

**Midwives' experiences of Shoulder Dystocia and
investigation of its incidence rate:
An exploratory sequential mixed methods study**

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CERTIFICATE OF ORIGINAL AUTHORSHIP

I, Sonia Minoeee declare that this thesis, is submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the Faculty of Health at the University of Technology Sydney.

This thesis is wholly my own work unless otherwise referenced or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

This document has not been submitted for qualifications at any other academic institution. This research is supported by the Australian Government International Research Training Program.

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Publications and Presentations Associated with This Thesis

This thesis is a compilation of published/ publishable manuscripts and thesis chapters. Four manuscripts have been published (Appendix 1). The published manuscripts include 1) a study protocol relevant to the topic of this thesis (Appendix 1) 2) a systematic scoping review (chapter two) and 3) two results chapters (chapters four and five). Findings of this thesis have also been presented at three virtual conferences (due to the outbreak of the Covid-19 pandemic in 2020-2021) (Appendix 2) and two UTS student forums/conference.

Publications

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- 1- Minooe S, Cummins A, Foureur M, Travaglia J. Long-term consequences of traumatic birth experiences for midwives. London Maternity and Midwifery Festival. January 2021 (virtual conference- oral presentation).
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- 4- Minooe S, Cummins A, Foureur M, Travaglia J. Long term impacts of traumatic birth experiences on clinical practice of midwives (Midwives' experiences of births complicated with shoulder dystocia). Faculty of Health, UTS, Research Student Conference. Spring 2020 (virtual conference- poster presentation)
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Abbreviations

- ABS:** Australian Bureau of Statistics
- ACM:** Australian College of Midwives
- ACOG:** American College of Obstetricians and Gynaecologists
- ACT:** Australian Capital Territory
- AIHW:** Australian Institute of Health and Welfare
- ALSO:** Advanced Life Support in Obstetrics
- APDC:** Admitted Patients Data Collection
- APGAR:** Appearance, Pulse, Grimace, Activity, and Respiration
- BMI:** Body Mass Index
- CI:** Confidence Interval
- EAP:** Employee Assistance Program
- GDM:** Gestational Diabetes Mellitus
- Gm:** Gram
- HBDI:** Head-to-Body Delivery Interval
- HIE:** Hypoxic-Ischaemic Encephalopathy
- HREC:** Human Research Ethics Committee
- IEO:** Index of Education and Occupation
- IER:** Index of Economic Resources
- IRSAD:** Index of Relative Socio-economic Advantage and Disadvantage
- IRSD:** Index of Relative Socio-economic Disadvantage
- LHD:** Local Health District
- LMIC:** Low and Middle Income Countries
- MDC:** Midwives Data Collection
- NICE:** National Institute for Health and Care Excellence
- NICU:** Neonatal Intensive Care Unit
- NSW:** New South Wales
- NT:** Northern Territory
- OR:** Odds Ratio
- PDC:** Perinatal Data Collection

PTG: Post-Traumatic Growth

PTSD: Post-Traumatic Stress Disorder

PROMPT: Practical Obstetric Multi-Professional Training

RANZCOG: Royal Australian and New Zealand College of Obstetricians and Gynaecologists

RCOG: Royal College of Obstetricians and Gynaecologists

RCT: Randomized Controlled Trial

RDMP: Research Data Management Plan

SCN: Special Care Nursery

SD: Shoulder Dystocia

SEIFA: Socio-Economic Indexes for Areas

SPSS: Statistical Package for the Social Sciences

SSA: Site Specific Assessment

STS: Secondary Traumatic Stress

UK: United Kingdom

US: United States of America

UTS: University of Technology Sydney

WHELM Study: Work, Health and Emotional Lives of Midwives Study

Glossary

Avoidance (in PTSD): Escaping from anything (thoughts, feelings, places, conversations, situations) which reminds the individual of the trauma.

Brachial plexus palsy: Injury of the neonate's brachial plexus at birth which may include Erb-Duchenne palsy (damage to the C5-6 nerve roots) or Klumpke palsy (damage to the C8-T1 nerve roots).

Burnout: Physical and emotional exhaustion due to chronic occupational stress.

Compassion fatigue: A state in which the clinician feels less empathic with the patient¹ and their sense of satisfaction with work diminishes.

Crowning: Emergence of the baby's head through the vaginal opening until it stays stationary and does not retract with uterine contractions.

Defensiveness (defensive practice): Clinician's attempt to avoid litigation through performing procedures which reduce medical uncertainty, but may not be appropriate.

Emotion work/ Emotional labour: Regulating emotions to fulfil organisational goals.

Fourth degree perineal tear: An injury to the rectal mucosa during vaginal birth.

Gaskin manoeuvre: Moving the labouring woman to her hands and knees.

Head-to-body delivery interval: The interval between the extraction of the baby's head and shoulders during a vaginal birth.

Hyperarousal (in PTSD): One of the criteria for the diagnosis of PTSD which is defined as hypervigilance and a state of exaggerated startle response.

Hypoxic ischemic encephalopathy: Serious neonatal brain injury caused by oxygen deprivation during prenatal, intrapartum or postnatal periods.

Iatrogenic injury: Injuries caused by medical treatment or the application of medical devices.

Intrusion: Recurrent involuntary distressing memories in PTSD.

Macrosomia: Birthweight of 4,000 gram or more.

¹ The word 'patient' is used only to refer to broad definitions which include all people regardless of their gender. Throughout the thesis, except for broad definitions, the word 'woman' is used to refer to women during the period of pregnancy, labour and postpartum.

McRoberts and suprapubic pressure manoeuvres: Hyperextending the birthing woman's legs onto her abdomen and simultaneously providing suprapubic pressure to assist the fetus in adducting the arms closer to the body in an attempt to release the impacted shoulders

Perineal trauma: Spontaneous or intentional (episiotomy) injury to the perineum during childbirth.

Posterior Arm Removal Manoeuvre: Grasping the hand, moving the arm gently in a sweeping motion across the fetal chest, over the head and outside the vagina.

Postpartum haemorrhage: Estimated blood loss of ≥ 500 mL in vaginal birth or $\geq 1,000$ mL in caesarean section.

Post-traumatic growth: Positive transformation in the aftermath of challenging events.

Post-traumatic stress disorder (PTSD): A mental disorder which develops due to failure in recovery after a traumatic event.

Primary traumatic stress: Stress due to direct experience or witness of trauma.

Reverse Woods Screw Manoeuvre: Performed following an unsuccessful Woods Screw manoeuvre by rotating the fetal body in the opposite direction by placing the fingers behind the posterior scapula.

Rubin Manoeuvre: Placing fingers behind the anterior scapula and attempting to rotate the baby forward so that the shoulders are more likely to be in an oblique position.

Secondary traumatic stress: Clinicians' stress due their knowledge of others' trauma and their desire to help them.

Second victim: Healthcare professionals who are involved in a medical error, a patient safety incident or an unexpected health event and as a result of the incident they are personally and/or professionally affected.

Symphysiotomy: Mechanical widening of the pelvic outlet by separating the pubic symphysis.

Third degree perineal tear: An injury to the anal sphincter muscle during vaginal birth.

Transient femoral neuropathy: Transient femoral nerve injury due to the pressure from the overlying inguinal ligament during the McRoberts' manoeuvre.

Woods Screw Manoeuvre: Placing fingers of one hand behind the fetal anterior scapula, and fingers of the other hand in front of the posterior arm, and attempting to rotate the baby in a counter-clockwise direction.

Zavanelli manoeuvre: The clinician's hand pushes the head of the partially born fetus back into the vagina, and extracts the baby by caesarean section.

Abstract

Introduction

Shoulder dystocia (SD) is known as one of the most traumatic birth experiences for midwives. Experience of a traumatic birth such as SD may cause emotional disturbances or in severe cases, mental health disorders for clinicians. It is well established that emotions can influence behaviours. However, evidence is limited on the professional behavioural consequences for midwives who experience births complicated by SD. This thesis explored the experiences of midwives regarding SD and the potential impact of such births on their clinical practice. In addition, I investigated the incidence and trends of SD, its risk factors and outcomes at one tertiary referral hospital in New South Wales (NSW), Australia over the period 2013-2018.

Methods

A two-phase sequential exploratory mixed methods study was conducted. The first phase included a qualitative descriptive study that consisted of semi-structured telephone/Zoom interviews with midwives who had experienced at least one case of SD in their career. A purposive sampling method was employed. Midwives were invited to the study through an invitation email sent by the Australian College of Midwives to its members. Thematic data analysis with an inductive approach was used to analyse the data. The second phase was a retrospective medical record review using de-identified data from one tertiary referral hospital in Sydney, NSW. Descriptive and inferential statistics were used to analyse data using IBM SPSS 27 software.

Results

For the first phase, a total of 25 midwives participated in the study. The core themes that emerged from the data were labelled 1) an unforgettable birth; a wake-up call 2) putting on a brave face 3) from passion to caution 4) factors worsening the experience 5) factors soothing the experience 6) towards the growth zone, and 7) I am resilient enough to recover. Midwives viewed SD as a traumatic birth associated with panic and anxiety. Following the

event, the pathways of thinking and practising were not similar among all midwives. Fear of repetition of the incident and negative thoughts after the experience shifted some midwives towards catastrophic thinking and hypervigilant behaviours. However, for some other midwives, SD was viewed as an opportunity to grow and to actualise their potential midwifery skills. A range of factors determined how midwives perceived SD and how they dealt with the event. These influencing factors included the model of care, the birth outcome, the midwives' sense of being judged or valued, having faith in birth normality and the workplace culture. Results from the second phase of the study showed that the overall incidence of SD was 6% among live births. Diagnosis of mild SD showed an increasing trend from 2013 to 2018. Binary logistic regression showed that SD was significantly associated with some antenatal and intrapartum risk factors, including post-term pregnancy (OR: 1.36, 95% CI: 1.29-1.44), maternal pre-existing diabetes/ Gestational Diabetes Mellitus (GDM) (OR: 1.57, 95% CI: 1.05-1.27), labour induction/ augmentation (OR: 1.63, 95% CI: 1.40-1.90) and duration of second stage of labour (more than two hours) (OR: 2.80, 95% CI: 2.40-3.27). The main maternal and neonatal adverse outcomes associated with SD were higher rate of postpartum haemorrhage (p-value <0.0001), APGAR score < 7 at the 1st and 5th minute (p-value <0.0001), and higher rates of neonatal resuscitation and admission to Neonatal Intensive Care Unit (NICU) (p-value <0.0001).

Conclusion

This study provided a snapshot of the incidence of shoulder dystocia at one metropolitan Australian hospital but importantly showed the insights about the emotional and professional impact of SD on midwives. It demonstrated that midwives' emotions (from previous experiences) can affect how they perceive normal birth, how they practise at birth and how they diagnose SD. The findings highlighted the need for further workplace and collegial support. Further, midwives are recommended to take up opportunities for ongoing reflection on their experiences and clinical performance to check if (un)consciously, they may have been affected by previous traumatic birth experiences. In addition, the increasing trend of SD is an alarm signal that suggests provision of further supports for midwives who may frequently be exposed to SD-complicated births are necessary.

