1)	n/a

Percentages add up to more than 100% as some selected more than one method

Table 20 lists the type and combinations of rectal and oral analgesic medication reported by the midwives. Of the 30.5% of midwives prescribing rectal medication, most (83.5%) reported a combination of paracetamol and diclofenac suppositories. Oral medication was prescribed by 76.1% and this was primarily paracetamol (97.6%) and NSAIDs (66.9%), often combined (48.5%). All 'other oral' medications (3.1%) were urinary alkalinisers.

Table 20: Rectal and oral analgesic medication for last tear

		Medication prescribed N(%)	No. midwives prescribing N(%)
Rectal medication*			
Type prescribed	Diclofenac**	111 (95.7)	115 (30.5)
	Paracetamol**	98 (84.5)	
Combinations of rectal medications	Paracetamol-Diclofenac	96 (83.5)	
	Diclofenac only	16 (13.9)	
	Paracetamol only	3 (2.6)	
Oral medication*			
Type prescribed	Paracetamol**	280 (97.6)	287 (76.1)
	Diclofenac**	124 (43.2)	
	Ibuprofen**	68 (23.7)	
	Panadeine	2 (0.7)	
	Codeine	1 (0.3)	
	Other oral	12 (4.2)	
Combinations of oral medications	Paracetamol-NSAID	172 (59.9)	
	Paracetamol only	96 (33.4)	
	Paracetamol-NSAID-Ural	8 (2.8)	
	NSAID only	4 (1.4)	
	Paracetamol and Ural	3 (1.0)	
	Panadeine-NSAID	2 (0.7)	
	Ural only	1 (0.3)	
	Paracetamol-NSAID-Codeine	1 (0.3)	

*Percentages add up to more than 100% as some selected more than one method

**Recommended evidence-based perineal analgesic medication

Table 21 describes CAM remedies used for perineal pain relief for the last tear with many midwives reporting the use of more than one type of CAM. Pelvic floor exercises were the most popular (43.8%). Cooling was the next most common remedy, with 172 cooling therapies used by over one third (37.7%) of midwives. Of the cooling therapies, 73.2% used tap water ice packs, described as frozen tap water soaked sanitary pads (n=61), crushed ice wrapped in cloth (n=8), or a frozen tap water filled glove finger (n=1). Gel cooling pads were reported by only 26 midwives. Herbal icepacks (n=11) were described as witch hazel (n=7), hypercal (n=3), and tea tree oil (n=1).

Nearly one third of midwives (31.8%) used herbal and homeopathic remedies. Of these 221 remedies, arnica (59.0%) and hypercal (solution and cream) (59%) were equally utilised by midwives. Hypericum (29.1%) and witch hazel (13.7%) were also common. 'Other herbal-homeopathic' remedies (2.6%) described were bathing in water infused with Chinese herbs or rosemary, and a sitz bath with mixed herbs. The free text

comments indicated that some midwives were confused between herbal and homeopathic remedies.

Table 21: CAM analgesia for last tear

		Total CAM analgesia N(%)	No. midwives reporting CAM N=377 (%)
Pelvic floor exercises	Pelvic floor exercises	165 (100)	165 (43.8)
Cooling therapy*	Tap water ice packs	104 (73.2)	142 (37.7)
	Gel pads	26 (18.3)	
	Cold bath	21 (14.8)	
	Herbal ice packs	11 (7.7)	
	Cold tap water poured	6 (4.2)	
	Cold ice other	4 (2.8)	
Homeopathic and herbal remedy*	Arnica	69 (59.0)	120 (31.8)
	Hypercal solution	43 (36.8)	
	Hypericum	34 (29.1)	
	Hypercal cream	26 (22.2)	
	Witch-hazel compress	16 (13.7)	
	Rescue remedy	9 (7.7)	
	Bellis perennis	4 (3.4)	
	Calendula	2 (1.7)	
	Chamomile	2 (1.7)	
	Calendula cream	1 (0.9)	
	Other herbal-homeopathic	3 (2.6)	
Salt additive in bath	Cold bath	21(52.5)	40 (10.6)
	Hot bath	19 (47.5)	
Heat therapy*	Warm bath	29 (93.5)	35 (9.3)
	Warm water poured	9 (29.0)	
	Warm shower	5 (16.1)	
	Sunshine	3 (9.7)	
	Warm hair dryer	2 (6.5)	
	Moist heat pack	1 (3.2)	
Oil treatment*	Tea tree oil	8 (61.5)	13 (3.4)
	Lavender oil	7 (57.8)	
Ring-donut cushion	Ring-donut cushion	13 (100)	13 (3.4)
Other therapy	Positioning	6 (66.6)	9 (2.3)
	Airing	2 (22.2)	
	Zinc ointment	1 (11.1)	

*Percentages add up to more than 100% as some selected more than one method

Of the total of 55 baths, nine were plain tap water and the rest had additives: oil (n=5), herbs (n=1), salt (n=40), salt combined with herbs (n=3), or salt combined with oil (n=1). Women adding salt to warm (n=19) or cold (n=21) baths was reported by 40 midwives (10.6%) and was significantly associated with midwives who had practised for five years

or less (χ^2 (4, N=377) =15.472, $p=.004$, $V=.203$). Furthermore, of the 40 midwives reporting baths in the heat or cold category, 28 described bathing in free text according to type of bath additive or under 'other' pain relief, and this required recoding. Forty nine heat therapies were reported by 35 midwives (9.3%). Of the 49, moist heat (baths, showers, warm water poured over perineum, and heat packs) was preferred by 80% and dry heat (sunshine and hairdryer) was less favoured at 20%.

Thirteen midwives (3.4%) used either tea tree or lavender oil and three used both. Oil was diluted as a wash solution or spray ($n=4$), bath additive ($n=2$), applied directly to perineal skin ($n=2$), and unspecified ($n=8$). A ring or donut cushion was described by 3.4%. 'Other therapy' reported by 9 midwives (2.3%) included positioning techniques, airing, and zinc cream. No midwives reported use of acupuncture or ultrasound.

Tables 22 and 23 describe the method of assessment of perineal healing of the last tear. Most (83.8%) midwives performed at least one visual check over the six week period. In addition, 94.4% asked the woman about her perineal healing.

Table 22: Method of assessment of last tear

Method of assessment	Sutured n=348	Unsutured n=29	Total N=377	<i>p</i>
Midwife looked	295 (84.8)	21 (72.4)	316 (83.8)	.110
Midwife asked woman	328 (94.3)	28 (96.6)	356 (94.4)	1.00
Support person looked	21 (6.0)	5 (17.2)	26 (6.9)	.039
Woman looked	170 (48.9)	15 (51.7)	185 (49.1)	.848
Another clinician looked	14 (4.0)	0	14 (3.7)	n/a
REEDA score	1 (0.3)	0	1 (0.3)	n/a

*Percentages add up to more than 100% as some selected more than one method

The midwives reported the woman looked at her own perineum 49.1% of the time, as did 6.9% of support people. Free text comments included advice to women try intercourse ($n=2$), bowel/bladder queries ($n=2$), postponement of midwifery visual check until discharge visit ($n=1$), and advice to the woman to perform a self-check ($n=1$). One midwife reported using the REEDA score. Visualisation by a support person was significantly associated with the tear being left unsutured (χ^2 (1, N=377), $p=.039$, $\Phi=.033$).

Nineteen women did not have their perineal tear visually checked at all, although midwives reported that all 19 women were asked about their tear. Midwives were the only people to look at the perineum for around half (46.4%) the women, although nearly

one tenth (9.8%) of women were the only ones to look at their perineum and three (0.8%) support people were the sole viewers. One third (33.7%) of tears were visually checked by both the midwife and woman.

Table 23: Combinations of visual assessment of healing of last tear

Combination of assessment methods	N=358
Midwife looked only	156 (46.4)
Both midwife and woman looked	127 (33.7)
Woman looked only	36 (9.8)
Midwife, support person, and woman looked	18 (4.8)
Both midwife and other clinician looked	11 (2.9)
Both midwife and support person looked	3 (0.8)
Support person looked only	3 (0.8)
Other clinician looked only	2 (0.5)
Both woman and support person looked	1 (0.3)
Midwife, support person, woman, other clinician looked	1 (0.3)

Table 24 illustrates the frequency of midwives' visual assessments in the postnatal period. Of the 316 (83.8%) of midwives who performed visual assessments of perineal healing, the majority (73.4%) assessed the woman's perineum between two to four times in six weeks. The same percentage (13.3%) of midwives looked once and more than five times.

Table 24: Frequency of midwives' visual assessment of healing of last tear

Frequency of visual assessment	Sutured n=295	Unsutured n=21	Total n=316	<i>p</i>
1	36 (12.2)	6 (28.6)	42 (13.3)	
2	98 (33.2)	7 (33.3)	105 (33.2)	
3-4	119 (40.3)	8 (38.1)	127 (40.2)	
5-6	32 (10.8)	0	32 (10.1)	
≥7	10 (3.4)	0	10 (3.2)	
Mean (SD)	2.600 (.952)	2.095 (.830)		.014

The independent group's *t*-test tested the effect of frequency of postnatal visual assessment on the last second degree tear being sutured or left unsutured. This found the frequency of midwives' visual assessments for sutured tears was significantly greater than for unsutured tears ($t(23.903)=2.662$, $p=.014$, $d=.565$).

Table 25 describes complications with healing of the last second degree tear to six weeks postpartum. Twenty one midwives recorded 29 complications. These included delay in healing (2.7%), pain greater than expected (2.1%), infection (1.9%), and 'other'

complication (1.1%). 'Other' complications were suture removal (n=3) and prolapse (n=1).

Table 25: Perineal morbidity

	Sutured n=348	Unsutured n=29	Total n=377
Complications type			
Nil complications	330 (94.8)	26 (89.7)	356 (94.4)
Delay in healing	7 (2.0)	3 (10.3)	10 (2.7)
Pain greater than expected	8 (2.3)	0	8 (2.1)
Perineal infection	6 (1.7)	1 (3.4)	7 (1.9)
Other complication	4 (1.1)	0	4 (1.1)
Complications action			
Nil required	4 (1.1)	1 (3.4)	5 (1.3)
Prescribed antibiotic	8 (2.3)	2 (6.9)	10 (2.7)
Referred obstetrician	4 (1.1)	0	4 (1.1)
Other action	4 (1.1)	0	4 (1.1)
Prescribed pain relief	3 (0.9)	0	3 (0.8)
Referred GP or physio	2 (0.6)	0	2 (0.6)

No midwives reported incontinence and there were no marked differences in the proportion of complications reported for sutured and unsutured tears, although the type of complications differed. Delay in healing and infection were more likely when the tear was left unsutured, however, pain greater than expected was exclusive to sutured tears.

No action was required to resolve these complications by 1.3% of midwives. Free text described the tear healing by secondary intention (n=1), woman declining action (n=1), haemorrhoid treatment (n=1), and unanswered (n=2). However, action was taken by 16 midwives, and four midwives took more than one action; including prescribing an antibiotic (2.7%), pain medication (0.8%), referral (obstetrician, general practitioner, or physiotherapist) (1.7%), or 'other' action (1.1%).

Antibiotics prescribed were Amoxycillin, Augmentin, Penicillin, and Flucloxacillin. Analgesics prescribed were NSAIDs and Paracetamol. 'Other' actions included removal of sutures (n=1) application of hypercal lotion (n=1), and documentation of a woman declining referral (n=1).

Summary

This chapter has described the results of the survey. There were 744 eligible respondents who made up quarter of the practising New Zealand midwifery population. Respondents were similar to the MCNZ workforce in years of midwifery practice, countries of first midwifery qualification, and ethnicities, although the sample was more likely to report being self-employed and being an LMC.

The results highlighted factors that were associated with increased confidence with repair including length of time since midwifery qualification, self-employment, and recently performing a perineal repair. When asked about the previous six months, midwives reporting considerable confidence in perineal repair were more likely to have performed a perineal repair within that time than midwives with low confidence.

Being an employed midwife was associated with decreased likelihood of treating a perineal tear, with a decreased likelihood of suturing a tear and leaving a tear unsutured. Conversely, working as a self-employed midwife or LMC increased the likelihood of treating a perineal tear, with an increased likelihood of both suturing and leaving a tear unsutured. Access to a guideline on perineal management was not typical, despite over half the midwives receiving perineal education within the last two years.

Assessment of the last second degree perineal tear followed best practice for the majority of midwives, although only four in 10 used the recommended suturing technique for all layers of the repair. Rectal examinations to exclude OASIS during assessment of the last tear were performed by nearly half the midwives. These last second degree tears were left unsutured by 7% of respondents, which was associated with lack of confidence with repair, and decreased likelihood of suturing a tear within the previous six months. Unsutured tears were estimated to be shorter and shallower than those sutured.

Care to six weeks postpartum was provided by half of the sample. Combinations of rectal and oral medications were prescribed for perineal pain, in addition to CAM therapies. The most common CAM therapies reported were pelvic floor exercises, perineal cooling, homeopathy and herbs. Midwives who repaired the tear were significantly more likely to report the use of rectal suppositories and pelvic floor exercises for perineal pain, while heat therapy was preferred by those who left the tear unsutured.

Postpartum visual perineal assessment was performed by most midwives. The majority assessed the woman's perineum two or more times and almost all midwives inquired about perineal healing. Half the midwives also reported the woman looked at her own perineal healing in the postpartum period. Having support people visually checking the woman's perineum was associated with a tear being left unsutured. Complications in perineal healing were uncommon.

Chapter Five: Discussion

Introduction

This chapter discusses the findings and provides a conclusion to the thesis which reports on a study designed to describe New Zealand midwives management of perineal trauma during childbirth over a six week period in 2013. Objectives were to provide knowledge about current midwifery perineal practice and evaluate this in relation to evidence-based guidelines. In addition, the aim was to analyse this information for associations between the practice of employed and self-employed midwives and between sutured and unsutured second degree tears.

This chapter is in three sections. Section One reviews the main findings. Section Two critically appraises the research methods used in this study; both the strengths and limitations. Section Three provides directions for research and policy, and outlines practice implications. The findings will provide a reference point for future midwifery education, research, and policy on perineal repair.

This research is the first specific study in New Zealand to comprehensively examine a wide range of data relating to midwives management of second degree tears in practice. The findings can be used to evaluate and inform midwifery perineal management and to benchmark New Zealand practice with similar countries (in particular the UK). They also add to the knowledge that supports the framework of New Zealand midwifery practice.