Chapter One

Introduction

Shoulder dystocia (SD) is defined as failure to deliver the baby's shoulders with gentle traction on the neck after the birth of the head (American College of Obstetricians and Gynaecologists (ACOG) 2017). Shoulder dystocia is known as one of the top birth emergencies feared by midwives (Dahlen & Caplice 2014) and is considered a traumatic birth by many clinicians including both obstetricians and (nurse-) midwives (Beck 2013; Kumar & Anthony 2002). Previous studies have shown a higher rate of stress disorders in midwives who had experienced perinatal trauma (Sheen, Spiby & Slade 2015). Fear, guilt, anxiety, grief, numbness, negative mood, helplessness and compassion fatigue are among the most common feelings experienced by midwives after birth trauma (Beck 2020).

Exposure to work-related stress can lead to a state of emotional and physical exhaustion which is known as burnout (Maslach, Schaufeli & Leiter 2001; Sheen, Spiby & Slade 2015). Many studies have confirmed the high level of burnout among midwives in different countries, including Australia (Creedy et al. 2017), New Zealand (Dixon et al. 2017), the United Kingdom (UK) (Hunter et al. 2019), Canada (Stoll & Gallagher 2019), Sweden (Hildingsson, Westlund & Wiklund 2013), Norway (Henriksen & Lukasse 2016), Greece (Katsantoni et al. 2019), Africa (Muliira & Ssendikadiwa 2016; Rouleau et al. 2012), and Israel (Cohen et al. 2017). An internationally well-known study in this regard is the WHELM Study (Work, Health and Emotional Lives of Midwives Study) which explored the relationship between emotional well-being and working environment of midwives (Hunter et al. 2017). The study originated in Australia and has collaborating arms in the UK, New Zealand, Sweden, Canada and Norway. Results of this study have confirmed a high level of stress, anxiety, depression and burnout among midwifery personnel. Studies have shown that emotional exhaustion is more severe in young, newly graduated midwives who have less working experience (Hildingsson & Fenwick 2015; Hunter et al. 2019). The burden of stressful emotions is even higher for those midwives who care for labouring women (Hunter 2002).

Working in a stressful profession and experiencing continuous fear and anxiety has been shown to have a negative impact on the practice of clinicians (Heath 2014). This can include an increase in defensiveness on the part of the clinician, which has been extensively studied in relation to practice change among clinicians after their experience of adverse patient events (U.S. Congress Office of Technology Assessment 1994). In defensive practice, clinicians attempt to avoid litigation through performing procedures which reduce medical uncertainty, but may not be appropriate for the patient/client (U.S. Congress Office of Technology Assessment 1994). However, the pathway after traumatic events is not limited to negative outcomes such as defensive behaviours. In the general population, as well as among healthcare professionals, trauma has been referred to as an opportunity for positive personal, spiritual and professional change (Taubman-Ben-Ari & Weintroub 2008; Tedeschi & Calhoun 2004).

Despite many studies on the impact of birth trauma in women as care-receivers, few have explored it among midwives, as care providers. Even fewer studies have explored the specific impact of SD which is among the top traumatic birth emergencies for midwives (Beck, LoGiudice & Gable 2015), and can potentially be associated with adverse outcomes described previously. Understanding these outcomes will help maternity services to better support the affected midwives, and to develop better management strategies for the traumatised staff. The results will also inform midwives about the pathways which may occur after trauma, and potentially assist them to not only cope more effectively with the outcomes, but to thrive after the incident.

This introductory chapter presents the epidemiological information on SD, including its definition, incidence, risk factors, outcomes and management. Next, with the perspective of SD as a traumatic birth, I present information on the concept of traumatic birth and the impact it has on the personal and professional lives of midwives. This chapter establishes the rationale for the thesis and the significance of conducting this research.

1.1 Epidemiological profile of Shoulder Dystocia

1.1.1 Definition and Diagnosis of Shoulder Dystocia

In a normal cephalic-presentation birth, the fetal cardinal movements during labour result in external rotation of the head, internal rotation of the shoulders and body expulsion (Cunningham et al. 2014). Restitution of the head and external rotation indicate that the fetal bisacromial diameter has rotated into the anterior-posterior diameter of the pelvis (Cunningham et al. 2014), facilitating the birth of the shoulders (Marshall & Raynor 2014). In certain cases such as fetal trunk mal-rotations, large bisacromial diameter or macrosomia (Gherman et al. 2006), this normal process can be impeded by obstruction of the fetal anterior shoulder behind the maternal symphysis pubis or, rarely, the posterior shoulder on the sacral promontory, which requires further assistance to be dislodged (Royal College of Obstetricians and Gynaecologists (RCOG) 2012). This impaction is referred to as SD, defined as the need for additional obstetric manoeuvres, more than applying gentle traction after birth of the fetal head (Cohen et al. 2017). According to the practice bulletin of the American College of Obstetricians and Gynaecologists (ACOG) SD is defined as the need for manoeuvres to free the impacted shoulder when gentle traction on the neck is not successful (ACOG 2017).

In practice, variations may exist between clinicians and institutions on birthing the shoulders. Evidence is scarce on the management of shoulders in the past decades, however, it appears that, prior to 1930, the common method of birth of the shoulders was the expectant approach (Mortimore & McNabb 1998) in which birth attendants avoided applying traction to the neck once the head was born; instead, they waited for the spontaneous emergence of the shoulders (Edgar 1916; Galabin 1886; Mortimore & McNabb 1998) (the so-called two-step method) (Zhang et al. 2016). Some reports show that an expectant approach may reduce the rate of shoulder impaction by allowing the spontaneous adjustment of the shoulders as they engage into the pelvis (Hart 1997; Kotaska & Campbell 2014; Locatelli et al. 2011; Strobelt et al. 2006). However, there is another approach in which the birth is expedited by manually restituting the head-to-shoulders alignment, and then applying a gentle traction on the neck (the so-called one-step method) (Welch 1997). In normal situations this latter approach is not

the recommended practice. The current guide from the World Health Organization advocates waiting for the spontaneous rotation of the shoulders within 1-2 minutes after the head is born (World Health Organization, United Nations Population Fund, World Bank & United Nations Children's Fund (UNICEF) 2015); if delayed, and after ensuring that restitution has occurred (Marshall & Raynor 2014), the accoucheur can apply gentle pressure to deliver the anterior shoulder (World Health Organization, United Nations Population Fund, World Bank & United Nations Children's Fund (UNICEF) 2015). This approach provides time for the external rotation of the head and restitution of the shoulders into the anterior-posterior alignment of the mother's pelvis.

Based on the definition presented above, the diagnosis of SD relies on the clinician's subjective assessment, and decision on the degree of difficulty in birth of the shoulders depends on the birth attendant's assessment, knowledge and skills. As a result of this subjectivity, there is notable variation in the reported incidence of SD (Gherman et al. 2006).

In 1995, Spong et al. proposed an objective definition for SD and added a time-based component to the definition. They measured the intervals of different phases of the second stage of labour from crowning of the head (the largest diameter of the presenting fetus to appear at the maternal introitus) to completion of the birth. The authors defined SD as a prolonged head-to-body delivery interval (HBDI) which exceeds the mean plus two standard deviations of 60 seconds (Spong et al. 1995). This definition has been included in some maternity care guidelines, such as RCOG and Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG). However, some further studies have reported longer interval times than the one proposed by Spong et al, for example the studies by Locatelli et al. 2011 and Zhang et al. 2016. A number of studies have found HBDI prolongation as a predictor of low APGAR (Appearance, Pulse, Grimace, Activity, and Respiration) score (Allen et al. 2002) and hypoxic ischemic encephalopathy (HIE) (Leung et al. 2011b), whereas, some others have found poor correlation between HBDI and these neonatal outcomes (Locatelli et al. 2011; Stallings, Edwards & Johnson 2001). Therefore, the predictive value of HBDI in regards to adverse neonatal outcomes is controversial.

As well as the two definitions presented above, there are some clinical signs which are suggestive, but not diagnostic, of SD which include bobbing of the head (the head coming down towards the introitus but retracting back after the contraction), slow emergence of the face and the chin, bulging of the fetal cheeks and retraction of the head against the perineum (known as the ‘turtle sign’) (ACOG 2017; Chapman 2018; Macdonald & Johnson 2017).

1.1.2 Risk Factors

There are some antenatal and intrapartum factors which may increase the risk of SD (Ouzounian 2016). These include maternal age >35 years; previous SD; maternal diabetes; macrosomia; prolonged/arrested labour, induction/augmentation and operative delivery (RCOG 2012; Zhang et al. 2018). Macrosomia is considered as the major risk factor, however, not all births of fetuses with macrosomia will result in SD (Mansor, Arumugam & Omar 2010). Around 25-60% of SDs occur in neonates without macrosomia weighing <4000 gm (Sacks & Chen 2000). The co-existence of multiple fetomaternal risk factors such as maternal gestational diabetes (GDM), fetal weight (4000-4500g) and operative delivery influences the incidence rate (Baxley & Gobbo 2004). For example, the incidence increases from 0.6-1.4% to 5-9% with increments in fetal weight from 2500-4000 grams to 4000-4500 grams (Baxley & Gobbo 2004). Maternal obesity and excessive weight gain during pregnancy are known as other risk factors (Dandolu et al. 2005; Hill & Cohen 2016). However, in many of cases, SD occurs in the absence of any recognised risk factors.

1.1.3 Incidence

There is high variation in the incidence of SD across different countries, depending on the criteria used, the populations studied, and the consistency of documentation (Athukorala, Middleton & Crowther 2006; Cohen et al. 2017; Gherman et al. 2006). The increased awareness of clinicians about diagnosing SD is also important in increasing the reporting of more cases of SD (MacKenzie et al. 2007). Accurate documentation of HBDI is a matter of debate, since the interval is more likely to be overestimated due to the stress of the emergency (Crofts et al. 2008). Despite limited data on the worldwide trend of SD, reports from the UK (from 1991 to 2005) (MacKenzie et al. 2007) and United States (US) (since 1980s) (Iffy,

Varadi & Papp 2015) indicate an increasing rate of SD. In the US, a 10-fold rise from 0.2% in 1979 to 2.11% in 2003 has been documented (Dandolu et al. 2005). A study by Iffy et al (2015), comparing the trend of SD incidence in the US and 11 other countries across four continents (Iffy, Varadi & Papp 2015), revealed that while the incidence has reduced or remained stable in most countries (from 1978 to 2012), it has increased fourfold in the US (from 1957 to 2005). Their study reported several factors potentially responsible for the rapidly increasing rate of SD over the past three decades with the one-step approach to birth named as one of the main risk factors. The one-step approach (gentle traction on the baby's neck once the head is born without waiting for the next uterine contraction, as described in section 1.1.1), is reported to be a common practice in many US hospitals (Donegan 2021).

A recent retrospective study conducted in Finland, reported the incidence of SD as 0.18% with an increasing trend from 0.10% to 0.32% between 2004 and 2017 (Heinonen et al. 2021). In contrast, there are also reports which have shown a decline in the rate of SD. A case-control study conducted in Israel reported a decrease from 0.3% in 1988 to 0.1% in 2014 (Grossman et al. 2020). As is clear, there is high variability among the reported rates; however, when all these numbers are put together, the incidence may range from around 0.2% to 3% in different countries (Grobman 2013).

Currently there is no official report on the incidence or time trends of SD in Australia. Anecdotal reports from the Australian Maternity Information Matrix (MIM) indicate an increase in the incidence from 2.7% in 2012 to 3.4% in 2017 (MIM 2018). The Australian national data show a rise in pregnancies complicated by diabetes (Australian Bureau of Statistics 2017) which may increase the risk of SD. The rising trends of diabetes and obesity in pregnancy are currently global public health problems (Behboudi-Gandevani, Parajuli & Vaismoradi 2021; Chen, Xu & Yan 2018; Hashim et al. 2019). These risk factors can both increase the risk of babies suspected to have macrosomia, and subsequently the risk of births complicated by SD (Kc, Shakya & Zhang 2015).

1.1.4 Outcomes

Most births complicated by SD can be relieved without maternal or neonatal physical morbidity; however, severe cases may leave permanent sequelae for the mother or the neonate. Major maternal complications include postpartum haemorrhage, perineal trauma, and third- and fourth-degree tears (Dajani & Magann 2014). Manoeuvres that require fetal manipulation during SD may increase the risk of maternal anal sphincter injuries (Gachon et al. 2016). Although rare, use of the McRoberts manoeuvre may subject women to symphyseal separation and transient femoral neuropathy (Gherman et al. 1998b). Less commonly, heroic manoeuvres such as the Zavanelli or symphysiotomy can cause cervico-vaginal lacerations, uterine rupture, bladder injury or urinary incontinence (Goodwin et al. 1997; Sandberg 1999). The psychological impacts of the condition also need to be considered, as women experiencing SD report feeling helpless and feeling that they had been assaulted during the birth (Beck 2013).

Neonatal outcomes can be even more severe than maternal complications, as they may cause death of the baby or leave life-long injuries (Gherman, Ouzounian & Goodwin 1998a). The newborn may experience iatrogenic injuries from attempts at freeing the impacted shoulder. Of these injuries, clavicular/humeral bone fractures are minor complications that usually resolve within four weeks without further consequences (Dajani & Magann 2014). However, brachial plexus palsy is the main adverse outcome, with the global incidence of 1.3-1.5 per 1000 births (Chauhan, Blackwell & Ananth 2014). It typically occurs when excessive lateral traction is applied while extracting the shoulders, and depending on the degree of the nerve injury, the prognosis varies from total recovery to permanent palsy (Abzug & Kozin 2014). It is, therefore, associated with costly and long-term treatments (Brauer & Waters 2007). Another major adverse outcome is hypoxic ischaemic encephalopathy (HIE) which is a rare but serious morbidity attributed to prolonged HBDI. The risk of HIE in HBDI <5 minutes is low (0.5%) compared to the HIE rate of 23.5% in prolongations ≥ 5 minutes (Leung et al. 2011b).

1.1.5 Severity of Shoulder Dystocia

Severity of SD is classified based on the types of manoeuvres which are used to release the shoulders (Table 1). The decision on when to apply the manoeuvres, especially the first-line manoeuvres such as McRoberts, is based on the subjective diagnosis of the clinician. Therefore, diagnosis of SD, in particular mild degree SD, is a subjective issue.

Table 1. Classification of the severity of shoulder dystocia

Grade*	Manoeuvres
Mild	McRoberts manoeuvre, Suprapubic pressure
Moderate	Rubin, Woods or reverse Woods manoeuvre, posterior shoulder delivery
Severe	Fracture clavicle or humerus
Undeliverable	Cephalic replacement and abdominal rescue
*Source: the Shoulder Dystocia Guideline; The Royal Women’s Hospital (Victoria Australia) (2019)	

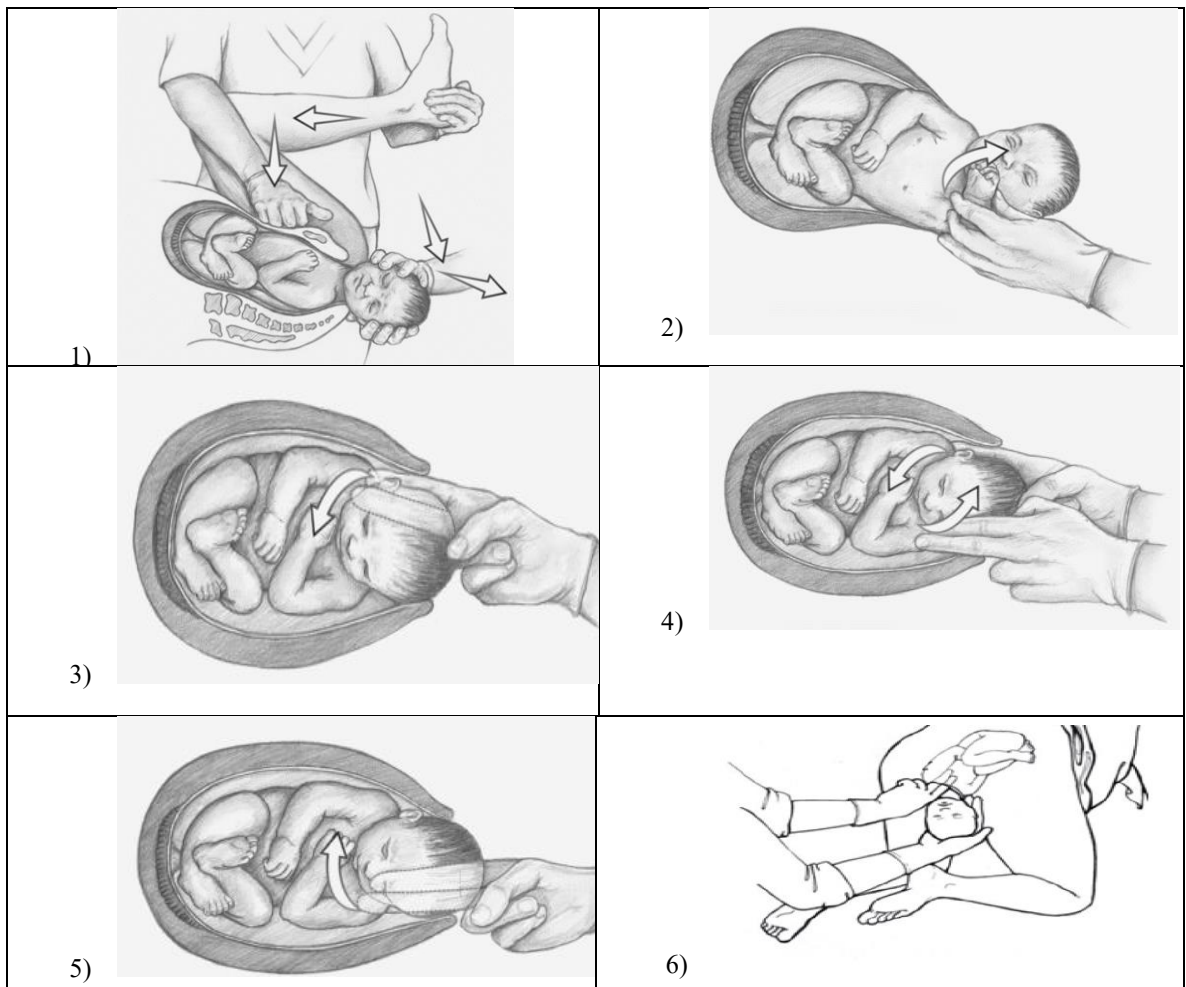
1.1.6 Management of Shoulder Dystocia

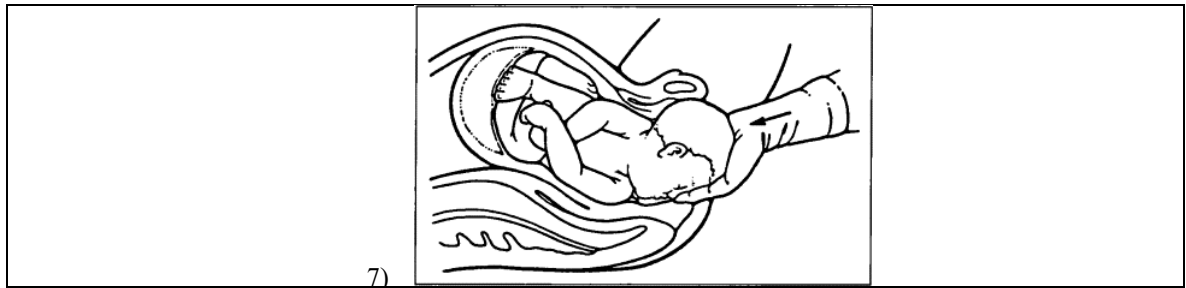
As described above, fetal shoulders can typically be extracted based on either the one-step delivery or the two-step approach to birth (Hishikawa et al. 2020; Zanardo et al. 2013). Previous studies have examined the pros and cons of these two methods. Generally, the one-step approach may be associated with a lower decline in the umbilical artery pH, whereas using the two-step process may reduce the incidence of SD (Hishikawa et al. 2020). However, in trapped shoulders, the importance of choosing the right approach becomes more important. Handling of SD requires simultaneous rapidity and gentleness. O’Leary (2009), in his book *Shoulder dystocia and birth injury*, referred to SD as the obstetrician’s Achilles’ heel (O’Leary 2009), which indicates the potential vulnerability of clinicians in managing SD. Shoulder dystocia is considered one of the most controversial obstetric problems in forensic medicine due to the permanent disabilities it may cause for the mother or baby (Habek & Cerovac 2020). Suboptimal management and/or poor documentation of births complicated by SD are the main reasons for litigation after SD (Habek & Cerovac 2020; Zuckerwise et al. 2020).

The following section describes the recommended approaches to manage SD based on the ACOG and RCOG guidelines (ACOG 2017; RCOG 2012). When SD is diagnosed, the

starting and the ending times should be documented precisely. The woman should be instructed not to push. Fundal pressure should not be used as it may cause further impaction of the shoulders and even lead to the rupture of the uterus. While extra help is summoned, the obstetric manoeuvres should be started. The manoeuvres to release the shoulders are designed to increase the functional size of the bony pelvis and/or decrease the bisacromial diameter of the fetus (Advanced Maternal and Reproductive Education (AMaRE) 2013).

Manoeuvres include 1) first-line manoeuvres (McRoberts and suprapubic pressure), and 2) second line manoeuvres (removal of the posterior arm, Rubin, Woods corkscrew, Gaskin and Zavanelli) (ACOG 2017) (Images 1-7).