Section One: Overall perineal practice

Confidence with assessment and repair

Most midwives (91.9%) reported confidence in perineal assessment 'most' or 'all' of the time. This confidence was reassuring in view of the morbidity that may result from sub-optimal assessment and missed diagnosis of OASIS (Benifla et al., 2000; Lal et al., 2003). These New Zealand figures match the 90% of UK midwives who reported a similar level of confidence in perineal assessment (Bick et al., 2012).

Confidence in perineal repair 'most' or 'all' of the time was reported by 81.0% of midwives in this research. This was considerably better than the survey by Dahlen and

Homer (2008) describing only half the 111 Australian midwives who responded being confident with perineal repair. It was also slightly more than the UK survey (Bick et al., 2012) where 75.7% of midwives were confident 'all' or 'most' of the time with repair. The lower than expected figure in the UK led Bick et al. to suggest a direct relationship between the 30.9% of midwives stating they had not performed any perineal repairs within the previous six months and the 25% reporting low confidence with repair. Certainly, only around half the New Zealand midwives who reported lacking confidence with perineal repair had sutured a perineum in the last six months. The link between confidence and recent experience is supported by Wilson (2011) who found that frequency and opportunity to participate in perineal repair significantly contributed to UK midwives' confidence.

Self-employed LMC midwives in this current research were significantly more likely to be confident in assessment and repair than employed midwives who were not LMCs ($p < .001$). This was also found by Gray (2010), who reported self-employed LMC midwives were the most confident with repair. While reasons for the reduced confidence of employed midwives who are not LMCs remains conjecture, Gray found that employed midwives described more barriers for perineal repair than self-employed midwives. Moreover, self-employed LMC midwives have more opportunity for perineal treatment as they provide continuity of care for 91.6% of New Zealand birthing women booked with an LMC in 2010, in marked contrast to employed core midwives who share responsibility with doctors for only 14.3% of women (MOH, 2012d).

The link between confidence and experience is supported by UK research (Wilson, 2011). Indeed, New Zealand midwives qualified for longer than 20 years ($p < .001$) were the most confident with repair, with similar findings of midwives confidence in perineal repair increasing with years of experience were reported in Australia and the UK (Bick et al., 2012; Dahlen & Homer, 2008). It also corresponded with the findings of Gray (2010), who concluded that years of practice since qualification were directly related to confidence in perineal decisions, with the longest qualified midwives reporting the most confidence.

The decision to suture or leave the last second degree tear unsutured in this research was associated with confidence with repair ($p < .001$), with 83.8% of midwives who sutured the tear reporting confidence with perineal repair 'all' or 'most' of the time in contrast to 51%

who left the tear unsutured. These figures align neatly with Gray (2010), reporting that midwives' confidence with perineal repair influenced three quarters of midwives to suture a perineal tear but only half of those who left the tear unsutured. Thus the findings from both Gray's research and this research, imply that some midwives who choose not to suture a second degree tear make this decision due to lack of confidence with perineal repair. It is also in keeping with UK studies that suggest midwives may deliberately avoid perineal repair and see self-healing as an equal option if they lack confidence in perineal suturing skills (Fleming et al., 2003; Salmon, 1999).

Birth in a tertiary setting was associated with less confidence in assessing a perineal tear compared to midwives who birthed babies at home, in a primary setting, or a secondary setting, ($p=.010$). Home birthing midwives were the least likely to report being sometimes and never confident. It is possible that this higher level of confidence with perineal assessment at home births reassured midwives that tears would heal well without suturing and contributed to the finding of unsutured tears being more likely after a home birth. The lowest confidence in assessment reported by midwives in tertiary facilities may reflect an undermining effect of a technological environment and medical intervention on midwives' beliefs in their abilities. However, birth setting in this survey, and in the survey by Bick et al. (2012), was not significant in regard to midwives' confidence with perineal repair.

Guidelines, competency, and training in perineal management

Perineal management is a requirement for qualified midwives (NZCOM, 2008). However, only 35.6% of employed midwives in this research reported that they were given access to a guideline or protocol on perineal management by their employer. In contrast, Bick et al. (2012) reported over twice as many UK midwives (82.8%) had access to a perineal management guideline. The origin of the guidelines in both the UK (Bick et al.) and this research was likely to be the maternity facility, suggesting that local guidelines attempt to fill the space left by the absence of national guidelines.

Knowledge gaps in perineal care left UK midwives relying on their own judgements and those of their colleagues (Spendlove, 2005). Thus, it is possible that the 64.4% of employed midwives in this New Zealand research who lacked access to perineal management guidelines may have relied on their own or on another's opinions. It is also

likely that some midwives obtained overseas guidelines, as 45% of midwives in Gray's (2010) survey indicated that professional guidelines had a considerable influence on their decision to perform a perineal repair despite none being produced in New Zealand, indicating that development of New Zealand guidelines in perineal management may be welcomed.

Competency has never been formally evaluated in relation to perineal assessment for 57.7% of midwives in this research and in repair for 56.8%. These figures are lower than the survey by Bick et al. (2012), who found 54.1% of UK midwives, reported never having received formal appraisal of competency in perineal assessment 45.9% in repair. The low level of evaluation in New Zealand is surprising, as midwives are required to have competence in basic midwifery skills to retain an annual practising certificate (MCNZ, 2005). Furthermore, it raises concerns that nearly 40% of New Zealand midwives have never had a formal evaluation of their perineal management, as outcomes of perineal repair are optimised when performed by midwives who are competent in the procedure (Andrews et al., 2006; Robinson & Beattie, 2002; Tohill & Metcalfe, 2005; Toohey, 2003).

Timing of the last training in perineal management for midwives in the sample was within the last two years for 53.5%, which is comparable to UK midwives (Bick et al., 2012). Self-employed midwives, who have had to seek out and self-fund perineal management education, have similar percentages obtaining education in the previous two years as employed midwives. This commitment to voluntary perineal education by self-employed midwives indicates that skills in perineal management are valued by them.

Section Two: Management of last second degree tear treated by midwife

Assessment and repair

NICE (2007) standards for method of assessment of perineal trauma were met by the majority of midwives in this research, with 96.1% reporting they looked to the apex of the last second degree tear they treated. Most (91.5%) used visual estimation to assess the size of the tear and this is consistent with UK studies (Metcalfe et al., 2002; Steen & Cooper, 1997). Congruent with previous New Zealand research, only one midwife used a measuring tool (Gray, 2010).

A few midwives (1.8%) who selected 'other' method of assessment, commented that they used touch and feel during their assessment. This was almost certainly underreported, as touch had not been provided as an answer option. Tactile assessment is more commonly seen with midwives' estimation of cervical dilatation by digital touch during vaginal examination, although it was considered that physical touch during the process of perineal repair enhanced accuracy with assessment of the length and depth of the trauma (Langley et al., 2006; Metcalfe et al., 2002). It is known that accuracy in the assessment of second degree perineal trauma may reduce morbidity of a missed third degree tear (Benifla et al., 2000; Lal et al., 2003) or delayed healing from an unexpectedly deep tear (Fleming et al., 2003).

Over half the midwives reported that women were in a semi-sitting/supine position (55.3%) during assessment. However, two thirds of midwives placed women in lithotomy for repair, increasing from 42.6% in lithotomy during assessment to 67.7% for repair. Aiding visualisation of the perineal trauma by changing the women's position between assessment and repair is consistent with NICE (2007) guidelines.

Around three quarters of midwives in this research assessed, repaired, and supervised repair of the last second degree tear independently which was a similar percentage to that reported in a UK audit (Odibo, 1997). Assistance with assessment and repair was reported by the other one quarter of midwives and this is consistent with the requirements of the New Zealand maternity referral guidelines (MOH, 2012a) to refer when the care is considered to be outside midwives' scope of practice. Collegial support appeared important with twice as many midwives reporting assistance with assessment from other midwives rather than from doctors.

The majority of second degree tears were estimated to be less than 3cm in vaginal length (65.4%), perineal length (76.7%) and perineal depth (81.2%). Midwives who were unable to estimate the length or depth of the tear were significantly more likely to have assistance with assessment ($p<.001$) and repair ($p<.001$) showing midwives' awareness of the importance of optimal assessment. The finding that a few midwives ($n=44$) reported assistance was not available was unexpected in New Zealand (HDC, 2007) as midwives are expected to have access to either a midwifery or medical colleague or a hospital team if assistance is required.

Pain relief

Recommendations for pain relief during perineal assessment are usually embedded with perineal repair, although NICE (2007) guidelines specifically suggest inhalational analgesia. Half of the midwives in this research followed NICE recommendations and used nitrous oxide during assessment of the last second degree tear. Nearly one fifth of women did not receive pain relief during assessment, possibly because perineal sensation is said to diminish immediately after birth (Dahlen, 2010), however no pain relief during repair was rare (1.6%). Lignocaine was common both for assessment (40.5%) and repair (78.6%) and this was similar to UK midwifery practice (Sanders et al., 2005). Lignocaine was sometimes combined with epidural pain relief and nitrous oxide which correlates with NICE (2007) guidelines.

Nearly 70% of midwives who used lignocaine for analgesia during perineal repair administered 15mls or less of the 1% solution. This is less than the dose recommended by overseas guidelines (NICE, 2007; Royal Women's Hospital, 2012) and may be a result of women having a trusting relationship with their midwives, high pain thresholds of New Zealand women, or lack of midwifery knowledge. Administration of lignocaine by squirting or swabbing was uncommon (1.4%) but comparable to a 2001 UK survey (Sanders et al., 2005). Only six midwives used lignocaine additives, and all six reported adrenaline. This was despite adrenaline traditionally not being considered appropriate for midwifery use (Sanders et al., 2002) and notwithstanding the known benefits of adrenaline during perineal repair (Colacioppo & Riesco, 2009).

Timing, material, and technique for repair

The finding that the majority of midwives (68.4%) undertook repair of the last second degree tear they treated within 30 minutes of the completion of the third stage, is encouraging. Early repair is considered to reduce the risk of infection, minimise bleeding, and decrease women's anxiety; resulting in overseas guidelines advising against delay in repair (NICE, 2007; RCM, 2012b). The proportion of timely repairs was larger than the 1997 UK audit where just under half of 884 women had their perineal repair within 30 minutes of birth (Odibo, 1997). The early timing may be because New Zealand women, like UK women (Green et al., 1998; Ho, 1985), do not wish to wait for repair, combined

with New Zealand midwives being more readily available to perform repair due to continuity of care.

Evidence-based suture material, Vicryl Rapide (Kettle et al., 2010), for repair of the last second degree tear, was chosen by 96.2% of midwives in this research. This was higher than the 85.7% of UK midwives choosing Vicryl Rapide in the survey by Bick et al. (2012), although similar to the UK midwives who had recently received specialised education in perineal repair for the PEARLS study (Ismail et al., 2013). Some respondents reported in free text that this was the preferred material at their local maternity units.

Evidence-based continuous non-locked suture technique (Kettle et al., 2007) was selected to repair the vaginal and muscle layer of the last second degree tear by half the midwives in this research. This figure increased to 72.9% using evidence-based subcuticular continuous technique for the skin layer (Kettle et al., 2007) or followed recommendations to leave well aligned perineal skin unsutured (Gordon et al., 1998; Obaro et al., 2003). Less encouraging was the finding that only 42% of New Zealand midwives used evidence-based suturing technique throughout the entire perineal repair, as this has been found to be cost effective (Kindberg et al. 2008; Petrou et al., 2001) and reduce perineal morbidity (Ismail et al., 2013). Although this was a positive result compared to only 6% of UK midwives (Bick et al., 2012). However, not all practice was as low as Bick et al. found, as a recent study reported recommended suturing technique was used throughout perineal repair in 36-73% of UK midwifery units, with the higher figure in areas where midwives had recently received specialised perineal education (Ismail et al., 2013). This finding aligns with this research, with the New Zealand midwives who had received the most recent perineal management training being significantly more likely to report using the correct suturing technique ($p=.001$) throughout the repair of the last second degree tear.

Rectal examination

Routine rectal examination during assessment of perineal trauma 'all' of the time was reported by only 35.4% of midwives. Despite this finding, when recalling the last second degree tear, rectal examinations during assessment of this tear were performed by 46.2%, indicating that nearly half the midwives perform a rectal examination when faced with the reality of perineal trauma. This figure is similar to the 42.4% of midwives reporting routine rectal examination in the survey by Bick et al. (2012). These New

Zealand figures are higher than expected because, in contrast to the UK (NICE, 2007; RCM, 2012b), there is no national recommendation advising routine rectal examination during assessment of second degree perineal trauma (HDC, 2005). Consequently, it adds weight to Gray's (2010) findings that evidence-based research is influential for the majority of New Zealand midwives in their decisions about perineal management, as midwives appear to be following UK evidence-based guidelines.

It was also positive that most midwives (95.7%) were aware that the anal sphincter was not involved in a second degree tear and correctly identified important factors evaluated during rectal examination. However, 21 midwives erroneously indicated anal sphincter involvement and this misunderstanding has also been seen overseas (Metcalf et al., 2002). Although this is a small percentage of midwives, it has clinical implications, because if these midwives misdiagnose OASIS as a second degree tear, this may result in faecal incontinence for the women (Benifla et al., 2000; Lal et al., 2003).

Midwives who did not suture the last second degree tear they treated were less likely to perform a rectal examination during assessment of this tear than midwives who sutured ($p<.001$). It may be because the unsutured tears were relatively short ($p<.001$) and more shallow ($p=.004$) compared to the sutured tears. However, it did not explain why only 34% of these midwives who chose not to suture reported that they would perform a routine rectal assessment for any perineal trauma 'all' or 'most' of the time, in contrast to 60% of midwives who repaired the last second degree tear ($p<.001$). It is possible that midwives who did not suture had increased awareness of lack of a national recommendation to perform routine rectal examination during perineal assessment, so saw this procedure as an unnecessary intervention, however this is conjecture.

After repair, most midwives (88.5%) indicated they followed recommended best practice (NICE, 2007) by performing a rectal examination to check that no suture material had penetrated the woman's rectum. This is similar to the 85.6% of UK midwives who routinely perform a rectal assessment after perineal repair (Bick et al., 2012).