Images 1-5. Obstetric manoeuvres

1) McRoberts Manoeuvre (hyperextending the birthing woman's legs onto her abdomen and simultaneously providing suprapubic pressure to assist the fetus in adducting the arms closer to the body in an attempt to release the impacted shoulders) 2) Posterior Arm Removal Manoeuvre (grasping the hand, moving the arm gently in a sweeping motion across the fetal chest, over the head and outside the vagina. This manoeuvre changes the fetal diameters and often enables a subsequent manual rotation to be successful) 3) Rubin Manoeuvre (placing fingers behind the anterior scapula and attempting to rotate the baby forward so that the shoulders are more likely to be in an oblique position) 4) Woods Screw Manoeuvre (Placing fingers of one hand behind the fetal anterior scapula, and fingers of the other hand in front of the posterior arm, and attempting to rotate the baby in counter-clockwise direction) 5) Reverse Woods Screw Manoeuvre (rotating the fetal body in the opposite direction by placing the fingers behind the posterior scapula) 6) Gaskin manoeuvre (moving woman to her hands and knees, and applying a gentle downward traction on the posterior shoulder or an upward traction on the anterior shoulder) 7) Zavanelli manoeuvre (returning the head of the partially born fetus to the vagina, and then extracting the baby by caesarean section) (Adapted from Camune & Brucker 2007; Global Library of Women's Medicine 2021).

The easiest and the most effective manoeuvre is McRoberts, in which the maternal legs are grasped and thighs are sharply flexed back against the abdomen (Image 1). If the first-line manoeuvres are not successful, removal of the posterior arm is recommended (Image 2), which is shown to be a highly successful manoeuvre. It is estimated that 95% of the impacted shoulders would be released following these manoeuvres (Leung et al. 2011a). If shoulders are still impacted, the rotational manoeuvres should be used such as Rubin, Woods or reverse Woods manoeuvres (Image 3-5). A less frequent manoeuvre is the posterior axilla sling traction in which a catheter is used to create a sling around the posterior shoulder. Sometimes the clinician may intentionally fracture the baby's clavicle in order to extract the shoulder; however, it is a difficult procedure and may increase the risk of injury to the underlying structures.

Use of episiotomy in SD is advocated in order to provide additional access through the soft tissue of perineum and vagina to perform the manoeuvres. A further manoeuvre is known as the Gaskin or all-fours in which the labouring woman is moved to her hands and knees, and a gentle traction is applied on the posterior shoulder (the shoulder against the maternal sacrum) or an upward traction on the anterior shoulder (the shoulder against the maternal pubic bone) (Bruner et al. 1998) (Image 6). This technique was introduced by Ina May Gaskin in 1976 who had learned it from a Belizean midwife who had, in turn, learned it from Mayan midwives in the highlands of Guatemala. Few researchers have assessed the efficacy of this manoeuvre. However, the technique appears to be safe and effective with minor side effects (Bruner et al. 1998).

Axillary traction is also an internal manoeuvre which, in one study, has been reported as an effective manoeuvre to manage SD. Ansell et al. (2019) conducted a retrospective review of medical records among women who were diagnosed with SD in Counties Manukau Health, Auckland during 2006-2013. The researchers compared the effectiveness of three different internal manoeuvres including 1) axillary traction (all manoeuvres that were documented as axillary traction or removal of the posterior shoulder) 2) posterior arm delivery 3) internal rotational manoeuvres (Woods' screw, reverse Woods' screw and/or internal rotation). The success rate of internal manoeuvres were 95.8%, 85.7% and 25.7%, respectively. Based on the high success rate, the authors recommended axillary traction to be considered as the first internal manoeuvre attempted when SD happens.

Evidence is not conclusive regarding the sequence of manoeuvres. Guidelines recommend repeating the manoeuvres until they are successful; however, in some cases vaginal birth may not be possible. In severe cases where the shoulders cannot be freed by these manoeuvres, more heroic procedures may be needed such as performing the Zavanelli manoeuvre. This is a manoeuvre which is performed in desperate situations where all the commonly used manoeuvres have failed. In Zavanelli, the clinician manually returns the head of the partially born fetus to the vagina, and then extracts the baby by caesarean section (Sandberg 1985), which indeed increases the risk of maternal morbidity and neonatal morbidity and mortality (Sandberg 1999) (Image 7).

In the next section, the traumatic aspects of SD are discussed, along with the post-traumatic outcomes which may affect midwives.

1.2 Traumatic Clinical Experiences

More than two decades ago, patients and their families were considered as the main victims of adverse clinical events, and little attention was paid to the burden of trauma on health care providers. In 2000, Wu introduced the term ‘second victim’ which refers to the health professionals who are involved in a medical error, a patient safety incident or an unexpected health event and as a result are personally and/or professionally affected (Wu 2000). Guilt, shame, anger, frustration, psychological distress, and fear have been described as common feelings among second victims (Seys et al. 2013). Severely affected clinicians may develop Post-Traumatic Stress Disorder (PTSD) (Rassin, Kanti & Silner 2005). Victims may relive the event and suffer from insomnia, nightmares and depressive disorders (Seys et al. 2013). Some reports show that the intensity of the clinician’s reaction towards the adverse event is associated with poor patient outcome and clinician’s level of responsibility (Engel, Rosenthal & Sutcliffe 2006).

A clinical traumatic event may affect clinicians regardless of their gender. However, studies show that reporting distress, fear of losing confidence, and concern about being blamed after adverse medical incidents may be higher among female second victims compared to male second victims (Seys et al. 2013). A study among Dutch obstetricians-gynaecologists with a majority of participants who were female (65.3% versus 34.7% male), reported a high prevalence of PTSD among the participants (Baas et al. 2018). Compared to men, female physicians, in particular those with family responsibilities, may be at higher risk of burnout caused by adverse medical events (Gupta et al. 2019). This is an important finding especially in professions which are female dominated such as midwifery.

Initially, after the introduction of the concept of the second victim, attention focused on the vulnerability of healthcare providers to work-related trauma. Since then, many researchers have explored the impact of trauma on medical doctors, surgeons, nurses, midwives and

emergency service personnel (Cabilan & Kynoch 2017; Christoffersen, Teigen & Rønningstad 2020; Jonsson & Segesten 2004; Pellino & Pellino 2015; Rinaldi et al. 2016). Researchers investigated the consequences of trauma in victimised clinicians; hundreds of reports have been published so far and a variety of interventions and support programs have been proposed to mitigate the impact on second victims (Merandi et al. 2017; Mira et al. 2017). Even new terms such as third victim (the hospital) and fourth victim (harm to future patients) emerged out of the initial concept (Ozeke et al. 2019). However, recently, there has been a concern regarding the misinterpretation of the term ‘second victim’. Wu, who originally proposed this term in 2000, published another paper in 2020 in which he expressed concerns about the stigmatisation of clinicians by using the term ‘second victim’ (Wu et al. 2020). As a result of this new outlook, recent papers have encouraged researchers to stop disseminating the concept of second victim, and to stop victimising healthcare professionals as it may imply a lack of responsibility in clinicians, and may underrate the experience of the first victims (Clarkson et al. 2019; Tumelty 2018).

However, regardless of the term being used and the interpretations derived from it, health professionals, compared to the general working population, are among the most vulnerable people to work-related stress (Sheen, Slade & Spiby 2014). Physical and mental health of obstetricians are affected by the type of job they do and the place they work in; for example, studies have shown elevated levels of adrenaline an hour after a shift in the labour and birth suite, as well as an increased daytime heart rate (Martinez de Tejada et al. 2013). As midwives and obstetricians have many shared stressors in labour and birth suites, similar results may potentially be obtained for midwives, had the study been conducted among midwifery staff. Also, obstetric care is accompanied by high levels of expectations that pregnancy and birth are normal processes. Therefore, compared to other medical professions, people are less likely to expect adverse outcomes during pregnancy and birth (Shub et al. 2012), which can impose extra stress on obstetric staff and add to their level of distress in the case of an adverse incident.

In terms of occupational trauma, some studies have focused on midwives (Hunter 2010; Pezaro et al. 2016). Midwifery ‘*emotion work*’ or ‘*emotional labour*’ has long been an issue

in maternity services and a topic of interest in midwifery research (Hunter 2001, 2004). Emotional labour is the act of regulating and managing emotions for organisational goals and requirements (Grandey 2000). Studies have so far addressed the association between workplace stress and physical and mental illness of midwives as well as burnout and a high rate of job attrition from the profession (Hunter 2005). The burden of emotion is high, in particular, for midwives who provide labour and birth care due to the emotionally demanding nature of childbirth (Davis-Floyd & Sargent 1997).

1.2.1 Shoulder Dystocia as a Traumatic Birth

Despite many studies on the definition of birth trauma from the perspective of women (Reed, Sharman & Inglis 2017), there is no clear definition from midwives' points of view. Previous studies reported that incidents which are involved with death, injury, emergency or interpersonal disrespect are considered as traumatic for midwives (Cohen et al. 2017; Leinweber et al. 2017). However, there is wide variation in perception of trauma, meaning that not every dramatic birth is perceived as a traumatic birth. In other words, and according to Beck (2004), birth trauma is *'in the eye of the beholder'* (Beck 2004, p.28).

In the early sections of this chapter, physical mechanisms of SD were discussed. However, SD is also important in terms of its mental and emotional implications for women and their families as well as for midwives. Although few studies have explored SD, they have all agreed on its traumatic nature. Recent research by Beck (2020) reported high levels of fear and anxiety about SD in maternal-newborn nurses. Nurses shared that *'the hair would raise on the back of their neck if they even thought that the woman they were caring for was at risk for a shoulder dystocia birth'* (Beck 2020, p.58). Participants vividly recalled SD births even after decades. Another nurse said: *'I tremble internally and am nauseated and my heart rate increases when I am given report that one of the patients in labour is nearly 42 weeks pregnant and the fetal size is a concern'* (Beck 2020, p.59). Another nurse said that *'I risked out a couple of patients who repeatedly had shoulder "difficulties" with prior deliveries'* or *'I find myself praying not be on call when a morbidly obese woman is in labour'* (Beck 2020, p.61). These were a few examples of how some (nurse-) midwives expressed their feelings about SD.

1.3 Impact of Trauma and work-related stress on Midwives

Midwifery is considered as a profession vulnerable to emotional disturbances (Rice & Warland 2013). Leinweber & Rowe (2010, p.76) referred to it as *'the cost of being with the woman'*. Birth, in the absence of any adverse incident, is involved with moments of adrenaline rush. In a recent survey as part of the Australian arm of the WHELM study, the working environment of midwives was described as *'a nightmare'* (Harvie, Sidebotham & Fenwick 2019). Compared to the number of studies assessing the effects of traumatic birth on birthing women (Beck & Watson 2010; Elmir et al. 2010; Hollander et al. 2017; Reed, Sharman & Inglis 2017; Thomson & Downe 2016), few have explored its impact on maternity staff (Elmir et al. 2017; Leinweber et al. 2017; Rice & Warland 2013). Findings of an Australian study revealed that around 70% of midwives have witnessed a traumatic birth (Leinweber et al. 2017), with 74.8% and 65.3% having experienced feelings of horror and guilt, respectively. Experiencing or witnessing traumatic birth can result in feelings of fear, horror, guilt, anger, concern, powerlessness and responsibility in midwives (Beck, LoGiudice & Gable 2015; Leinweber et al. 2017). For some midwives or nurse-midwives, the impact of a traumatic birth may be to such an extent that it makes them express: *'Some of the joy of birth, the sparkle in my eye, and in my soul is gone and will never return. I will never be the same personally or professionally'* (Beck 2020, p.60).

Work-related incidents expose midwives to both primary and secondary traumatic stress. In primary traumatic stress, midwives directly experience or witness trauma, whereas in secondary traumatic stress (STS), the exposure is indirect, meaning that the clinician has the knowledge of other's trauma and wants to help them (Figley 2013). Many studies have investigated the prevalence of PTSD in midwives. Most of these studies have been conducted in Europe or Australia. A survey among UK midwives revealed that more than 95% of midwives were exposed to traumatic events at work (Sheen, Spiby & Slade 2015), with a 33% prevalence of PTSD among participants. A survey among Dutch midwives reported a 17% prevalence rate of PTSD among midwives who had experienced an occupational traumatic event (Kerkman et al. 2019). A comparable prevalence rate of 17% was also reported among the Australian midwives (Leinweber et al. 2017). In the US, a higher rate of

36% has been reported among certified nurse-midwives (Beck, LoGiudice & Gable 2015). In a survey among Swedish midwives, a lower rate of 5% was reported; however, 15% of the participants reported symptoms indicative of partial PTSD (Wahlberg, Andreen Sachs, et al. 2017). Reports from low-income countries are more limited, but not favourable either. A study conducted in Uganda reported poor quality of professional life in midwives with more than 20% of the participants suffering from STS (Muliira & Ssendikadiwa 2016). In Senegal, also, a high rate of emotional exhaustion was reported (Rouleau et al. 2012). Although to interpret these statistics, factors such as the sample size, the response rate, and the assessment tools should be considered, the undeniable fact is that midwives across the world are at high risk of work-related trauma and poor psychological well-being. In the long term, severe incidents can push clinicians to change their workplace or to leave midwifery which contributes to workforce attrition (Beck, LoGiudice & Gable 2015). Traumatic exposures at work are known risk factors for PTSD, burnout and compassion fatigue in midwives (Cohen et al. 2017), which are discussed in more detail in the following sections.

Post-traumatic stress disorder is defined based on four main elements of *intrusion*, *avoidance*, *negative changes in thinking and mood* and *hyperarousal* (American Psychiatric Association 2013). Midwives who witness or experience a traumatic birth or those who care for a traumatised woman may suffer from one or more of these elements, defined as follows:

- ***Intrusion***: recurrent involuntary distressing memories
- ***Avoidance***: escaping from anything (thoughts, feelings, places, conversations, situations) which reminds them of the trauma
- ***Hyperarousal***: the state of high alert, hypervigilance and exaggerated startle response.
- ***Negative changes***: including persistent and exaggerated negative beliefs and feelings.

Presentation of PTSD in clinical practice may include: avoiding taking care of women who are in the same room where the previous trauma occurred; avoiding certain women, such as those diagnosed with stillbirth; not attending births any more (Beck 2020); or having symptoms such as sleep disturbances or difficulty in concentration (American Psychiatric

Association 2013). Also, alterations in beliefs may be about the victim him/herself, others or the world; feelings of fear, horror, anger, guilt, blame and shame. Victims of PTSD may be unable to experience positive emotions (American Psychiatric Association 2013).

The clinical practice of midwives is not separate from their emotions; fearful and anxious midwives are less likely to provide compassionate care to women (Beaumont et al. 2016). Physically and emotionally stressed midwives who are not effectively supported may consider leaving the profession. This creates a vicious circle, because when midwives leave the profession, the situation becomes harder for those who remain in the profession, which in turn contributes to tougher working conditions and more consideration for leaving their job (Royal College of Midwives 2016).

As well as PTSD, chronic occupational stress may result in physical and emotional exhaustion which is known as burnout (Maslach 2003). Three components of burnout include 1) feelings of exhaustion 2) feelings of cynicism and detachment from the job (depersonalisation) and 3) sense of ineffectiveness and lack of accomplishment (Maslach & Leiter 2016). When burnout is merged with STS, compassion fatigue is characterised (Mathieu & Medicine 2007), that is a state in which the clinician feels less empathic with the patient, their sense of satisfaction with work diminishes, absenteeism increases, and their ability to make decisions and care for patients is impaired (Mathieu & Medicine 2007).

The psychological responses described above are important in terms of their impact on the professional behaviour of clinicians. So far, this impact has been studied in different healthcare professions. Among ambulance personnel, it has been shown that failure in practice causes feelings of guilt, shame and rejection (Jonsson & Segesten 2004), with subsequent PTSD causing compassion numbness and increasing vigilant behaviours (Jonsson & Segesten 2004). Among obstetricians and gynaecologists, it has been shown that adverse work events make clinicians more defensive in their decision-making and changes their work habits such as doing nightshifts, performing surgery alone or attending women with vaginal breech births (Baas et al. 2018). Comparable findings among doctors practising obstetrics and gynaecology in the UK reported high levels of burnout and suicidal thoughts

among the doctors, which indeed were associated with defensive medical practice (Bourne et al. 2019).

Defensive practice is another outcome of adverse work incidents, and is defined as what clinicians do in order to avoid being sued rather than doing what is basically appropriate for the client. It is generally considered as a harmful professional behaviour (U.S. Congress Office of Technology Assessment 1994). Defensiveness includes procedures done to reduce medical uncertainty (U.S. Congress Office of Technology Assessment 1994), and may include two types of behaviours 1) assurance behaviour and 2) avoidance behaviour. Performing procedures which are more than medically indicated is categorised as assurance behaviour, such as over-prescribing or over-referral (Bourne et al. 2019). However, in avoidance behaviour, physicians avoid certain patients or procedures that are perceived to increase the probability of litigation (Studdert et al. 2005). Having said this, normal or intervening practices are subject to individual interpretations (Reime et al. 2004) and therefore, the boundaries of defensiveness in clinical practice are difficult to determine (Symon 2000).

Among midwives, also, it has been shown that the experience of perinatal trauma leads them to practise more defensively (Sheen, Spiby & Slade 2016). Excessive anxiety after traumatic births, even in low-risk situations may lead midwives to over-estimate the risk and to over-diagnose situations that can be managed conservatively. In fact, midwives may attempt to avoid repeating previous traumas through over-diagnosis of similar cases, resulting in more traumatisation of normal birth.

The evidence is now strong that fear and anxiety undermine effective care and are associated with negative birth outcomes (Kennedy & Shannon 2004). Fear is a protective factor; however, the consequence of undirected fear would no longer be protection against birth complications, but may be detrimental to the mother, neonate or midwife (Dahlen 2010).

According to Beck et al., following traumatic births (specifically after SD, cord prolapse and placenta abruptio) midwives may lose their trust in future births and become more guarded

and suspicious (Beck, LoGiudice & Gable 2015). When medico-legal precautions are added, preventive interventions are more likely to be done. Midwives who appear in court to give witness statements are reported to feel ‘unprotected’ and ‘scapegoated’ even if they were not being prosecuted (Hood, Fenwick & Butt 2010). Similar reports among obstetricians show that experiencing a lawsuit or witnessing a colleagues’ litigation affects the preferences of obstetricians regarding defensive practice (Zhu 2018).

Having examined the negative aspects of an adverse birth event, it is important to be aware of its potential positive aspects as well. Tedeschi and Calhoun in the mid-1990s developed a theory named as post-traumatic growth (PTG) which referred to positive transformation in the aftermath of challenging events (Tedeschi & Calhoun 1996). Hunter, in her report on emotional distress among UK midwives, spoke about ‘*emotion work as gift or coercion?*’ (Hunter 2010, p.262), and discussed that the experience of intense emotions in midwifery is necessary and beneficial for midwifing the midwives. Other recent studies have also supported this notion that a traumatic birth event is capable of improving the competence and professional confidence of midwives (Beck, Eaton & Gable 2016; Beck, Rivera & Gable 2017; Schröder et al. 2016). A single event may be perceived differently by different midwives and may lead to either positive or negative pathways. As a result, exploring the experiences of midwives after traumatic births will provide vital information on how their perception about birth may be affected in the aftermath of the traumatic event and how the affected perception may influence their provision of midwifery care.

1.4 Rationale for undertaking this study

For many Australian midwives, caring for a woman during labour and birth is perceived as stressful and daunting (Toohill et al. 2019). In the past decade, many studies have been conducted with the aim of exploring work-related stress and anxiety in the midwifery community of Australia (Creedy et al. 2017; Leinweber & Rowe 2010; Rice & Warland 2013; Toohill et al. 2019). In some studies, the concept of traumatic birth has been indirectly discussed through other concepts such as compassion fatigue, burnout, job satisfaction and attrition. These studies unanimously reported that fear and anxiety about trauma contribute

to poor mental well-being of midwives. The extent of stress in some cases is reported to be high enough to lead midwives to think that the job they are doing is not worth this amount of stress (Geraghty, Speelman & Bayes 2019).

The stress is in direct relationship with burnout and job dissatisfaction which in turn, affects midwives' decisions to stay or to leave (Mollart et al. 2013; Rouleau et al. 2012). Younger and early career midwives are more vulnerable to emotional distress (Creedy et al. 2017; Harvie, Sidebotham & Fenwick 2019). Results of a recent study showed that almost half the Australian midwives who participated in the study (443 out of 1,037) had considered leaving the profession in the last six months (Harvie, Sidebotham & Fenwick 2019), which is comparable with reports from other countries such as UK (1,330 out of 1,997 midwives) (Hunter et al. 2017) and Sweden (one in three midwives out of a pool of 475 participants) (Hildingsson, Westlund & Wiklund 2013). In another recent study, Australian midwives expressed their working environment as a '*war like*' situation, with sometimes unbearable levels of stress, which negatively affected their commitment to and engagement with the work (Geraghty, Speelman & Bayes 2019, p.e.297). In such stressful situations, exposure to birth emergencies are considered as highly traumatic events which may add to the stressful nature of the midwifery profession (Dahlen & Caplice 2014).