Documentation

Most (84.7%) midwifery respondents documented general information about the last second degree tear. Furthermore, suturing material and technique, anaesthetics, and

rectal examination post-repair, were recorded by the majority of midwives who repaired the tear. These findings are in contrast to a perineal care UK prospective cohort study (Metcalf et al., 2006) where midwives often omitted to record suture material and repair technique. Nevertheless only around half the midwives documented consent for suturing or non-suturing, discussion about care of the tear, and haemostasis.

A diagram of the tear was reported by only a third of midwives. It was also surprising that less than one fifth recorded a rectal examination during assessment, considering that 46.2% had performed this examination. This missing documentation may be related to the labour and birth proforma in half of New Zealand birth records (NZCOM, 2012) limiting information on perineal management to just three questions; the degree of trauma, sutured or non-sutured, and who repaired. Therefore midwives are required to record all other perineal treatment details in free text in clinical notes; however this is in the absence of guidelines on best practice for documentation of perineal management.

Lack of records in regard to unsutured perineal trauma was a phenomenon reported in a UK study (1999). A UK RCT also identified a lack of documentation about the decision making when tears were left unsutured (Fleming et al., 2003). This was not so in this research, as midwives who left the last second degree tear unsutured were more likely to document consent and discussion about care of the tear than those who repaired ($p<.001$). This suggests that New Zealand midwives provided information and sought consent from women who had their second degree tear left unsutured.

Sutured and unsutured tears

New Zealand midwives reported that 92.9% of the last second degree tears they treated in the last six months were sutured and 7.1% left unsutured. These percentages are similar to the proportion of the total number of second degree tears the midwives estimated that they had sutured over the last six months ($n=3965$, 89.4%) compared to the total number of tears they estimated they had left unsutured ($n=470$, 10.6%). The similarity in figures indicates that the midwives accurately recalled their management of second degree tears over this six month period. This low percentage of unsutured tears is likely to be viewed optimistically due to difficulty in reaching consensus about the wisdom of leaving second degree tears unsutured in New Zealand (Finn, 2008) and paucity of

international evidence about long-term outcomes for these unsutured tears (Elharmeel et al., 2011).

The 7.1% of midwives reporting the last second degree tear they treated was left unsutured correlates with the 10.6% of tears left unsutured by midwives in the previous six months. Yet, 40.2% had indicated that they currently left some second degree tears to heal without suturing. The same disparity was seen in the UK where 58% of UK midwives surveyed by Bick et al. (2012) reported that they currently leave some second degree tears to heal without suturing, despite only 5.4% of second degree tears not sutured in a recent survey of 81% of UK maternity units (Thiagamoorthy et al., 2014). It may be that midwives feel non-suturing is an option that they are expected to offer - thus the high percentage reporting this as part of their practice - despite this being a rare component of their day to day perineal management.

This research found self-employment ($p<.001$) and LMC midwifery ($p<.001$) were associated with the increased likelihood of a midwife treating a second degree tear (suturing or leaving it unsutured) in the previous six months. However, neither employment status nor LMC midwifery was significant in regard to whether the midwives sutured the last second degree tear they treated. This differs from the survey by Dahlen and Homer (2008) where Australian midwives felt the most important reason for undertaking perineal repair was to provide continuity of care, but it is consistent with Gray (2010) finding that continuity of carer had minimal influence on the decision to suture or not suture for 57% of New Zealand midwives.

Nearly one fifth (19.4%) of 692 midwives had not repaired any second degree tears in the previous six months. This figure compares favourably with Bick et al.'s (2012) survey where 30.9% of UK midwives had not performed any repairs within the same time frame. This greater number of New Zealand midwives reporting recent experience with perineal repair is likely due to working within a continuity of care model, in comparison to the UK, where fragmented care is the norm, reducing opportunity for some UK midwives to perform perineal repair (Bick et al., 2012).

A UK study suggested that a circle of feedback and reflection between women and midwives was shown to impact on midwives' decisions to repair perineal tears or leave them unsutured (Clement & Reed, 1998). This feedback from women may also affect

midwives' perineal practice in New Zealand, as in addition to direct visual and verbal feedback from women during postnatal assessments, the MCNZ has a compulsory biannual quality assurance process for midwives: the Midwifery Standards Review (MSR) (NZCOM, 2007). The MSR process includes formal evaluation and reflection on the midwives' practice statistics, written feedback from women, and a professional portfolio demonstrating understanding of practice covering topics such as perineal trauma.

Significant differences were found between the sutured and unsutured second degree tears in regard to the estimated perineal length ($p<.001$), vaginal length ($p<.001$) and perineal depth ($p=.004$) with increasing measurement for all three factors related to increasing likelihood of repair. This finding aligns with two UK studies which tested a perineal trauma measuring tool (Langley et al., 2006; Metcalfe et al., 2002). Differences in length and depth between sutured and unsutured tears in this research remained significant when evaluating the mean vaginal length ($p<.001$) and perineal length ($p=.037$), although not depth ($p=.073$). This is consistent with Gray (2010) reporting length had significant influence on 72% of New Zealand midwives in regard to suturing in contrast to 84% in regard to non-suturing. Gray similarly found depth of a tear assumed equal importance in midwives' decisions to suture (92%) or not to suture (95%). Furthermore another UK study also reported unsutured tears were shorter in length but not depth compared to sutured tears, although only 23% of the tears in the UK study were measured and the rest, like this research, were estimated (Metcalfe et al., 2006).

Measurements for the depth of unsutured tears in both this research and the study by Metcalfe et al. (2006) may have been underestimated because perception of measurement of perineal trauma appears enhanced during repair (Langley et al., 2006; Metcalfe et al., 2002). Bearing that in mind, it was reassuring that New Zealand midwives estimated the size of the unsutured tears as smaller in comparison to two UK studies (Langley et al., 2006; Metcalfe et al., 2002), in which midwives measured considerably larger unsutured second degree tears. The practice of New Zealand midwives therefore aligns with the caution advocated by Elharmeel et al. (2011) regarding leaving perineal tears unsutured.

New Zealand midwives who did not suture the last second degree tear they treated were also less likely to have performed a perineal repair in the previous six months ($p<.001$).

This lack of recent experience with repair may explain why the midwives who left tears unsutured reported less confidence with performing perineal repair ($p<0.001$) and why they were more likely to have left one or more second degree tears unsutured in the last six months ($p<.001$). The findings align with UK studies suggesting that midwives who leave tears unsutured may lack confidence and competence in suturing skills, causing these midwives to bias women towards non-suturing (Clement & Reed, 1998; Fleming et al., 2003; Spendlove, 2005).

Midwives who attended a birth at home were significantly more likely to leave a second degree tear unsutured than midwives attending a birth in a maternity facility ($p=.002$). The association with leaving a tear unsutured increased with the complexity level of medical intervention in the maternity unit, being twice as likely when attending a birth in primary unit, three times more likely in a secondary unit and four times more likely in a tertiary unit. This finding aligns with two UK studies showing the same graduated effect with birth setting (Smith et al., 2013; Thiagamoorthy et al., 2014) and also aligns with Miller's (2008) New Zealand study showing unsutured tears to be more common after home birth in comparison to hospital birth. However, it differs from Gray's (2010) conclusion that birth setting did not impact on the decision to suture or not suture for most New Zealand midwives. Overseas research demonstrates that workplace expectations and access to doctors influences the treatment of a second degree tear (Bick et al., 2012; Spendlove, 2005). Thus midwives' decisions about the most appropriate care of a tear may not change as a result of birth place, but if midwives feel that their management is under scrutiny in a medicalised environment they may alter their practice to fit the culture. It may also be related to maternity facility generated documents biasing New Zealand employed midwives toward suturing of second degree tears (Gray, 2010).

Postpartum: analgesia and healing

Analgesia

The reported use of postpartum perineal pain relief for women with the last second degree tear was 88.3% of the 377 midwives providing care in the six weeks after birth. This is explained by many studies, which have shown that most women feel perineal pain after vaginal birth (Albers et al., 1999; Andrews et al., 2008; Brown & Lumley, 1998;

Glazener et al., 1995; Klein et al., 1994; MacArthur & MacArthur, 2004; Sleep, 1991; Sleep et al., 1984) and that some women may decline treatment (Chou et al., 2010). Similarly, most midwives used more than one type of pain relief in this research, a practice that has also been described in Australia and the UK (East, Sherburn, et al., 2012; Sleep & Grant, 1988b).

There were no significant differences in midwives reporting that use of analgesia was associated with the tear being sutured or left unsutured in this research, consistent with overseas studies showing no difference in pain scores between these groups (Fleming et al., 2003; Langley et al., 2006; Leeman et al., 2007; Lundquist et al., 2000; Metcalfe et al., 2006). However, despite no difference in pain scores, the use of oral analgesia was associated with sutured tears in overseas studies (Langley et al., 2006; Leeman et al., 2007; Lundquist et al., 2000) but not in this research. This may be due to rectal analgesic suppositories reported solely by midwives who sutured, as NSAID suppositories after perineal repair is known to reduce the need for additional analgesia up to 24 hours after birth (Achariyapota & Titapant, 2008; Dodd et al., 2004; Hedayati et al., 2003; Yildizhan et al., 2009).

Rectal and oral medication

Prescribing rectal analgesia was reported by 30.5% midwives. This corresponds with the knowledge that NSAID rectal suppositories offer more effective local pain relief with faster onset (Hedayati et al., 2003). However, a greater uptake could have been expected, given that 88.5% of midwives performed a rectal examination after suturing and an Australian study (Dodd et al., 2004) found women reported a high level of satisfaction with diclofenac suppositories following repair. Of the midwives prescribing rectal analgesia, 97.4% reported NSAID (diclofenac) suppositories consistent with the evidence (Achariyapota & Titapant, 2008; Dodd et al., 2004; Hedayati et al., 2003; Yildizhan et al., 2009) and 83.5% combined these with paracetamol suppositories.

Oral medication was the most popular analgesia (76.1%) reported as being used. This indicates that New Zealand practice is in agreement with that of other countries where oral medication is the predominant form of pain relief after birth (East, Sherburn, et al., 2012; Ghosh et al., 2004; Leeman et al., 2009; 2005). Of those midwives using oral medications, Paracetamol was preferred by most (97.6%); consistent with Cochrane

recommendations that paracetamol should be the first choice of oral medication for perineal pain due to analgesic benefits and limited side-effects (Chou et al., 2010). NSAIDs were the second most common oral medication reported by midwives and may be effective for perineal pain when taken alone (Facchinetti et al., 2005), although this was rare (1.1%). Most midwives in this research appropriately augmented oral and rectal paracetamol with NSAID (63.0% and 83.5% respectively), which is common for postpartum perineal analgesia (East, Sherburn, et al., 2012; Hyllested et al., 2002; Sachs, 2005; Sleep & Grant, 1988b) and maximises the analgesic effect (Ong et al., 2010).

Codeine is not recommended for perineal pain due to side-effects (Steen, 2005) and possible harm to a breastfed baby (Koren et al., 2006), so it was encouraging that it was reported by only one of 377 midwives, although two used Panadeine (paracetamol/codeine mix). This is considerably fewer than 3.7% reporting codeine in an Australian hospital in 2009 (East, Sherburn, et al., 2012). The appropriately low use of oral opioids may be due to oral opioids being rarely required for second degree tears (Sachs, 2005) and outside New Zealand midwives' scope of prescribing for uncomplicated childbirth (NZCOM, 2009a).

The use of a urinary alkaliniser was described in free text under 'other oral' pain relief by 12 midwives (10 sutured and 2 unsutured), although it was likely under-reported as it was not provided as an answer option. Reasons given were "for stinging on passing urine," and "to ease micturition" which are similar to descriptions used by women in regard to unsutured second degree tears in a Swedish RCT (Lundquist et al., 2000). The text descriptions provided by midwives suggest that urinary discomfort is a postpartum issue common to women with sutured and unsutured second degree tears.

Pelvic floor exercises

Pelvic floor exercises were the most common CAM therapy reported by midwives for the management of perineal pain (43.8%). This fits with advice that these exercises may aid perineal healing (Fox, 2011), decrease oedema, and promote circulation (Rhode & Barger, 1990) and reduce perineal pain (Sleep & Grant, 1987). Midwifery reports of pelvic floor exercises were associated with sutured second degree tears ($p=.032$). Yet, this was in contrast to a UK RCT (Langley et al., 2006) where women with unsutured tears reported that they were more likely to be practising pelvic floor exercises at day 10 and 28 after

birth. The discrepancy may be related to differing perceptions between women respondents in Langley's study and midwifery respondents in this research.

Cooling and heating

Cooling therapy was reported by 37.7% of 377 midwives, illustrating that this traditional perineal analgesia (Rhode & Barger, 1990) remains popular. However, the figure from this research is lower than the 60% of women applying icepacks for perineal pain in an Australian study (East, Sherburn, et al., 2012). The lower use may reflect midwives' awareness of the Cochrane review of local cooling for perineal analgesia advising limited evidence of effectiveness (East, Begg, et al., 2012) or, conversely, championing of cooling therapy at the hospital in the Australian study by the researchers (East, Sherburn, et al., 2012) may have influenced their findings.

Handmade tap water ice packs were the most frequently selected cooling treatment and this finding is consistent with the literature (Bick et al., 2008; Petersen, 2011; Steen et al., 2000). Gel pads were reported by only 26 of the 144 midwives using cooling treatment, despite women's preference for gel pads over ice packs (Navvabi et al., 2009; Steen et al., 2000; Steen & Marchant, 2007). This corresponds to the low use of manufactured gel pads in Australia (East, Sherburn, et al., 2012), which was attributed to the high cost of these pads (Petersen, 2011). Expense may also be the situation in New Zealand, currently costing NZ\$40 for two 'Femme Pads' compared to less than 10 cents for a frozen sanitary pad.

Cold baths were used by 21 midwives, although the most recent trials regarding cold baths for perineal pain were from the 1980s (Droegemueller, 1980; LaFoy & Geden, 1989; Ramler & Roberts, 1986). Absence of recent research may be a factor in why cold baths were not listed under cooling therapy by five respondents and instead reported in free text when asked for detail under other CAM categories. Furthermore, midwives may have considered the herbal and salt additives to be more important than the cooling effect of the bath water.

Heat for relief of perineal pain was reported by 9.3% of midwives. Consistent with the discussion by Rhode and Barger (1990), moist heat in this New Zealand research was four times more common than dry heat. Under-reporting of warm baths for perineal

analgesia by midwives was noted in two UK studies (Sleep & Grant, 1988b; Way, 2012) and it was suggested that this was due to warm baths being considered as a form of hygiene rather than pain relief. This suggestion aligns with findings from this study, which found that seven of the nineteen respondents described warm baths under herbs or oils and not heat. This indicates that for these seven midwives, the herbal and oil additives were considered to have the analgesic effect, and not the warm bath water.

Salt was added to a bath for perineal analgesia by 40 (10.6%) of the 377 midwives. All of the 21 midwives who reported cold baths and 19 of the 25 midwives reporting hot baths added salt. This was despite a 1988 study concluding that bathing relieved perineal pain irrespective of the addition of salt or Savlon solution (Sleep & Grant, 1988a). Midwives adding salt to the bath were likely to have been in practice five years or fewer ($p=.004$) and this may be a reflection of lack of evidence-based perineal guidelines in New Zealand resulting in some midwives relying on tradition and the opinion of colleagues.

Homeopathy, herbs and oils

Homeopathic remedies were utilised by 23.3% of midwives, despite limited evidence of their effectiveness (Hofmeyr, Piccioni, & Blauhof, 1990). Similar to the UK (Carter & Aston, 2012), arnica was the most popular. Herbal remedies for perineal pain relief were the choice of 11.7% of midwives, and of these, hypercal (calendula and hypericum) and witch-hazel compresses were preferred. Hypercal is popular for perineal wound healing (Crompton, 2012) despite no research on the benefit of hypercal in perineal practice. Similarly, witch-hazel has been used for decades in the UK (Rhode & Barger, 1990) despite a lack of research into its efficacy (Barclay & Martin, 1983; East et al., 2007; Moore & James, 1989; Spellacy, 1963). The low uptake of oil (3.4%) compared to other CAM remedies, despite the use of oils in UK maternity care (Mousley, 2005), may be due lack of evidence on the efficiency for treatment of perineal trauma (Ernst & Huntley, 2004; Jones, 2011a).

The choice of homeopathy, herbs, and oil remedies may be due to the ease of availability (Hall et al., 2010), midwives offering them as part of normal practice (Harding & Foureur, 2009; NZCOM, 2000), or the woman's preference to avoid medications (Chou et al., 2010). However, there was some uncertainty with midwives' categorisations of herbal and homeopathic remedies, and a similar finding was noted in a UK study (Thompson,

Bishop, & Northstone, 2010); possibly because the same herb may be used to treat a condition both herbally and homeopathically (Frye, 2003).

Other pain relief

A ring or donut cushion for perineal pain relief was reported by 3.4%. This is less than the 24% of women using these cushions from the most recently located study on the subject, a 1992 UK survey (Harris, 1992). The low rate of use in New Zealand is consistent with the withdrawal of these cushions from postnatal wards in the 1990s due to the suggestion that they may increase the risk of oedema and thrombosis (Grant & Sleep, 1989). Evidence of harm for a healthy postpartum population was later found to be without substance (Church & Lyne, 1994; Harris, 1992); however it appears these cushions did not regain their former popularity. Other less conventional pain relief reported in free text by 2.1% of midwives included advising women about positioning to ease perineal discomfort and airing of the perineum.

Healing

The midwives appeared thorough in their assessments of perineal healing, using a combination of visual and verbal methods during the first six weeks postpartum. Opportunities for these assessments were provided in the expected 5-10 home visits in the six week postnatal period (MOH, 2012b). Most midwives (83.8%) looked at the perineum, which fits with the NZCOM decision points advocating midwives perform physical assessments in the postpartum period. Ninety four percent also asked for the women's opinion regarding their own perineum, which is consistent with UK guidelines (NICE, 2006). Only looking at perineum if women expressed concerns was considered an adequate tool for perineal assessment by NICE (2006) and this was reported by 5.0% of midwives.

Women's self-assessment of perineal healing was advocated by experienced UK community midwives (Jones, 2011b) and in this New Zealand research half the women (49.1%) visualised their own perineum. Another 6.9% of midwives reported that the women's support people looked at the women's perineum. This unexpected level of self-assessment and involvement of support people may be a sign of a trusting partnership in action between women, support people, and midwives, as advocated in New Zealand

(NZCOM, 2008), although has not been previously documented in regard to perineal assessment. Visualisation by support people was associated with a tear being left unsutured ($p=.039$) which may be indicative of concern about healing, or alternatively, a sign of women and their support people taking responsibility for evaluation of healing. Only one midwife reported using a perineal scoring tool; this aligns with Gray's (2010) finding, and the impracticality of the tools in practice (Hill, 1990).

Visual assessments of perineal healing were performed at least once in the first six weeks postpartum by 83.8% of midwives. Most (73.4%) looked at women's perineia between two and four times. Although some looked only once (13.3%), others looked five times or more (13.3%). This fits with UK research suggesting that midwives make appropriate judgments for timing of perineal assessment based on the needs of individual women rather than by rote (Dymond, 1999; Jones, 2011b; MacArthur et al., 2003). There were no significant differences associated with the tear being sutured or unsutured, however it may be clinically important that no unsutured tears were visualised more than four times by the midwife, in comparison to 14.2% of sutured tears.

A New Zealand report on maternity satisfaction from 3235 women in 2011 (MOH, 2012b) outlined 'physical checks' of the mother as a priority for improvement due to 11% of women reporting dissatisfaction. The implication was that satisfaction was directly related to the number of times the women received a physical assessment from the midwife. On the other hand, it is plausible that dissatisfied women may have preferred self-assessment, verbal assessment, or greater involvement of their support people.

Complications with healing of the last second degree tear were reported by fewer than 3% of midwives, which is low by international standards. Furthermore, risk of perineal infection after vaginal delivery was 1.9% and under the background estimate from literature of 2-6% (Glazener, 2005). This infection rate is considerably less than 11% reported in a UK phone audit (Johnson, 2012). Looking solely at data on second degree tears, the proportion of perineal infection reported still remained lower than the rate of 3.9% seen after the implementation of a multiprofessional education program to optimise perineal care in Ireland and the UK (Fox, 2011; Ismail et al., 2013), and considerably lower than 6.2% in the Swedish RCT of second degree tears (Lundquist et al., 2000). Additionally, as many midwives appear to be using evidence-based perineal practice, it is

put forward that the low infection rate may be the result of continuity of midwifery care and more postnatal visits over a longer period than reported in the UK and Ireland (Barker, 2013; Bick, 2010; Fox, 2011). Infection was not significantly associated with either sutured or unsutured tears, however the percentage of infections in unsutured tears was slightly higher than in sutured tears, which may be clinically significant.

Infection is linked to delay in perineal healing (Johnson et al., 2012), so it is not unexpected that a low rate of infection corresponded to a low rate of delay in healing (2.7%). It is also likely that New Zealand midwives, required to perform a minimum five home visits (MOH, 2012b), diagnosed and resolved infection promptly with a prescription of antibiotics (n=10) during these visits. However, similar to a UK RCT (Fleming et al., 2003), the proportion of midwives reporting delay in healing in this research was higher for unsutured than for sutured tears.

The rate of perineal pain greater than expected at 2.1% was consistent with the 1-3% of women describing severe pain or prolonged discomfort in overseas research (Kindberg et al., 2008; Lundquist et al., 2000; Upton et al., 2002; Valenzuela et al., 2009). However, what was unforeseen was that this pain was exclusive to sutured tears, as pain scores were similar between sutured and unsutured tears in overseas studies (Fleming et al., 2003; Langley et al., 2006; Leeman et al., 2007; Lundquist et al., 2000; Metcalfe et al., 2006). The finding of higher than expected levels of perineal pain only in the sutured group may be due to midwives' interpretations that pain from sutures was more problematic than discomfort from unsutured tears. Nevertheless, problems with sutures were reported under 'other complication' by only 1% of midwives and this was lower than the range of 2-13% in other studies of second degree tear healing (Ismail et al., 2013; Lundquist et al., 2000), possibly because sutures were not included as an answer option in this research. Unexpected levels of pain associated with sutured tears may also be related to overseas research showing that sutured women used more analgesia (Leeman et al., 2007). However, frequency of analgesia use was not asked in this research, so if sutured women used more analgesia more often, this may have been interpreted as pain greater than expected.

The absence of urinary incontinence was unexpected, as it is common after birth (Layton, 2004; Metcalfe et al., 2006; Thom & Rortveit, 2010). Moreover with the length and

frequency of postnatal contacts, it is likely that midwives would have asked the women about urinary symptoms (Abramowitz et al., 2000), although it is possible that midwives expected a degree of loss of bladder control and regarded incontinence as a condition of pregnancy and genetics rather than a complication of a second degree tear (Homer & Dahlen, 2007). There were no reports of bowel incontinence and this indicates that the midwives performed a thorough assessment and did not miss OASIS, which is associated with faecal incontinence (Abramowitz et al., 2000; Andrews et al., 2006; Sultan & Kettle, 2007).

Action to resolve complications with perineal healing was not required by 1.3%. Free text comments indicated that this was because the tear healed by secondary intention, the women declining action and haemorrhoid treatment. This is consistent with spontaneous resolution of some perineal healing complications described in an audit by Fox (2011). Six women were referred to an obstetrician, GP or physiotherapist within six weeks postpartum, which aligns with Austin's (2003) suggestion of timely referral for perineal complications due to known midwife. Antibiotics and analgesic medication were prescribed by midwives for around half the complications and it is possible that by avoiding delay, with women not required to see a doctor for a medical prescription, may have contributed to the low rate of reported complications.

Study strengths and limitations

The survey method clearly appealed to the target population, as indicated by the greater than expected number of eligible respondents representing the largest known cohort of New Zealand midwives to be studied on this topic to date. The higher than anticipated return rate indicates perineal care is a topic of interest to practising midwives (Sanders, Peters, & Campbell, 2005), possibly aided by the survey being able to be completed within the recommended parameter of 15 minutes (Marcus et al., 2007) which was positively commented on by several respondents. The option of saving answers and returning later to complete the survey was also well utilised (Qualtrics Inc, 2012).

Open-ended answers were an option if respondents did not wish to choose an answer from the list provided. This enabled clarification of interpretation of the question, and documentation of unexpected practice. The option of open-ended text also improved

accuracy, as where free text differed from the tick box selected, the text was assumed to be accurate e.g., one respondent selected 'yes' for rectal examination during assessment prior to the decision to treat the last second degree tear but wrote in free text "*Tear was nowhere near anus so I only used a lubricated gloved finger to check the anus AFTER (sic) the suturing as I always do*". Consequently, this answer was analysed as 'no'.

The definition of 'current practice' in perineal assessment and repair for a number of midwives was deduced by asking the number of second degree tears managed by the midwives in the last six months. It may have been that these midwives did not provide birth care in the previous months, or that women they cared for had birthed without second degree perineal trauma, however this was unknown. The addition of a question about how many labours and births the midwife had taken responsibility for in a specified time frame would ameliorate this in future studies.

Confusion over midwives' categorisations of homeopathy and herbs for perineal analgesia was surprising; as the wording in the survey was based on a 2009 survey of CAM use by Canadian and New Zealand midwives (Harding & Foureur, 2009) so was assumed to be valid. It appeared that some midwives did not realise that the same plant could be used in different forms, which raises questions about midwives' understandings of CAM therapy. Furthermore, most midwives categorised bathing by type of bath additive or under 'other' pain relief, rather than as a heat or cooling therapy. Consequently, it may be more appropriate to list baths as a standalone category in future surveys to ensure this information on bathing is accurately captured. Other common topics in free text answers that may be better placed in defined categories in future surveys on perineal analgesia were maternal position, airing of the perineum, and urinary alkalinisers.

Implications for practice, education and research

Around one third of New Zealand women who have a vaginal birth experience a second degree tear (NZCOM, 2013). Therefore, while perineal outcomes in this research are better than anticipated from international studies, there is scope for improvement with less than half the midwives using evidence-based suturing technique throughout all layers of the repair and a similar low proportion performing a rectal examination during assessment of the last second degree tear they treated. Unproven or ineffective

postpartum analgesic therapies were also reported by nearly half the midwives. The present educational strategy of perineal management being an integral part of the undergraduate midwifery education programme (MCNZ, 2007), elective perineal education offered by some DHBs (MCNZ, 2014), and the prioritisation of perineal teaching in the 2012 NZCOM continuing education plan (Gray, 2012) is positive. Certainly this research and a UK study (Ismail et al., 2013) found that midwives who had the most recent perineal education were more likely to use evidence-based suturing techniques, which is known to be economical (Kindberg et al., 2008; Petrou et al., 2001) and reduce perineal morbidity (Ismail et al.). Current perineal education should be obligatory for all midwives. This could be achieved through including perineal management in the compulsory post-graduate midwifery recertification program (MCNZ, 2005).

In addition, employed midwives who were not LMCs, were less likely to manage any second degree perineal tears (sutured and unsutured) within the last six months than self-employed LMC midwives. Employment was also associated with reduced confidence with perineal repair, with the most recently qualified midwives and those who recently left a tear unsutured reporting the lowest confidence. It is known (Andrews et al., 2006; Robinson & Beattie, 2002; Tohill & Metcalfe, 2005; Toohey, 2003) that experience and confidence is associated with optimal perineal management and outcomes. This suggests that if midwifery employers wish to avoid deskilling their midwifery staff and prevent negative repercussions from sub-optimal perineal management, they should increase opportunity and access to perineal skills training.

The majority of New Zealand midwives perform perineal assessments using techniques that meet international recommendations and seek assistance with management of perineal trauma when required. Consequently the wide range of incidence of perineal trauma (35-88%) between New Zealand maternity facilities for women expected to have similar outcomes (MOH, 2012c) does not appear to be related to variation in standards of midwifery perineal assessment skills. Instead, the variation indicates problems with data entry or classification. If these issues are resolved and accurate data are collected from DHB maternity facilities, this may assist in identifying regions that would benefit from targeted perineal education.