Shoulder dystocia is a type of birth which includes features of both a traumatic birth and a maternity emergency with related interventions that may add to the significance of the incident. To date, several studies have explored the experiences of midwives following traumatic births or maternity emergencies (Beck & Gable 2012; Beck, LoGiudice & Gable 2015; Goldbort et al. 2011; Halperin et al. 2011; Sheen, Spiby & Slade 2016). However, except for one (Beck 2013), none have specifically addressed this issue in relation to SD. Among US nurse-midwives, SD is ranked among the top three traumatic births (Beck, LoGiudice & Gable 2015). Among Israeli midwives, SD is reported as one of the top five traumatic births (Halperin et al. 2011). Shoulder dystocia is also referred to as the most fearful maternity emergency (Dahlen & Caplice 2014) and one of the greatest fears among Australian midwives (Dahlen 2010). These are important statistics because fear can impact how clinicians diagnose a certain condition (Heath 2014).

Shoulder dystocia may also contribute to both negative and positive outcomes of a birth trauma. Evidence is limited on which pathway midwives go through after trauma (whether it is PTSD, PTG or both). It is also unclear how the viewpoint of midwives about normal birth may be affected following birth trauma. Further, the factors which contribute to these changes are less explored topics. Identification of these factors will provide insight on how to better support midwives, how to minimise the negative outcomes and how to direct midwives towards the more favourable pathway after trauma.

It is well known that SD can potentially cause permanent complications for women and their babies (Davis et al. 2021; Narendran et al. 2021). Therefore, acknowledgement of the toll which traumatic births such as SD take on midwives' emotions and clinical practice is essential to ensure their emotional well-being and subsequently the quality of care they provide as well as their level of professional satisfaction. By conducting this study, I aimed to contribute to the knowledge of the impact of traumatic births, specifically SD, on the professional life of midwives.

In order to provide important contextual knowledge for my investigation of midwives' experiences of SD, I needed to identify epidemiological data about the incidence of SD to which Australian midwives are exposed. My investigation of state-wide and nationally collected maternity data sources had revealed an absence of reporting about SD. It was therefore not clear how often Australian midwives experience SD. There is currently no published information on the epidemiology of SD in Australia, nor in NSW which has the highest annual birth rate in Australia, of more than 95,000 births (in 2017) (Australian Bureau of Statistics 2018). Therefore, a second phase of my study was designed that aimed to investigate the incidence of SD in a tertiary hospital in Sydney, Australia. Being aware of the incidence and comparing the local rates with the global rates of SD can provide insight into how clinicians diagnose SD in their local settings. Too high an incidence may show a potential for over-diagnosis, whereas, too low an incidence may indicate under-diagnosis of SD through use of strict diagnostic criteria. High or low incidence rates can also reveal facts about the increasing or decreasing rate of the predisposing factors in the community. Being

aware of the local data on risk factors can improve diagnosis of women at high risk of SD, and assist clinicians to make better decisions about care options (Committee on Diagnostic Error in Health Care 2015). This, in turn, can prevent maternal/neonatal complications and reduce the costs attributed to the occurrence of SD. For my study, understanding the incidence of SD in at least one Australian maternity hospital would enable further insights to be applied during the interpretation of the data obtained from midwives who had experienced SD. Publishing the findings of my investigation into the incidence of SD would also provide important epidemiological information for midwives and other maternity clinicians to add to their awareness and decision-making processes.

1.5 Thesis aims, objectives and research questions

This thesis aimed to address the impact of experiencing SD on the emotions and professional performance of midwives. The thesis also aimed to examine the frequency of midwives' exposure to SD at one tertiary hospital in Sydney. The aims, objectives and questions underpinning this research are as follows:

1.5.1 Aims and objectives

This thesis aims:

1. To explore the experiences of midwives about SD
2. To investigate the epidemiology of SD at one tertiary referral hospital in Sydney, NSW, Australia.

This thesis has five objectives, which are to:

1. Describe the impact of SD births on the feelings and emotions of midwives.
2. Describe the impact of SD on the attitude of midwives towards normal birth as well as the impact on their clinical practice.
3. Investigate the professional pathway which may occur for midwives following the experience of SD births.
4. Identify the factors which may improve or exacerbate the experience of SD births.

5. Examine the incidence, risk factors and outcomes of SD at one hospital over the period 2013-2018.

1.5.2 Research Questions

This thesis sought to answer six specific research questions. These were:

1. How do midwives view SD births?
2. What are the emotional and clinical outcomes of such births for midwives?
3. How can any potential negative outcomes after SD births be improved?
4. What is the trend of SD over the period 2013-2018 at one hospital in Sydney, Australia?
5. What are the antepartum and intrapartum risk factors for SD over the period 2013-2018 at one hospital in Sydney, Australia?
6. What are the maternal and neonatal outcomes of SD over the period 2013-2018 at one hospital in Sydney, Australia?

1.6 Outline of Thesis

This thesis consisted of two phases which are presented in eight chapters. The first phase is a qualitative exploration of midwives' experiences of SD. The second phase is a retrospective cohort study using de-identified hospital data.

Chapter one has provided the background to the study and an introduction to the definitions and diagnostic criteria of SD. Shoulder dystocia as a birth trauma as well as the subjectivity of perceiving birth trauma have been discussed. This chapter also presents the outcomes that traumatic births may cause for midwives. It describes the rationale and significance of conducting this study along with the research aims.

Chapter two presents a literature review on the impact of traumatic births on clinical decision-making of midwives. The literature was thematically analysed. Four themes were identified in the literature which explained the ways that clinical decisions may be influenced by traumatic birth experiences. This literature review was published as a systematic scoping

review, and with permission from the publisher, the article has been provided in the thesis in its published format.

Chapter three provides the design and methodology of the two phases of the study. For the first phase, a qualitative descriptive methodology and for the second phase, a retrospective data analysis of routinely collected data were employed. This chapter explains the setting, recruitment, methods of data collection, data analysis and ethical issues.

Chapters four and five present the results of the first phase of the study (qualitative phase). These chapters present two different pathways that midwives may experience after exposure to SD. The main focus of chapter four is catastrophic thinking and hyper-vigilance as the main adverse professional consequences of SD for midwives. Chapter five discusses the potential positive outcomes of experiencing SD, and the potential for professional growth and development after SD.

Chapter six presents the results of the second phase of the study (quantitative section). The statistical approaches and the findings of the data analysis are presented in this chapter.

Chapters seven and eight include discussion and conclusion of the whole study. They present the integration of both qualitative and quantitative findings. Clinical implications of the results and the limitations of the two studies are discussed in these chapters.

Chapter Two

Literature Review: Scoping Review of the Impact of Birth Trauma on Clinical Decisions of Midwives

2.1 Chapter Preface

The initial design of this thesis was planned to be a pure quantitative study about measuring the head-to-body delivery interval (HBDI) during vaginal births. A systematic review was conducted and the study protocol for that review was published (Appendix 1). However, due to feasibility issues as well as the ethical challenges of the study, the topic was refined and changed to a different, but relevant, topic. The new topic aimed at exploring the experiences of midwives about SD and the potential impacts of those experiences on their practice in future births.

Following refining the topic, I undertook a systematic scoping literature review to identify what is generally known and what is the literature gap on the impacts of traumatic birth, in particular SD, on clinical decisions and practice of midwives. A scoping review is an approach to synthesising research evidence (Pham et al. 2014), and provides a broad overview of the nature and extent of under-studied topics, through a five-stage framework of (1) identifying the research question (2) identifying relevant studies (3) study selection (4) extracting/charting data (5) collating, summarising and reporting the results (Arksey & O'Malley 2005). Due to the broadness of the topic and the limited number of studies that have specifically examined the impact of SD or birth emergency traumas on midwives' clinical practice, a scoping review was an appropriate methodology to address our research question.

This chapter is published in the *Journal of Evaluation in Clinical Practice*, and the accepted manuscript is reproduced in this chapter with permission. The update of the literature review revealed that, since the publication of this scoping review, there have been some new studies which have examined the issue of birth trauma in relation to midwives' emotion and practice.

These recently published papers have been discussed in the introduction and discussion chapters.

Minoee S, Cummins A, Sims DJ, Foureur M, Travaglia J. Scoping review of the impact of birth trauma on clinical decisions of midwives. *J Eval Clin Pract.* 2020 Aug;26(4):1270-1279. doi: 10.1111/jep.13335. Epub 2019 Dec 10. PMID: 31823445.

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2.2 Abstract

Objective: The psychological and emotional impact of a traumatic birth experience on clinicians is well-established. It is also known that emotions can generally influence decisions. However, it is not clear whether experiencing a birth trauma can affect the professional behaviour and decision-making of clinicians. This study explores the impact of birth trauma on clinical decision-making of midwives.

Data Sources: Four databases (Medline, Scopus, CINAHL and ProQuest) were searched to identify English language studies published from 1990 to 2018. Due to the lack of studies with specific focus on clinical decision-making after birth trauma, we defined two main domains for our literature search. To be included, studies had to focus on either traumatic birth experience or clinical decision-making in midwifery. The findings of the two domains were then integrated.

Study Selection: Of a total 2,104 studies identified, 70 received full-text screening with 40 included in the review. Twenty-two articles were about traumatic birth events and 18 examined decision-making in midwifery.

Data Extraction: Information were extracted on each article's purpose, study design, data collection, participants, definitions of birth trauma and the context in which clinical decisions were made.

Results: Thematic analysis was conducted. The impact of birth trauma on midwives could be categorised into the following themes: psychological issues; professional concerns; changes in practice; and positive impact. Review of literature indicated that clinical decision-making could be influenced through all these themes.

Conclusion: Decision making can be impacted by the midwife's affective state related to previous experience of birth trauma. The continuum of impact may vary from increased defensiveness to increased personal and professional growth. Being aware of this impact can help midwives to better manage their emotions while making decision after traumatic birth experiences.

Keywords: decision-making, midwifery, scoping review, traumatic birth

2.3 Introduction

Midwives commonly witness and experience scenes of joy, and occasionally, scenes of distress. The birth process can be complicated by traumatic experiences such as obstetric emergencies, physical injuries to the mother/baby or maternal/neonatal mortalities. It is therefore unsurprising that midwives are vulnerable to emotional disturbances (Rice & Warland 2013).

Birth trauma is generally defined as an event which involves physical, emotional or psychological distress (Greenfield, Jomeen & Glover 2016). However, it can be interpreted and perceived differently by different individuals (Beck 2004). Birth trauma can result in posttraumatic stress disorder (PTSD) and feelings such as fear, horror, guilt, anger and concern in the exposed midwives (Beck, LoGiudice & Gable 2015; Goldbort et al. 2011; Leinweber et al. 2017). Studies in the US (Beck, LoGiudice & Gable 2015), UK (Sheen, Spiby & Slade 2015) and Australia (Leinweber et al. 2017) demonstrate high rates of PTSD symptoms in midwives following traumatic births. Findings of a recent study revealed that around 70% of Australian midwives have witnessed a traumatic birth (Leinweber et al. 2017), with 74.8% and 65.3% having experienced feelings of horror and guilt, respectively.

In non-medical contexts, it has been shown that being in a good mood increases the likelihood of making optimistic decisions for future events, whereas, experiencing a bad mood or fear, are emotional states that are more likely to result in pessimistic decisions (Keltner & Lerner 2010). One reason can be due to the fact that fear can increase the perception of risk (Lerner, Keltner & emotion 2000).