Improved documentation of perineal treatment is also advised. While most midwives documented a description of the last second degree tear, fewer recorded other aspects of their perineal management, and these gaps leave midwives vulnerable if questions are raised about a perineal repair. However, documentation of consent to leave a tear unsutured was reported by a high proportion (91.5%) of the 47 midwives who did not suture, although the reason behind this decision is unknown and may benefit from further examination. It may be based on midwives knowledge of the increased likelihood of delayed healing for unsutured tears; yet it could be argued that women's consent was based on information that was biased toward non-suturing due to these midwives reporting less confidence with repair. Meanwhile, midwives who do not suture second degree tears should remain mindful that the informed consent process must be fully documented and able to stand up to scrutiny.

The development of a national midwifery-generated evidence-based perineal management consensus statement would standardise and support perineal education, and increase the low number (35.6%) of midwives who report access to an appropriate guideline. This consensus statement would be most appropriately generated by NZCOM, as the professional organisation promoting quality standards for New Zealand midwives. It should include perineal assessment and repair techniques, perineal analgesia, and documentation of care provided. It should also incorporate information to aid midwives in their decision to repair a second degree tear or leave it unsutured. Replication of this survey after the development of a consensus statement and uptake of standardised post-graduate perineal education may provide information about the value of these strategies.

Recommendations for future research

The finding that 70% of midwives used 15mls or less of lignocaine as analgesia during perineal repair was unexpected, given that NICE (2007) recommends 20mls. The lower dose may indicate knowledge shortfall or that midwives felt women had adequate pain relief with the lower dose. In addition, finding that only 1.4% of midwives added adrenaline to lignocaine, despite the known beneficial effects of prolonged analgesia and haemostasis, raises questions. Examination of the influences affecting use of lignocaine in New Zealand midwifery perineal practice would be beneficial.

The use of a ring or donut cushion for perineal pain relief was reported by a small number of midwives. This indicates that these cushions may still be a useful therapy, particularly since evidence of harm to healthy postnatal women was refuted many years ago (Church & Lyne, 1994). Updated research into the risks and benefits of these cushions for postnatal perineal care may be useful.

Palpating perineal tissues during assessment of perineal trauma was an evaluation technique described by a small number of New Zealand midwives. Tactile sensation appears to enhance accuracy of assessment, thus may influence the decision to refer for assistance or to suture or not to suture. Further exploration of the value of touch in regard to assessment of perineal trauma is recommended.

Factors that influence the decisions of New Zealand midwives to suture or not-suture second degree tears are known (Gray, 2010), although the ratio of sutured (92.9%) to unsutured tears (7.1%) is a new finding and the reasons are undetermined. It may be related to midwives reflection on women's feedback or midwives high level of confidence with repair. However, unsutured tears are associated with home birth and a high level of documentation of consent, so women's choice is also likely to be a factor. These are areas for future investigation.

A lower than expected reported rate of infection, pain, and delay in healing in this research in comparison to rates reported in overseas studies is positive. Thus findings from this research may enhance inquiry into the aspects of postnatal care that support the healing of second degree tears. The reason does not appear to lie in optimal perineal suturing technique, as less than half the midwives used the correct method throughout the entire repair. Consequently, it is feasible that the explanation for the low rate in this research lies in midwives postnatal care (pain relief, perineal assessment, and prevention of complications) and further research could provide information that would result in a similar reduction in perineal morbidity overseas.

Conclusions

The aim of this research was to describe current New Zealand midwifery perineal practice in 2013 by surveying midwives' management of perineal trauma from the time of birth to six weeks postpartum. These findings will help to fill the gap in knowledge about

midwives' perineal management. The objectives to describe perineal practice, evaluate this practice against overseas evidence-based guidelines, assess the influence of midwives' employment statuses, and examine similarities and differences between sutured or unsutured second degree tears were met. The research has added a practice perspective to Gray's (2010) study on factors influencing New Zealand midwives' perineal management decisions. Moreover, with 744 eligible respondents constituting 25% of the New Zealand midwifery population, cautious extrapolation of the results to the wider community of midwives is appropriate.

There are three main conclusions from this study. The first is that it is a credit to the professionalism of New Zealand midwives that despite the lack of national guidelines and only voluntary perineal education, over half had received perineal management education within the previous two years and the majority reported using evidence-based perineal assessment, suture material, skin repair techniques, and timing of repair. However, perineal care can be improved with respect to rectal examination, suturing technique, documentation, and postpartum analgesia. In addition, employed core midwives were less confident with repair and less likely to have performed a recent repair than self-employed LMCs. The development of a national midwifery consensus statement on perineal care combined with perineal education and skills becoming a practice requirement, would increase the use of evidence-based perineal practice, boost the confidence of employed core midwives, and enhance maternal perineal health.

Second, the last second degree tear treated by the midwifery respondents was over 14 times more likely to be sutured than left unsutured. These unsutured tears were estimated to be significantly shorter and shallower than sutured tears, yet were associated with delayed healing, although this delay has to be balanced with higher levels of pain reported from sutured tears. Unsutured tears were also associated with home birth and reduced likelihood of midwives performing a rectal examination during assessment of perineal trauma. Moreover, midwives who left the tear unsutured were less confident with repair and were less likely to have performed a repair in the previous six months, indicating that non-suturing may be related to lack of expertise with repair. However, midwives who left tears unsutured reported greater diligence in documentation of the tear. Therefore, it may be that midwives leaving tears unsutured prefer less intervention, are mindful of pain associated with sutured tears, and choose

their perineal management in partnership with women, having shared of the possibility of delayed healing and the lack of evidence on long-term outcomes.

Finally, follow-up of perineal outcomes to six weeks postpartum allowed some conclusions to be drawn regarding perineal healing. The majority of midwives followed evidence-based recommendations for postpartum perineal analgesia; including rectal and oral analgesia, pelvic floor exercises, and perineal cooling. Nearly half also reported CAM therapies. Most midwives surpassed NICE (2006) guidelines for assessment of perineal healing. The low rate of complications in healing of second degree tears in this research, compared to overseas statistics, appears to be related to the midwives providing continuity of care for six weeks postpartum, midwifery prescribing rights, and midwives working in partnership with women to vigilantly assess and manage their perineal healing. These findings provide new information to inform local and international midwifery perineal practice.

The findings of this study confirm that the New Zealand model of midwifery care, with midwives as autonomous practitioners in partnership with women, has produced midwives able to make appropriate evidence-based professional judgements, in regard to perineal practice. It has also offered new information on midwives' perineal practice for further consideration and provides a reference point for future midwifery education, research, and policy on perineal management.

Appendix A. Ethical approval

1. Multi-region Ethics Committee approval, January 2012
2. Multi-region Ethics Committee extension, May 2012
3. Health and Disability Ethics Committee extension, October 2013

Appendix B. Survey

1. Pilot survey information sheet and feedback forms, January 2012
2. Database access governance group approval to access the NZCOM membership database, November 2012
3. Survey invitation and reminders, February-March 2013
4. Survey questions (hard-copy of online survey with attached survey logic), February 2013

Appendices are in the attached CD-ROM

Reference list

- Abramowitz, L., Sobhani, I., Ganansia, R., Vuagnat, A., Benifla, J., Darai, E., . . . Mignon, M. (2000). Are sphincter defects the cause of anal incontinence after vaginal delivery? *Diseases of the Colon & Rectum*, 43(5), 590-596.
- Acharyapota, V., & Titapant, V. (2008). Relieving perineal pain after perineorrhaphy by diclofenac rectal suppositories: a randomized double-blinded placebo controlled trial. *J Med Assoc Thai*, 91(6), 799-804.
- Adams, J. (2006). An exploratory study of complementary and alternative medicine in hospital midwifery: models of care and professional struggle. *Complementary Therapies in Clinical Practice*, 12(1), 40.
- Akl, E., Maroun, N., Klocke, R., Montori, V., & Schünemann, H. (2005). Electronic mail was not better than postal mail for surveying residents and faculty. *Journal of Clinical Epidemiology*, 58(4), 425-429.
- Albers, L., & Borders, N. (2007). Minimizing genital tract trauma and related pain following spontaneous vaginal birth. *J Midwifery Womens Health*, 52(3), 246-253.
- Albers, L., Garcia, J., Renfrew, M., McCandlish, R., & Elbourne, D. (1999). Distribution of genital tract trauma in childbirth and related postnatal pain. *Birth: Issues in Perinatal Care*, 26(1), 11-15.
- Andrews, V., Sultan, A., Thakar, R., & Jones, P. (2006). Occult anal sphincter injuries-myth or reality? *BJOG: An International Journal of Obstetrics & Gynaecology*, 113(2), 195-200.
- Andrews, V., Thakar, R., Sultan, A., & Jones, P. (2008). Evaluation of postpartum perineal pain and dyspareunia-a prospective study. *European Journal of Obstetrics & Gynaecology and Reproductive Biology*, 137(2), 152-156.
- Andrews, V., Thakar, R., Sultan, A., & Kettle, C. (2005). Clinical issues. Can hands-on perineal repair courses affect clinical practice? *British Journal of Midwifery*, 13(9), 562-566.
- Auckland District Health Board. (2012). Intrapartum care-normal labour & birth (pp. 1-18). Auckland: Author.
- Auckland Home Birth Association (Ed.). (1993). *Guide to Healthy Pregnancy and Childbirth* (3rd ed.). Auckland: Author.
- Austin, J. (2003). An audit of third degree perineal tears. *British Journal of Midwifery*, 11(11), 649-656.
- Australian College of Midwives. (2013). Know your midwife. The benefits of continuity of care. Retrieved from <http://www.midwives.org.au/scripts/cgiip.exe/WService=MIDW/ccms.r?PageId=10206>
- Baghurst, P. (2012). The case for retaining severe perineal tears as an indicator of the quality of obstetric care. *Australian and New Zealand Journal of Obstetrics and Gynaecology*.
- Barclay, L., & Martin, N. (1983). A sensitive area: care of the episiotomy in the postpartum period. *Australian Journal Advanced Nursing*, 1, 12-19.
- Barker, K. (2013). Cinderella of the services-'the pantomime of postnatal care'. *British Journal of Midwifery*, 21(12), 842-842.
- Behmanesh, F., Aghamohammadi, A., Zeinalzadeh, M., & Khafri, S. (2013). Effects of olive oil sitz bath on improvement of perineal injury after delivery. *Koomesh*, 14(3), 309-315.

- Benifla, J., Abramowitz, L., Sobhani, I., Ganansia, R., Darai, E., Mignon, M., & Madelenat, P. (2000). Postpartum sphincter rupture and anal incontinence: prospective study with 259 patients. *Gynecologie, Obstetrique & Fertilité*, 28(1), 15-22.
- Bick, D. (2010). Postpartum management of the perineum. *British Journal of Midwifery*, 17(9), 571.
- Bick, D., & Bassett, S. (2013). How to...provide postnatal perineal care. *Midwives*, 16(2), 34-35.
- Bick, D., Ismail, K., Macdonald, S., Thomas, P., Tohill, S., & Kettle, C. (2012). How good are we at implementing evidence to support the management of birth related perineal trauma? A UK wide survey of midwifery practice. *BMC Pregnancy and Childbirth*, 12(1), 57.
- Bick, D., MacArthur, C., & Winter, H. (2008). *Postnatal care. Evidence and guidelines for management* (Second ed.). London: Churchill Livingstone.
- Bluff, R., & Holloway, I. (1994). 'They know best': women's perceptions of midwifery care during labour and childbirth. *Midwifery*, 10(3), 157-164.
- Bowen, M., & Selinger, M. (2002). Episiotomy closure comparing enbucrilate tissue adhesive with conventional sutures. *International Journal of Gynecology & Obstetrics*, 78(3), 201-205.
- Bowling, A. (2005). Mode of questionnaire administration can have serious effects on data quality. *Journal of Public Health*, 27(3), 281.
- Braithwaite, D., Emery, J., De Lusignan, S., & Sutton, S. (2003). Using the Internet to conduct surveys of health professionals: a valid alternative? *Family Practice*, 20(5), 545.
- Brindle, S., Douglas, F., van Teijlingen, E., & Hundley, V. (2005). Midwifery research: questionnaire surveys. *RCM Midwives*, 8(4), 156-158.
- Brown, S., & Lumley, J. (1998). Maternal health after childbirth: results of an Australian population based survey. *Br J Obstet Gynaecol*, 105(2), 156-161.
- Bryman, A. (2004). *Social research methods* (Vol. 2). Oxford: Oxford University Press
- Calvert, J., & Steen, M. (2007). Homeopathic remedies for self-administration during childbirth. *British Journal of Midwifery*, 15(3), 159-165.
- Carson, C., Hammer, K., & Riley, T. (2006). Melaleuca alternifolia (tea tree) oil: a review of antimicrobial and other medicinal properties. *Clinical Microbiology Reviews*, 19(1), 50.
- Carter, J., & Aston, G. (2012). Use of homeopathic arnica among childbearing women: A survey. *British Journal of Midwifery*, 20(4), 254-261.
- Cepeda, M., Tzortzopoulou, A., Thackrey, M., Hudcova, J., Arora Gandhi, P., & Schumann, R. (2010). Adjusting the pH of lidocaine for reducing pain on injection. *Cochrane Database Syst Rev*(12), CD006581. doi: 10.1002/14651858.CD006581.pub2
- Chou, D., Abalos, E., Gyte, G., & Gulmezoglu, A. (2010). Paracetamol/acetaminophen (single administration) for perineal pain in the early postpartum period. *Cochrane Database Systematic Review*(3), CD008407. doi: 10.1002/14651858.cd008407
- Church, S., & Lyne, P. (1994). Research-based practice: some problems illustrated by the discussion of evidence concerning the use of a pressure-relieving device in nursing and midwifery. *Journal of Advanced Nursing*, 19(3), 513-518.
- Cioffi, J., Swain, J., & Arundell, F. (2010). The decision to suture after childbirth: cues, related factors, knowledge and experience used by midwives. *Midwifery*, 26(2), 246-255.
- Clark, D. (2005). Helpful herbal remedies for postpartum. *Special Delivery*, 28(2), 56.

- Clement, S., & Reed, B. (1998). To stitch or not to stitch? A long term study of women with unsutured perineal tears. *Practising Midwife*, 2, 20-28.
- Colacioppo, P., & Riesco, M. (2009). Effectiveness of local anaesthetics with and without vasoconstrictors for perineal repair during spontaneous delivery: double-blind randomised controlled trial. *Midwifery*, 25(1), 88-95.
- Crompton, R. (2012). Homeopathy for common complaints during pregnancy and childbirth. *The practising midwife*, 15(8), 155-185.
- Dahlen, H. (Ed.). (2010). *Perineal care and repair*. Sydney, Australia: Churchill Livingstone, Elsevier.
- Dahlen, H., & Homer, C. (2008). What are the views of midwives in relation to perineal repair? *Women and Birth*, 21(1), 27-35.
- Dale, A., & Cornwell, S. (1994). The role of lavender oil in relieving perineal discomfort following childbirth: a blind randomized clinical trial. *Journal of Advanced Nursing*, 19(1), 89-96.
- Davidson, N. (1974). REEDA:evaluating postpartum healing. *Journal of Nurse Midwifery*, 19(2), 6-8.
- Davies, L. (2008). Home thoughts from abroad. In S. Wickham (Ed.), *Midwifery Best Practice, Volume 5* (5 ed., Vol. 5). China: Elsevier Limited.
- Dencker, A., Lundgren, I., & Sporrang, T. (2006). Suturing after childbirth-a randomised controlled study testing a new monofilament material. *BJOG*, 113(1), 114-116.
- Denscombe, M. (2010). *The good research guide for small-scale social research projects*: McGraw-Hill International.
- Dixon, L. (2010). Supporting women becoming mothers. In S. Pairman, J. Pincombe, C. Thorogood & S. Tracey (Eds.), *Midwifery preparation for practice* (pp. 455-469). Sydney, Australia: Churchill Livingstone, Elsevier.
- Dodd, J., Hedayati, H., Pearce, E., Hotham, N., & Crowther, C. (2004). Rectal analgesia for the relief of perineal pain after childbirth: a randomised controlled trial of diclofenac suppositories. *BJOG*, 111(10), 1059-1064.
- Douglas, F., van Teijlingen, E., Brindle, S., Hundley, V., Bruce, J., & Torrance, N. (2005). Designing questionnaire for midwifery research. *RCM Midwives*, 8(5), 212-215.
- Draper, J., & Newell, R. (1996). A discussion of some of the literature relating to history, repair and consequences of perineal trauma. *Midwifery*, 12(3), 140-145.
- Droegemueller, W. (1980). Cold sitz baths for relief of postpartum perineal pain. *Clinical Obstetrics and Gynecology*, 23, 1039-1043.
- Dudding, T., Vaizey, C., & Kamm, M. (2008). Obstetric anal sphincter injury: incidence, risk factors, and management. *Annals of Surgery*, 247(2), 224.
- Dymond, J. (1999). Research in brief: Routine post-natal perineal inspection by midwives. *Journal of Clinical Nursing*, 8(2), 225.
- East, C., Begg, L., Henshall, N., Marchant, P., & Wallace, K. (2012). Local cooling for relieving pain from perineal trauma sustained during childbirth. *Cochrane Database Syst Rev*(5), CD006304. doi: 10.1002/14651858.CD006304.pub3.
- East, C., Sherburn, M., Nagle, C., Said, J., & Forster, D. (2012). Perineal pain following childbirth: Prevalence, effects on postnatal recovery and analgesia usage. *Midwifery*.
- Edwards, P., Roberts, I., Clarke, M., Diguiseppi, C., Wentz, R., Kwan, I., . . . Pratap, S. (2009). Methods to increase response to postal and electronic questionnaires. *Cochrane Database Syst Rev*(3). doi: 10.1002/14651858.MR000008.pub4

- Elharmeel, S., Chaudhary, Y., Tan, S., Scheermeyer, E., Hanafy, A., & van Driel, M. (2011). Surgical repair of spontaneous perineal tears that occur during childbirth versus no intervention *Cochrane Database of Systematic Reviews* 2011(8). doi: 10.1002/14651858.CD008534.pub2.
- Ernst, E. (2005). Is homeopathy a clinically valuable approach? *Trends in Pharmacological Sciences*, 26(11), 547-548.
- Ernst, E., & Huntley, A. (2004). Tea tree oil: a systematic review of randomized clinical trials. *Research in Complementary Medicine*, 7(1), 17-20.
- Facchinetti, F., Luisa Casini, M., Costabile, L., Malavasi, B., & Unfer, V. (2005). Diclofenac pyrrolidine versus Ketoprofen for the relief of pain from episiotomy: A randomized controlled trial. *Acta Obstetrica Et Gynecologica Scandinavica*, 84(10), 951-955.
- Finn, E. (2008). Midwifery practice - learning from complaints. *Health and Disability Commissioner*.
- Fleming, V., Hagen, S., & Niven, C. (2003). Does perineal suturing make a difference? The SUNS trial. *BJOG: An International Journal of Obstetrics & Gynaecology*, 110(7), 684-689.
- Fox, A. (2011). Challenges: Perineal wound care in the community. *World of Irish Nursing & Midwifery* 19(5), 48-50.
- Fox, A. (2011). Post-natal wound care in the community. *World of Irish Nursing & Midwifery* 19(6).
- Frye, J. (2003). Herbal and homeopathic medicine: understanding the difference. *Seminars in Integrative Medicine*, 1(3), 158-166.
- Gay, L., & Diehl, P. (1992). *Research methods for business and management*: Macmillan Coll Division.
- Ghosh, C., Mercier, F., Couaillet, M., & Benhamou, D. (2004). Quality-assurance program for the improvement of morbidity during the first three postpartum days following episiotomy and perineal trauma. *Acute Pain*, 6(1), 1-7.
- Gilman, G. (Ed.). (1990). *Drug absorption, bioavailability, and routes of administration* (Vol. 7). New York: Macmillan Publishing Co.
- Gilmour, C., & Twining, S. (2002). Postnatal care in hospitals: ritual, routine or individualised. *The Australian Journal of Midwifery*, 15(2), 11-15.
- Glazener, C. (1997). Sexual function after childbirth: women's experiences, persistent morbidity and lack of professional recognition. *Br J Obstet Gynaecol*, 104(3), 330-335.
- Glazener, C. (2005). Women's health after delivery. In C. Henderson & D. Bick (Eds.), *Perineal Care: an international issue* (pp. 32-57). London: Quay Books.
- Glazener, C., Abdalla, M., Stroud, P., Templeton, A., Russell, I., & Naji, S. (1995). Postnatal maternal morbidity: extent, causes, prevention and treatment. *BJOG: An International Journal of Obstetrics & Gynaecology*, 102(4), 282-287.
- Gordon, B., Mackrodt, C., Fern, E., Truesdale, A., Ayers, S., & Grant, A. (1998). The Ipswich Childbirth Study: 1. A randomised evaluation of two stage postpartum perineal repair leaving the skin unsutured. *British Journal of Obstetrics and Gynaecology*, 105(4), 435-440.
- Grant, A., & Sleep, J. (Eds.). (1989). *Relief of perineal pain and discomfort after childbirth* (Vol. 2). Oxford: Oxford University Press.
- Gray, E. (2010). *Suturing versus non-suturing of spontaneous perineal tears following normal birth: Factors that influence the practice of New Zealand/Aotearoa midwives*. Master of Midwifery, Otago Polytechnic, Dunedin.

- Gray, E. (2012). New Zealand College of Midwives proposed continuing education strategy 2013-2015 (2nd ed.). Christchurch.
- Green, J., Coupland, V., & Kitzinger, J. (1998). *Great expectations: a prospective study of women's expectations and experiences of childbirth*. Cheshire: Books for Midwives Press
- Greenshields, W., Hulme, H., & Oliver, S. (1993). *The perineum in childbirth: a survey of women's experiences and midwives' practices*. London: National Childbirth Trust London.
- Grigg, C., & Tracy, S. (2013). New Zealand's unique maternity system. *Women and Birth*, 26(1), e59-e64.
- Groom, K., & Paterson-Brown, S. (2002). Can we improve on the diagnosis of third degree tears? *European Journal of Obstetrics, Gynecology, and Reproductive biology*, 101(1), 19-21.
- Guilliland, K., & Pairman, S. (1995). The midwifery partnership. A model for practice. Victoria University of Wellington. Monograph Series 95/1. Wellington: Victoria University of Wellington.
- Guilliland, K., & Pairman, S. (2010a). *The midwifery partnership-A model for practice* (2nd ed.). Christchurch: New Zealand College of Midwives.
- Guilliland, K., & Pairman, S. (2010b). *Women's business: the Story of the New Zealand College of Midwives, 1986-2010*. Christchurch: New Zealand College of Midwives.
- Hale, R. (2005). Suturing the perineum. *British Journal of Midwifery* 13, 689-692.
- Hall, H., McKenna, L., & Griffiths, D. (2010). Midwives' support for complementary and alternative medicine: a literature review. *Women and Birth*, 25(1), 4-12.
- Harding, D., & Foureur, M. (2009). New Zealand and Canadian midwives' use of complementary and alternative medicine. *New Zealand College of Midwives Journal*, 40, 7-12.
- Harris, F., van Teijlingen, E., Hundley, V., Farmer, J., Bryers, H., Caldwell, J., . . . Tucker, J. (2010). The buck stops here: midwives and maternity care in rural Scotland. *Midwifery*, 27(3), 301-307.
- Harris, M. (1992). The impact of research findings on current practice in relieving post-partum perineal pain in a large district general hospital. *Midwifery*, 8, 125-131.
- Hartz, D., Foureur, M., & Tracy, S. (2012). Australian caseload midwifery: The exception or the rule. *Women and Birth*, 25(1), 39-46.
- Hasegawa, J., & Leventhal, L. (2009). Pharmacological and nonpharmacological treatment for relief of perineal pain after vaginal delivery. *Einstein*, 7(2), 194-200.
- Head, M. (1993). Do sutured tears to the perineum heal better than unsutured ones. *Nursing Times*, 89, 64-65.
- Health and Disability Commissioner. (1996). Code of Health and Disability Services Consumers' Rights. New Zealand.
- Health and Disability Commissioner. (2002a). Case 01/05191 (pp. 1-18). New Zealand.
- Health and Disability Commissioner. (2002b). Case 99/10489 (pp. 1-45). New Zealand.
- Health and Disability Commissioner. (2005). Case 03HDC10782 (pp. 1-38). New Zealand.
- Health and Disability Commissioner. (2006). Case 05HDC13928 (pp. 1-23). New Zealand.
- Health and Disability Commissioner. (2007). Case 07HDC03243 (pp. 1-27). New Zealand.
- Health and Disability Commissioner. (2014). Health and Disability Commissioner, from <http://www.hdc.org.nz/>
- Hedayati, H., Parsons, J., & Crowther, C. (2003). Rectal analgesia for pain from perineal trauma following childbirth. *Cochrane Database of Systematic Reviews*(3). doi: 10.1002/14651858.CD003931.

- Hedayati, H., Parsons, J., & Crowther, C. A. (2005). Topically applied anaesthetics for treating perineal pain after childbirth. *Cochrane Database Syst Rev*(2), CD004223. doi: 10.1002/14651858.CD004223.pub2
- Herron-Marx, S., Williams, A., & Hicks, C. (2007). A Q methodology study of women's experience of enduring postnatal perineal and pelvic floor morbidity. *Midwifery*, 23(3), 322-334.
- Hill, P. (1990). Psychometric properties of the REEDA. *Journal of Nurse-Midwifery*, 35(3), 162-165.
- Hill, R. (1989). Effects of hot and cold on the perineum after episiotomy/laceration. *J Obs & Gynecol Neonatal Nurs*, 18, 124-129.
- Hill, R. (1998). What sample size is "enough" in internet survey research. *Interpersonal Computing and Technology: An electronic journal for the 21st century*, 6(3-4), 1-12.
- Ho, E. (1985). Should midwives be repairing episiotomies? . *Midwives Chronicle and Nursing Notes*, 98, 296
- Hofmeyr, G., Piccioni, V., & Blauhof, P. (1990). Postpartum homoeopathic arnica montana: a potency finding pilot study. *British Journal of Clinical Practice*, 44, 619-621.
- Homer, C., & Dahlen, H. (2007). Obstetric-induced incontinence: A black hole of preventable morbidity? An 'alternative' opinion. *Australian and New Zealand Journal of Obstetrics and Gynaecology*, 47(2), 86-90.
- Hume, H., & Greenshields, W. (1993). *The Perineum in childbirth: a survey conducted by the National Childbirth Trust*. London: National Childbirth Trust.
- Hundley, V., Tucker, J., van Teijlingen, E., Kiger, A., Ireland, J., Harris, F., . . . Bryers, H. (2007). Midwives' competence: is it affected by working in a rural location? *Rural and Remote Health* 7(764).
- Hunter, L. (2012). Challenging the reported disadvantages of e-questionnaires and addressing methodological issues of online data collection. *Nurse Researcher*, 20(1), 11-20.
- Hyllested, M., Jones, S., Pedersen, J., & Kehlet, H. (2002). Comparative effect of paracetamol, NSAIDs or their combination in postoperative pain management: a qualitative review. *British journal of anaesthesia*, 88(2), 199-214.
- Ismail, K., Kettle, C., Macdonald, S., Tohill, S., Thomas, P., & Bick, D. (2013). Perineal assessment and repair longitudinal study (PEARLS): a matched-pair cluster randomized trial. *BMC Medicine*, 11, 209.
- James, E. (2010). *Midwives' experiences when working with third year midwifery students*. Master of Education, The University of Waikato, Hamilton. Retrieved from <http://researchcommons.waikato.ac.nz/>
- Johnson, A., Thakar, R., & Sultan, A. (2012). Obstetric perineal wound infection: is there underreporting? *British Journal of Nursing*, 21(5-Supplement), S28-S35.
- Johnson, M. (2002). Ignorance of anatomy 'frightening', *The New Zealand Herald*. Retrieved from http://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=1292501
- Jones, C. (2011a). The efficacy of lavender oil on perineal trauma: a review of the evidence. *Complementary Therapies in Clinical Practice*, 17(4), 215-220.
- Jones, C. (2011b). Perineal healing measurements: Midwifery practice and midwifery research. *Essentially MIDIRS*, 2(4), 47-49.
- Kamondetdech, R., & Tannirandorn, Y. (2008). Ibuprofen versus acetaminophen for the relief of perineal pain after childbirth: a randomized controlled trial. *J Med Assoc Thai*, 91(3), 282-286.