In clinical contexts, decisions are generally made through analytical and intuitive modes or a combination of both (Croskerry, Singhal & Mamede 2013; Kahneman 2011). Emotions and previous experiences, good or bad, are integral parts of intuition (Croskerry, Abbass & Wu 2010). Evidence shows that clinical decisions are engaged with clinicians' moods and feelings (Kozlowski et al. 2017). The impact of the care-providers' feelings on clinical practice may be to such an extent that such feelings even influence patient safety (Heyhoe et al. 2016).

Given childbirth is an emotionally-laden experience for healthcare professionals, it is important to identify how birth-related trauma may affect clinical decisions. Answering this question can help midwives firstly, to be aware of the potential impact, and secondly, to have better control over their emotions while making decisions in order to minimise the risk of emotions overcoming clinical judgements.

To date, no study has investigated the influence of birth trauma on clinical decision-making of midwives. As there were few studies focusing on the topic of clinical decision-making after birth trauma, we therefore defined two domains of "birth trauma" and "clinical decision-making in midwifery" for our literature review. A scoping review was the most appropriate methodology, as the research question was broad and not yet comprehensively studied (Arksey & O'Malley 2005). This review first summarises the evidence of the impact of birth trauma on midwives; then identifies the influencers of clinical decision-making in midwifery, and then where possible, links the themes from the two domains to demonstrate the interactions between them.

2.4 Methods

Search strategy and eligibility criteria

A systematic scoping review is an approach to synthesising research evidence which provides a broad overview of the nature and extent of under-studied topics (Arksey & O'Malley 2005; Pham et al. 2014). This review followed Arksey and O'Malley's five-stage framework of: (1) identifying the research question (2) identifying relevant studies (3) study selection (4) extracting/charting data and (5) collating, summarising and reporting the results (Arksey & O'Malley 2005).

We conducted this review in accordance with the reporting guidelines outlined in the Preferred Reporting Items for Systematic Scoping Reviews and Meta-Analyses (PRISMA-ScR) statement (Figure 1) (Tricco et al. 2018). By combining MeSH and free-text terms, a systematic search in four databases including Medline, Scopus, CINAHL and ProQuest was conducted. The search terms covered topics on “birth trauma”, “stressful childbirth” and “clinical decision-making” (Supplementary Table 1). The search was limited to English language studies. An initial hand-search revealed that the most relevant studies were conducted within the past 15 years; however, to ensure coverage of related studies from the 1990s on decision-making, the search was widened to publications from 1990 to August 2018. Hand searching was performed to check the references and citations of the eligible studies. To capture an extensive overview of the subject, the search was not limited by study type (e.g., original articles, review articles, commentaries, quantitative/qualitative studies, editorials, case studies). However, to extract and chart data, only the findings of original articles were used, and other publication types were cited in the discussion section of the paper, where appropriate.

The primary target group of this review was midwives; however, in a number of included studies obstetricians or intrapartum nurses were studied as well as midwives. Studies were excluded if they explored the experiences of midwifery students.

Quality assessment

Since the aim of a scoping review is to map the existing literature on less well-defined research questions and to synthesise research evidence (Pham et al. 2014), formal quality assessment of studies is not considered as a priority (Arksey & O'Malley 2005). However, two reviewers (S.M and D.S) independently performed quality appraisal of included studies using the following checklists COREQ (CONsolidated criteria for REporting Qualitative research) for qualitative studies (Tong, Sainsbury & Craig 2007), NIH (National Institutes of Health quality assessment tool for observational cohort and cross-sectional studies) for quantitative studies (National Heart, Lung and Blood Institute 2019) and MMAT (Mixed Methods Appraisal Tool) for mixed-methods studies (Pluye et al. 2011) (Supplementary Tables 2-4).

2.5 Results

Characteristics and quality of included studies

Database searching yielded 2082 papers, with a further 22 studies identified from hand searching. Following removal of duplicates and screening titles and abstracts, 70 full-texts remained to be assessed for eligibility, of which 40 were entered into the review as detailed in the PRISMA flow diagram (Figure 1).

Of a total 40 studies, 22 articles were on the impact of birth trauma and 18 were on decision-making in midwifery (Supplementary Tables 5 and 6). Studies used qualitative (n=23), quantitative (n=9) or mixed-methods (n=8) methodologies. Among the studies on traumatic birth, one study was an integrative review (Sheen, Slade & Spiby 2014) and one was a PhD thesis published as a conference proceeding (Baxter 2012), both of which were excluded from the table of evidence.

Data were mostly collected through interview (over 60%). Almost all studies were conducted in high-resource countries including the UK (n=7), US (n=6), Australia (n=6), New Zealand (n=4), Sweden (n=4), Israel (n=3), Denmark (n=2), Netherlands (n=2), Scotland (n=2), Ireland (n=1), and with a single study from a low income country, Malawi. Two studies recruited participants from different continents (McCool et al. 2009) or different European

countries (Burvill 2002). Most studies (70%) on traumatic births were published within the past five years and all studies on decision-making were published since 2001, except two from the 1990s.

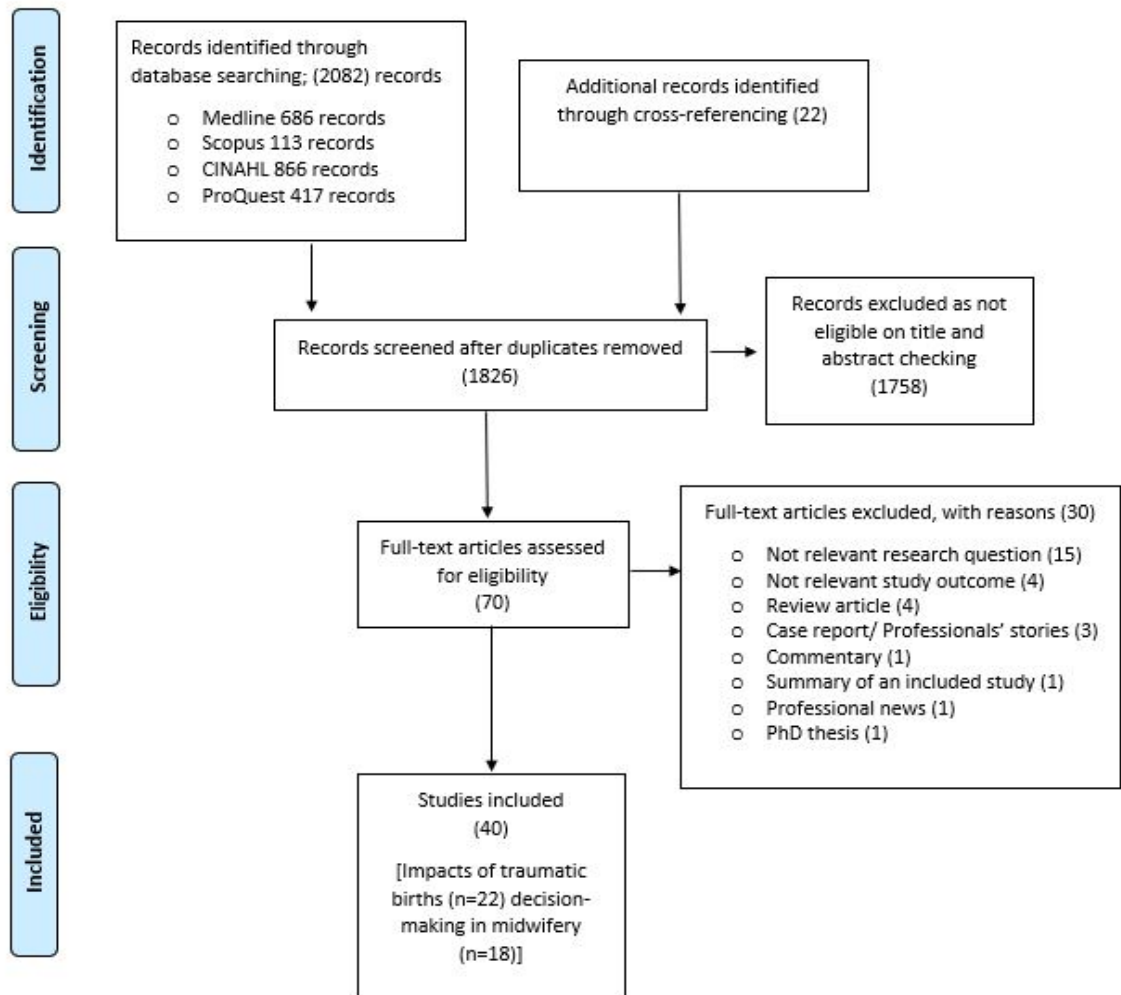


Figure 1 PRISMA flow diagram of included studies

Using the COREQ checklist, studies were generally assessed according to three main domains of “research team and reflexivity”, “study design” and “analysis and findings”. Most qualitative studies provided limited information on the sections of “Relationship with Participants”, “Data Collection” and “Data Analysis”; whereas, the sections of “Theoretical Framework”, “Setting” and “Reporting” fulfilled most criteria (Supplementary Table 2). Based on the NIH tool, the quality of studies was rated as good (fulfilling the criteria >80%), fair (fulfilling the criteria 60-80%) or poor (fulfilling the criteria <60%). The overall quality

of quantitative studies was good; however, in most quantitative studies the time interval between the measurement of exposures and outcomes was not provided. Also, most of these studies had a response rate of less than 50% (Supplementary Table 3). Through the MMAT checklist, quantitative and qualitative sections of mixed-methods studies were simultaneously evaluated. The majority of mixed-methods studies did not discuss the relationship between the findings and the context in which data were collected (Supplementary Table 4). As shown in Supplementary tables 2-4, some studies had incomplete reporting, however, the overall quality of studies was acceptable to be included in data synthesis.

All reviewers agreed on which data to extract from the included studies. Data were extracted by one reviewer (S.M) and quality assessed by two independent reviewers (S.M and D.S). Discrepancies between reviewers quality appraisal of studies were resolved through consensus, or if necessary, through discussion with a third reviewer.

Definition of birth trauma in the literature

Research on traumatic birth has received much attention in recent years (2012-2018) (Supplementary Table 5). The concept of “traumatic birth” had a wide variation of definitions across studies covering both physical and emotional injuries (Table 1). Most, if not all studies had one thing in common which was the subjectivity of the interpretation of birth trauma. The following examples show how broadly birth trauma was viewed among midwives. In a recent study by Toohill et al. (2018) 160 Australian midwives expressed birth trauma as: 1) witnessing the disrespect of women; 2) being disrespected as a midwife; 3) being complicit in poor care practices; 4) working with, and living in the reality that not everything goes according to plan; or 5) situational and workplace factors intensifying stress. Leinweber et al. (2017) described traumatic birth event as: death, injury, poor care, harmful acts, or interpersonal disrespect. Cohen et al. (2017) reported trauma as faults, emergencies, complications and death as well as exposure to aggressive behaviour from the woman. Similar findings by Rice et al. (2013, p.1060) showed that midwives expressed their feelings about traumatic birth as ‘feeling for the woman’.