- Kaur, N., Rana, A., & Suri, V. (2013). Effect of dry heat versus moist heat on episiotomy pain and wound healing. *Nursing and Midwifery Research*, 9(1), 21.
- Kelley, K., Clark, B., Brown, V., & Sitzia, J. (2003). Good practice in the conduct and reporting of survey research. *International Journal for Quality in Health Care*, 15(3), 261-266.
- Kettle, C. (2006). The management of perineal trauma. In C. Henderson & D. Bick (Eds.), *Perineal care: An international issue. Current Issues in midwifery series* (pp. 32-58). London: Quay Books Division, MA Healthcare Limited.
- Kettle, C., Dowswell, T., & Ismail, K. (2010). Absorbable suture materials for primary repair of episiotomy and second degree tears. *Cochrane Database Syst Rev*(6), CD000006. doi: 10.1002/14651858.CD000006.pub2
- Kettle, C., & Fenner, D. (2007). Repair of episiotomy, first and second degree tears. In A. Sultan, R. Thakar & D. Fenner (Eds.), *Perineal and anal sphincter trauma* (pp. 20-32). London: Springer.
- Kettle, C., Hills, R., & Ismail, K. (2007). Continuous versus interrupted sutures for repair of episiotomy or second degree tears. *Cochrane Database Syst Rev*(4), CD000947. doi: 10.1002/14651858.CD000947.pub2
- Kettle, C., Hills, R., Jones, P., Darby, L., Gray, R., & Johanson, R. (2002). Continuous versus interrupted perineal repair with standard or rapidly absorbed sutures after spontaneous vaginal birth: a randomised controlled trial. *Lancet*, 359(9325), 2217-2223.
- Kettle, C., & O'Brien, P. (2004). Methods and materials used in perineal repair *Green-top guideline No. 23* (2nd ed., pp. 1-8). London: RCOG Press.
- Kettle, C., & Raynor, M. (2010). Perineal management and repair. In J. Marshall & M. Raynor (Eds.), *Advancing skills in midwifery practice* (pp. 104-120). China: Elsevier Health Sciences
- Kindberg, S., Stehouwer, M., Hvidman, L., & Henriksen, T. (2008). Postpartum perineal repair performed by midwives: a randomised trial comparing two suture techniques leaving the skin unsutured. *BJOG*, 115(4), 472-479.
- Klein, M., Gauthier, R., Robbins, J., Kaczorowski, J., Jorgensen, S., Franco, E., . . . et al. (1994). Relationship of episiotomy to perineal trauma and morbidity, sexual dysfunction, and pelvic floor relaxation. *Am J Obstet Gynecol*, 171(3), 591-598.
- Koren, G., Cairns, J., Chitayat, G., & Leeder, S. (2006). Pharmacogenetics of morphine poisoning in a breast fed neonate of a codeine-prescribed mother. *Lancet*, 368, 704.
- Krejcie, R., & Morgan, D. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, 30(3), 607-610.
- LaFoy, J., & Geden, E. (1989). Postepisiotomy pain: warm versus cold sitz bath. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, 18(5), 399-403.
- Lal, M., Mann, C., Callender, R., & Radley, S. (2003). Does cesarean delivery prevent anal incontinence? *Obstet Gynecol*, 101(2), 305-312.
- Langley, V., Thoburn, S., & Barton, A. (2006). Second degree tears: to suture or not? A randomised controlled trial. *Br J Midwifery*, 14, 550-554.
- Layton, S. (2004). The effect of perineal trauma on women's health. *British Journal of Midwifery*, 12(4), 231-236.
- Leeman, L., Fullilove, A., Borders, N., Manocchio, R., Albers, L., & Rogers, R. (2009). Postpartum perineal pain in a low episiotomy setting: association with severity of genital trauma, labor care, and birth variables. *Birth: Issues in Perinatal Care*, 36(4), 283-288.

- Leeman, L., Rogers, R., Greulich, B., & Albers, L. (2007). Do unsutured second-degree perineal lacerations affect postpartum functional outcomes? *Journal American Board Family Medicine*, 20(5), 451-457.
- Lewis, L. (1995). Are you sitting comfortably? *Midwifery Matters*, 66, 3-5.
- Lundquist, M., Olsson, A., Nissen, E., & Norman, M. (2000). Is it necessary to suture all lacerations after a vaginal delivery? *Birth*, 27(2), 79-85.
- MacArthur, A., & Macarthur, C. (2004). Incidence, severity, and determinants of perineal pain after vaginal delivery: a prospective cohort study. *American Journal of Obstetrics and Gynecology*, 191, 1199-1204.
- MacArthur, C., Winter, H., Bick, D., Lilford, R., Lancashire, R., Knowles, H., . . . Gee, H. (2003). Redesigning postnatal care: a randomised controlled trial of protocol-based midwifery-led care focused on individual women's physical and psychological health needs. *Health Technol Assess*, 7(37), 1-98.
- Manfreda, K., Bosnjak, M., Berzelak, J., Haas, I., Vehovar, V., & Berzelak, N. (2008). Web surveys versus other survey modes: A meta-analysis comparing response rates. *Journal of the Market Research Society*, 50(1), 79.
- Mann, C. (2003). Observational research methods. Research design II: cohort, cross sectional, and case-control studies. *Emergency Medicine Journal*, 20(1), 54-60.
- Marcus, B., Bosnjak, M., Lindner, S., Pilischenko, S., & Schütz, A. (2007). Compensating for low topic interest and long surveys. A field experiment on nonresponse in web surveys. *Social Science Computer Review*, 25(3), 372-383.
- McCandlish, R. (2001). Perineal trauma: Prevention and treatment. *The Journal of Midwifery & Womens Health*, 46(6), 396-401.
- McCandlish, R., Bowler, U., 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. *BJOG: An International Journal of Obstetrics & Gynaecology*, 105(12), 1262-1272.
- McColl, E., Jacoby, A., Thomas, L., Soutter, J., Bamford, C., Steen, N., . . . Bond, J. (2001). Design and use of questionnaires: a review of best practice applicable to surveys of health service staff and patients. *Health Technol Assess*, 5(31), 1-256.
- McElhinney, B., Glenn, D., Dornan, G., & Harper, M. (2000). Episiotomy repair: Vicryl versus Vicryl rapide. *The Ulster Medical Journal*, 69(1), 27.
- McGuinness, M., Norr, K., & Nacion, K. (1991). Comparison between different perineal outcomes on tissue healing. *J Nurse Midwifery*, 36(3), 192-198.
- Metcalfe, A., Bick, D., Tohill, S., Williams, A., & Haldon, V. (2006). A prospective cohort study of repair and non-repair of second-degree perineal trauma: results and issues for future research. *Evidence Based Midwifery*, 4(2), 60-64.
- Metcalfe, A., Tohill, S., Williams, A., Haldon, V., Brown, L., & Henry, L. (2002). A pragmatic tool for the measurement of perineal tears. *British Journal of Midwifery*, 10(7), 412-417.
- Midwifery Council of New Zealand. (2005). Recertification programme: competence based practising certificates for midwives. Policy document, from <http://www.midwiferycouncil.health.nz/images/stories/pdf/Education-Prereg/Recertification%20Programme%20revised%20Feb%202014.pdf>
- Midwifery Council of New Zealand. (2007). Standards for approval of pre-registration midwifery education programmes and accreditation of education providers (pp. 1-38). Wellington: Midwifery Council of New Zealand.
- Midwifery Council of New Zealand. (2010). Midwifery workforce report 2009 (pp. 1-67). Wellington.

- Midwifery Council of New Zealand. (2013a). 2012 midwifery workforce survey (pp. 1-38). Wellington: Author.
- Midwifery Council of New Zealand. (2013b). Application guidelines for overseas midwives, from <http://www.midwiferycouncil.health.nz/application-guidelines-for-overseas-midwives/>
- Midwifery Council of New Zealand. (2014). Cannulation, phlebotomy and perineal suturing, from <http://www.midwiferycouncil.health.nz/images/stories/pdf/education-courses/by-subject/Cannulation%20Phlebotomy%20and%20Perineal%20Suturing.pdf>
- Miller, S. (2008). *First birth at home or in hospital in Aotearoa/New Zealand: intrapartum midwifery care and related outcomes*. Master of Midwifery. Victoria University of Wellington, Wellington.
- Ministry of Health. (2004). *Ethnicity data protocols for the health and disability sector*. Wellington: Author.
- Ministry of Health. (2007). *Primary maternity services notice 2007*. Wellington: Author.
- Ministry of Health. (2012a). Guidelines for consultation with obstetric and related medical services (referral guidelines). Wellington: Author.
- Ministry of Health. (2012b). Maternity consumer surveys 2011 (pp. 1-128). Wellington.
- Ministry of Health. (2012c). New Zealand maternity clinical indicators 2009: Revised June 2012. Wellington: Author.
- Ministry of Health. (2012d). Report on maternity 2010 (pp. 1-89). Wellington: Author.
- Moore, W., & James, D. (1989). A random trial of three topical analgesic agents in the treatment of episiotomy pain following instrumental vaginal delivery. *Journal of Obstetrics & Gynecology*, 10(1), 35-39.
- Morano, S., Mistrangelo, E., Pastorino, D., Lijoi, D., Costantini, S., & Ragni, N. (2006). A randomized comparison of suturing techniques for episiotomy and laceration repair after spontaneous vaginal birth. *J Minim Invasive Gynecol*, 13(5), 457-462.
- Morgan, S., Reichert, T., & Harrison, T. (2002). *From numbers to words. Reporting Statistical Results for the Social Sciences*. Boston Allyn & Bacon.
- Mota, R., Costa, F., Amaral, A., Oliveira, F., Santos, C., & Ayres de Campos, D. (2009). Skin adhesive versus subcuticular suture for perineal skin repair after episiotomy—a randomized controlled trial. *Acta Obstetricia Et Gynecologica Scandinavica*, 88(6), 660-666.
- Mousley, S. (2005). Audit of an aromatherapy service in a maternity unit. *Complementary Therapies in Clinical Practice*, 11(3), 205-210.
- Mutema, E. (2007). 'A tale of two cities': auditing midwifery practice and perineal trauma. *British Journal of Midwifery*, 15(8), 511-513.
- National Collaborating Centre for Women's and Children's Health. (2006). Routine postnatal care of women and their babies. Commissioned by the National Institute for Health and Clinical Excellence (NICE). London: RCOG Press.
- National Collaborating Centre for Women's and Children's Health. (2007). Intrapartum care: care of healthy women and their babies during childbirth. Commissioned by the National Institute for Health and Clinical Excellence (NICE). *Clinical Guideline* (Vol. 2011). London: RCOG Press.
- National Statistical Service. (2013). Sample Size Calculator, from <http://www.nss.gov.au/nss/home.nsf/pages/Sample+size+calculator>

- Nauta, M., Landsmeer, M., & Koren, G. (2009). Codeine-acetaminophen versus nonsteroidal anti-inflammatory drugs in the treatment of post-abdominal surgery pain: a systematic review of randomized trials. *American Journal of Surgery*, 198(2), 256-261.
- Navvabi, S., Abedian, Z., & Steen-Greaves, M. (2009). Effectiveness of cooling gel pads and ice packs on perineal pain. *British Journal of Midwifery*, 17(11), 724.
- New Zealand College of Midwives. (2000). Consensus statement. Complementary therapies (pp. 1-2). Christchurch: Author.
- New Zealand College of Midwives. (2007). Midwifery standards review. Christchurch: Author.
- New Zealand College of Midwives. (2008). Midwives handbook for practice (3 ed.). Christchurch: Author.
- New Zealand College of Midwives. (2009a). Consensus statement. Prescribing guidelines (pp. 1-2). Christchurch: Author.
- New Zealand College of Midwives. (2009b). Report on MMPO midwives care activities and outcomes 2005 (pp. 1-56). Christchurch.
- New Zealand College of Midwives. (2012). Midwifery and Maternity Provider Organisation maternity notes. Christchurch: Author.
- New Zealand College of Midwives. (2013). Report on New Zealand's MMPO midwives care activities and outcomes 2011 (pp. 1-52). Christchurch.
- Nissen, I., Jensen, K., & Öhrström, J. (1992). Indomethacin in the management of postoperative pain. *British Journal of Anaesthesia*, 69(3), 304-305.
- Nursing Council of New Zealand. (2012). The New Zealand nursing workforce survey. A profile of nurse practitioners, registered nurses and enrolled nurses 2011. Wellington.
- Obaro, V., Tabowei, T., & Loto, O. (2003). A multi-centre evaluation of the two-layered repair of postpartum perineal trauma. *Journal of Obstetrics and Gynaecology*, 23(1), 5-8.
- Odibo, H. (1997). Suturing of perineal trauma: how well are we doing - an audit. *British Journal of Midwifery*, 5, 690-693.
- Ong, C., Lirk, P., Tan, C., & Seymour, R. (2007). An evidence-based update on nonsteroidal anti-inflammatory drugs. *Clinical Medicine & Research*, 5(1), 19-34.
- Ong, C., Seymour, R., Lirk, P., & Merry, A. (2010). Combining paracetamol (acetaminophen) with nonsteroidal antiinflammatory drugs: A qualitative systematic review of analgesic efficacy for acute postoperative pain. *Anesthesia & Analgesia*, 110(4), 1170-1179.
- Oppenheim, A. (1992). *Questionnaire design, interviewing and attitude measurement* (2nd ed.). London: Continuum.
- Page, L. (2013). Research on midwifery continuity of care shows many advantages. *British Journal of Midwifery*, 21(10), 690-690.
- Pairman, S., Tracy, S. K., Thorogood, C., & Pincombe, J. (2010). *Midwifery: preparation for practice*: Churchill Livingstone.
- Papps, E., & Olssen, M. (1997). *Doctoring childbirth and regulating midwifery in New Zealand: A Foucauldian perspective*. Palmerston North: Dunmore Press.
- Peter, E., Janssen, P., Grange, C., & Douglas, M. (2001). Ibuprofen versus acetaminophen with codeine for the relief of perineal pain after childbirth: a randomized controlled trial. *Canadian Medical Association Journal*, 165(9), 1203-1209.
- Petersen, M. (2011). Review of interventions to relieve postpartum pain from perineal trauma. *The American Journal of Maternal Child Nursing*, 36(4), 241-245.

- Petrou, S., Gordon, B., Mackrodt, C., Fern, E., Ayers, S., Grant, A., . . . McCandlish, R. (2001). How cost-effective is it to leave perineal skin unsutured? *British Journal of Midwifery*, 9(4), 209-217.
- Punch, K. F. (2003). *Survey research: the basics*. London: Sage.
- Qualtrics Inc. (2012). Qualtrics (Version 12,018). Utah, USA: Author. Retrieved from <http://www.qualtrics.com/why-survey-software>
- Rajan, L. (1994). The impact of obstetric procedures and analgesia/anaesthesia during labour and delivery on breast feeding. *Midwifery*, 10(2), 87-103.
- Ramler, D., & Roberts, J. (1986). A comparison of cold and warm sitz baths for relief of postpartum perineal pain. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, 15(6), 471-474.
- Renfrew, M., Hannah, W., Albers, L., & Floyd, E. (1988). Practices that minimize trauma to the genital tract in childbirth. *Birth*, 25(3), 143-160.
- Rhode, M., & Barger, M. (1990). Perineal care: then and now. *Journal of Nurse-Midwifery*, 35(4), 220-230.
- Robinson, P., & Beattie, P. (2002). Perineal anatomy and episiotomy. Are episiotomies and repairs being performed correctly in NZ hospitals. *The New Zealand Medical Journal* 115(1150), 144.
- Rogerson, L., Mason, G., & Roberts, A. (2000). Preliminary experience with twenty perineal repairs using Indermil tissue adhesive. *European Journal of Obstetrics & Gynecology and Reproductive Biology*, 88(2), 139-142.
- Royal College of Midwives. (2012a). Evidence based guidelines for midwifery-led care in labour. Care of the perineum (4th ed., pp. 1-8). London.
- Royal College of Midwives. (2012b). Evidence based guidelines for midwifery-led care in labour. Suturing the perineum (4th ed., pp. 1-10). London.
- Royal College of Obstetricians and Gynaecologists. (2004). Methods and Materials Used in Perineal Repair. Guideline No. 23. London.
- Royal College of Obstetricians and Gynaecologists. (2007). Management of third and fourth degree perineal tears. Green-top guideline No. 29 (2nd ed., pp. 1-11). London.
- Royal Women's Hospital. (2012). Labour: Perineal trauma: Assessment, repair and safe practice, from <http://www.thewomens.org.au/MaternityClinicalPracticeGuidelines>
- Sachs, C. (2005). Oral analgesics for acute nonspecific pain. *American Family Physician*, 71(5), 913-918.
- Saddiqe, Z., Naeem, I., & Maimoona, A. (2010). A review of the antibacterial activity of *Hypericum perforatum* L. *Journal of Ethnopharmacology*, 131(3), 511-521.
- Salmon, D. (1999). A feminist analysis of women's experiences of perineal trauma in the immediate post-delivery period. *Midwifery*, 15(4), 247-256.
- Sandall, J., Soltani, H., Gates, S., Shennan, A., & Devane, D. (2013). Midwife-led continuity models versus other models of care for childbearing women. *Cochrane Database of Systematic Reviews*, 8. doi: 10.1002/14651858.CD004667.pub3.
- Sanders, J., Campbell, R., & Peters, T. (2002). Effectiveness of pain relief during perineal suturing. *BJOG: An International Journal of Obstetrics & Gynaecology*, 109(9), 1066-1068.
- Sanders, J., Peters, T., & Campbell, R. (2005). Techniques to reduce perineal pain during spontaneous vaginal delivery and perineal suturing: a UK survey of midwifery practice. *Midwifery*, 21(2), 154-160.

- Santos, J., Oliveira, S., Nobre, M., Aranha, A., & Alvarenga, M. (2012). A randomised clinical trial of the effect of low-level laser therapy for perineal pain and healing after episiotomy: A pilot study. *Midwifery*, 28(5), 653-659.
- Scheuren, F. (2004). *What is a survey* (2nd ed.). Washington: American Statistical Association.
- Schneider, Z., Elliott, D., & Whitehead, D. (2007). *Nursing & midwifery research: methods and appraisal for evidence-based practice*: Elsevier Australia.
- Scott, R., & Jennings, P. (1997). Rectal diclofenac analgesia after abdominal hysterectomy. *Australian and New Zealand Journal of Obstetrics and Gynaecology*, 37(1), 112-114.
- Sheikhan, F., Jahdi, F., Khoei, E., Shamsalizadeh, N., Sheikhan, M., & Haghani, H. (2011). Episiotomy pain relief: Use of avender oil essence in primiparous Iranian women. *Complementary Therapies in Clinical Practice*, 1-5.
- Sinclair, D. (1962). Perineal Ice-packs. *British Medical Journal*, 2(5317), 1473.
- Sleep, J. (1991). Midwives, research and childbirth. In S. Robinson & A. Thomson (Eds.), *Perineal care: a series of five randomised trials* (Vol. 2, pp. 199-251). London: Chapman and Hall.
- Sleep, J., & Grant, A. (1987). Pelvic floor exercises in postnatal care. *Midwifery*, 3(4), 158-164.
- Sleep, J., & Grant, A. (1988a). Effects of salt and Savlon bath concentrate post partum. *Nursing Times Occasional Paper*, 84, 55-57.
- Sleep, J., & Grant, A. (1988b). Relief of perineal pain following childbirth: A survey of midwifery practice. *Midwifery*, 4(3), 118-122.
- Sleep, J., Grant, A., Garcia, J., Elbourne, D., Spencer, J., & Chalmers, I. (1984). West Berkshire perineal management trial. *British medical journal (Clinical research ed.)*, 289(6445), 587.
- Smith, L., Price, N., Simonite, V., & Burns, E. (2013). Incidence of and risk factors for perineal trauma: a prospective observational study. *BMC pregnancy and childbirth*, 13(1), 59.
- Soh, A. (2004). Lower Genital Tract Trauma Report *Women's Health Division Annual Clinical Report 2004*. Christchurch: Christchurch Women's Hospital.
- Spellacy, M. (1963). A double blind control study of a medicated pad for the relief of episiotomy pain. *American Journal of Obstetrics and Gynaecology* 92, 272-274.
- Spendlove, Z. (2005). To suture or not to suture? Decisions, decisions, decisions. A grounded theory study exploring the decision-making processes of midwives regarding management of perineal trauma following spontaneous childbirth. *Evidence Based Midwifery*, 3(1), 45-50.
- Srimaekarat, T. (2011). Tramadol suppository versus placebo for the relief of perineal pain after perineorrhaphy: A randomized controlled trial in Thailand. *Journal of Medical Association of Thailand*, 94(1), 17-20.
- Statistics New Zealand. (2013). Household use of information and communication technology: 2012 (pp. 1-20). New Zealand.
- Steen, M. (2001). Do we care enough about perineal wounds? *British Journal of Midwifery*, 9(5), 316-320.
- Steen, M. (2005). 'I can't sit down' - easing genital tract trauma. *British Journal of Midwifery*, 13(5), 311.
- Steen, M., Briggs, M., & King, D. (2006). Alleviating postnatal perineal trauma: too cool or not to cool? *British Journal of Midwifery*, 14(5), 304.

- Steen, M., & Cooper, K. (1997). A tool for assessing perineal trauma. *Journal of Wound Care*, 6(9), 432-436.
- Steen, M., Cooper, K., Marchant, P., Griffiths-Jones, M., & Walker, J. (2000). A randomised controlled trial to compare the effectiveness of ice-packs and epifoam with cooling maternity gel pads at alleviating postnatal perineal trauma. *Midwifery*, 16(1), 48-55.
- Steen, M., & Marchant, P. (2001). Alleviating perineal trauma: the APT study. *RCM Midwives Journal*, 4(8), 256-259.
- Steen, M., & Marchant, P. (2007). Ice packs and cooling gel pads versus no localised treatment for relief of perineal pain: a randomised controlled trial. *Evidence Based Midwifery*, 5(1), 16-22.
- Sultan, A., Kamm, M., & Hudson, C. (1995). Obstetric perineal trauma: an audit of training. *J Obstet Gynaecol*, 15, 19-23.
- Sultan, A., Kamm, M., Hudson, C., Thomas, J., & Bartram, C. (1993). Anal-sphincter disruption during vaginal delivery. *New England Journal of Medicine*, 329(26), 1905-1911.
- Sultan, A., & Kettle, C. (2007). Diagnosis of perineal trauma. In A. Sultan, R. Thakar & D. Fenner (Eds.), *Perineal and Anal Sphincter Trauma* (pp. 13-19). London: Springer.
- Swain, J., & Dahlen, H. (2013). Putting evidence into practice: A quality activity of proactive pain relief for postpartum perineal pain. *Women and Birth*, 26(1), 65-70.
- Thiagamoorthy, G., Johnson, A., Thakar, R., & Sultan, A. (2014). National survey of perineal trauma and its subsequent management in the United Kingdom. *International Urogynecology Journal*, 1-7.
- Thom, D., & Rortveit, G. (2010). Prevalence of postpartum urinary incontinence: a systematic review. *Acta Obstetrica Et Gynecologica Scandinavica*, 89(12), 1511-1522.
- Thompson, E., Bishop, J., & Northstone, K. (2010). The use of homeopathic products in childhood: data generated over 8.5 years from the Avon Longitudinal Study of Parents and Children (ALSPAC). *Journal of Alternative and Complementary Medicine*, 16(1), 69-79.
- Tiran, D. (2003). Implementing complementary therapies into midwifery practice. *Complementary Therapies in Nursing and Midwifery*, 9(1), 10-13.
- Tohill, S., & Metcalfe, A. (2005). *Perineal tear assessment and the development of the Peri-Rule*. London: Quay Books.
- Tomlinson, L., Smallldridge, J., & McIver, G. (2012). Women's health oasis audit 2012 Auckland: Counties Manukau District Health Board.
- Toms, L., Derry, S., Moore, R., & McQuay, H. (2009). Single dose oral paracetamol (acetaminophen) with codeine for postoperative pain in adults. *Cochrane Database Systematic Reviews*(1). doi: 10.1002/14651858.CD001547.pub2.
- Toohey, S. (2003). Tear repairs: broadening an educational initiative. *O&G, The Royal Australian and New Zealand College of Obstetricians and Gynaecologists* 5(4), 273-276.
- Tracy, S., Welsh, A., Hall, B., Hartz, D., Lainchbury, A., Bisits, A., . . . Tracy, M. (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(1), 46-55.
- Trochez, R., Waterfield, M., & Freeman, R. (2011). Hands on or hands off the perineum: a survey of care of the perineum in labour (HOOPS). *International Urogynecology Journal*, 22(10), 1279 - 1285.

- Truell, A. (2003). Use of internet tools for survey research. *Information Technology, Learning, and Performance Journal*, 21(1), 31.
- Ullman, R., Yiannouzis, K., & Gomme, C. (2004). Testing a tool to assess perineal trauma. *British Journal of Midwifery*, 12(2), 93-100.
- Upton, A., Roberts, C. L., Ryan, M., Faulkner, M., Reynolds, M., & Raynes-Greenow, C. (2002). A randomised trial, conducted by midwives, of perineal repairs comparing a polyglycolic suture material and chromic catgut. *Midwifery*, 18(3), 223-229.
- Vague, S. (2003). *Midwives' experiences of working with women in labour: interpreting the meaning of pain*. AUT University.
- Vakilian, K., Atarha, M., Bekhradi, R., & Chaman, R. (2011). Healing advantages of lavender essential oil during episiotomy recovery: a clinical trial. *Complementary Therapies in Clinical Practice*, 17(1), 50-53.
- Valenzuela, P., Saiz Puente, M. S., Valero, J. L., Azorin, R., Ortega, R., & Guijarro, R. (2009). Continuous versus interrupted sutures for repair of episiotomy or second-degree perineal tears: a randomised controlled trial. *BJOG*, 116(3), 436-441.
- van Teijlingen, E., & Hundley, V. (2001). The importance of pilot studies. *Social Research Update*(35), 1-4.
- Vyvyan, H., & Hanafiah, Z. (1995). Patients' attitudes to rectal drug administration. *Anaesthesia*, 50(11), 983-984.
- Wagstaff, P. (2006). Surveys. In E. Cluett & R. Bluff (Eds.), *Principles and practice of research in midwifery* (2nd ed., pp. 93-116). Philadelphia: Churchill Livingstone Elsevier
- Walsh, D. (2007). *Evidence-based care for normal labour & birth: A guide for midwives*. London: Routledge.
- Way, S. (2012). A qualitative study exploring women's personal experiences of their perineum after childbirth: expectations, reality and returning to normality. *Midwifery*, 28(5), 712-719.
- Wickham, S. (2000). Perineal pampering-before, during and after birth. *MIDIRS Midwifery Digest*, 11(1), S23-S27.
- Wiersma, W. (2012). *The validity of surveys: online and offline*. Oxford: Oxford Internet Institute.
- Williams, A., Herron-Marx, S., & Hicks, C. (2007). The prevalence of enduring postnatal perineal morbidity and its relationship to perineal trauma. *Midwifery*, 23(4), 392-403.
- Williams, M., & Chames, M. (2006). Risk factors for the breakdown of perineal laceration repair after vaginal delivery. *American Journal of Obstetrics and Gynecology*, 195(3), 755-759.
- Wilson, A. (2011). Effectiveness of an educational programme in perineal repair for midwives. *Midwifery*, 1-12.
- Worth-Butler, M., Murphy, R., & Fraser, D. (1994). Towards an integrated model of competence in midwifery. *Midwifery*, 10(4), 225-231.
- Wright, K. (2005). Researching Internet based populations: Advantages and disadvantages of online survey research, online questionnaire authoring software packages, and web survey services. *Journal of Computer Mediated Communication*, 10(3), 00-00.
- Yildizhan, R., Yildizhan, B., Sahin, S., & Suer, N. (2009). Comparison of the efficacy of diclofenac and indomethacin suppositories in treating perineal pain after episiotomy or laceration. *Archives of Gynecology and Obstetrics*, 280(5), 735-738.

- Zahrani, S., Akbari, S., & Valaie, N. (2002). Comparison of the effect of betadine and water in episiotomy wound healing. *Feyz Journals of Kashan University of Medical Sciences*, 5(4).
- Zoomerang Survey Coach. (2006). Survey design checklist. United States: MarketTools. Retrieved from http://www.parkdatabase.org/files/documents/2006_Survey-Design-Checklist_Zoomerang.pdf