Table 1. Definition of traumatic birth experiences and the subthemes in the included studies		
Study	Definition	Subtheme (Impact of birth trauma)
Baxter 2012	An emotional or psychological state of discomfort while providing direct care	Feelings of guilt and helplessness Reduced self-confidence Hypervigilance
Beck 2012 Beck 2015 Cohen 2017	Secondary traumatic stress (STS)	Feelings of fear, shock, anger, horror, anxiety, shame, guilt, self-blaming, powerlessness, flashbacks to previous distress, Recurring nightmares Fear of litigation Becoming cautious Losing trust in birth Job change, leaving the profession
Rice 2013 Calvert 2015 Beck 2017 Leinweber 2017	Self-identified (self-perceived) traumatic experience	Feelings of responsibility, guilt, regret, powerlessness Loss of confidence Need for debriefing Analysing the event Over intervention after the event Positive impact (learning and growing)
Halperin 2011	Life-threatening situation of mothers and/or newborns in labour and delivery wards	Loss of confidence, emotional reactions, life-long memories, being marked in professional life
Hamama-Raz 2016	Perinatal death exposure	Symptoms of post traumatic stress disorder and depression
Leinweber 2017	- Death and severe injury of mother/baby - Disrespect of women's dignity - Involvement in suboptimal care - Abusive care/management	Feelings of fear, horror, guilt, anger, responsibility
McCool 2009	Self-identified adverse outcome (sub-optimal or unexpected health outcome)	Fear of litigation and public exposure, fear of losing livelihood
Schröder 2016 Schroder 2016	An event in which the infant/mother suffered presumed permanent, severe and possibly fatal injuries related to the birth	Sleep disorders, depressive symptoms, Feelings of guilt, fear of woman's blame Lower self confidence/esteem Positive impact (thinking about meaning of life, spiritual development)
Wahlberg 2017	Exposure to a serious and potentially traumatic event in the delivery unit, such as maternal/neonatal death, injury, violence or threat	Feelings of guilt and post traumatic stress symptoms
Sheen 2015 Sheen 2016	Traumatic perinatal event (an event where midwives perceived the mother/newborn	Feelings of shock, despair, guilt, self-blame, distressed in personal life

Table 1. Definition of traumatic birth experiences and the subthemes in the included studies		
	to be at risk of serious injury or death and where they experienced a sense of fear, helplessness or horror)	Less confidence, defensiveness in practice, being over-anxious, Rumination Leaving midwifery Positive impact (learning coping strategies, more assertiveness)
Ansell Irving 2012 Beck 2013	Shoulder dystocia	Post traumatic stress symptoms Positive impact (learning and discovery)
Lindberg 2013 Edqvist 2014	Sphincter injury	Feelings of blame, guilt, shame, failure, feeling of being unprofessional Fear of being judged Positive impact (learning skills, keeping updated and feeling confident)
Goldbort 2011	- Failed instrumentally assisted vaginal birth that resulted in an emergency caesarean - Any unexpected complications - An infant who required unexpected neonatal resuscitation - Any birthing experience that was perceived by the nurse as unexpected/traumatic	Distressful memories Positive impact (learn and grow)

Data Synthesis

Emergent key concepts

To better understand the focus of the studies, initially two word clouds based on the original quotations and summarised findings were generated (Supplementary Figures 1 and 2). Word clouds provided a visual presentation of the most frequently used words in a text. The size of the vocabularies corresponded to the frequency of their use (Ramsden & Bate 2008). Data were entered into an online word cloud generator (<https://wordart.com>). Common words were removed, and the minimum word frequency was set at ≥ 5 . Data extracted from text visualisation were used in developing a framework of concepts and themes.

Thematic analysis was conducted, and similar concepts were grouped into the same categories. Main findings for each of the two domains (birth trauma and decision-making) were categorised into four key themes. Identified themes were *psychological impact*,

practice change, professional concerns and positive impact, in the domain of birth trauma, and *clinician, woman, organisation and profession-related factors*, in the domain of decision-making. Relevant themes were linked together between the two domains where appropriate (Figure 2).

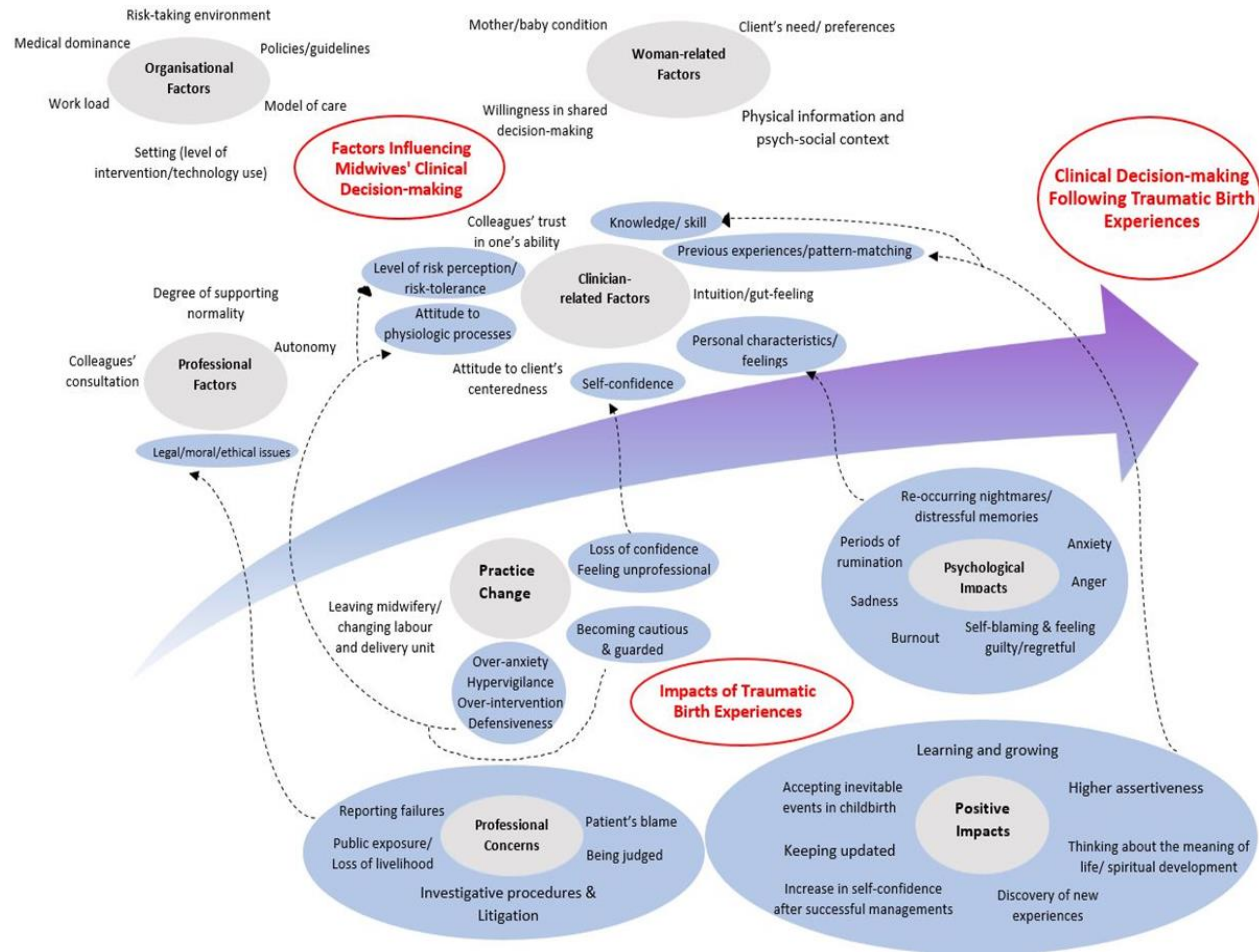


Figure 2 Diagram of key themes and concepts; dotted lines indicate the interactions between the two domains of “traumatic birth experiences” and “clinical decision-making”

Traumatic birth experiences

Figure 2 demonstrates themes and sub-themes in detail. *Psychological impact* was considered as an outcome of birth trauma, which simultaneously was a major influencer on

decision-making. PTSD and secondary traumatic stress (STS) were among the most common psychological outcomes. Prevalence of partial or significant PTSD due to work-related trauma was high in countries such as the US (36%) (Beck, LoGiudice & Gable 2015), Australia (17%) (Leinweber et al. 2017), Israel (16%) (Cohen et al. 2017) and Sweden (15%) (Wahlberg et al. 2017).

Studies pointed toward the notion of *practice change* after a traumatic experience. Midwives reported that birth trauma caused them to lose their self-confidence and their trust in birth. Midwives expressed feeling unprofessional and becoming hyper-vigilant and defensive after trauma (Baxter 2012; Beck, LoGiudice & Gable 2015; Calvert & Benn 2015; Halperin et al. 2011; Lindberg, Mella & Johansson 2013; Sheen, Spiby & Slade 2016). Severe traumatic cases led them to take time off, to change the workplace or even to leave the profession, contributing to workforce attrition (Beck & Gable 2012; Beck, LoGiudice & Gable 2015; Calvert & Benn 2015; Sheen, Spiby & Slade 2016). Midwives were also concerned about litigation, being sued and (publicly) judged (*professional concerns*) (Beck & Gable 2012; McCool et al. 2009).

However, the impact was not restricted to negative outcomes only. Midwives were capable of analysing the traumatic experience, learning from it and trying not to carry fear to the next births (Rice & Warland 2013). Some midwives viewed traumatic events as a learning experience which contributed to their professional growth (Goldbort et al. 2011). Not all midwives developed post traumatic disorder, instead, some overcame it and converted it to posttraumatic growth (*positive impact*). Personal and professional constructive impact of trauma varied from appreciation of life, spiritual change and existential considerations to discovery of new experiences, self-confidence improvement and higher assertiveness (Beck, Rivera & Gable 2017; Schröder et al. 2016) (Figure 2).

Factors influencing clinical decisions

The contexts in which decision-making was assessed in the literature were broad. As Table 2 shows, all studies, except one (Danerek & Dykes 2001), explored the issue of decision-making in situations other than emergencies. Despite discussing decision-making in diverse

contexts and settings; comparable concepts could be extracted. Two common theories of clinical decision-making were discussed in the literature: 1- hypothetico-deductive 2- intuitive-humanistic theories (Jefford, Fahy & Sundin 2011). Hypothetico-deductive (rational) decision-making is based on the analytical and cognitive approach, whereas intuitive (pattern-matching) decision-making is a non-analytical approach and occurs as a result of fast-thinking (Raynor, Marshall & Sullivan 2005). However, what shaped clinical decisions, was not limited to the rational reasoning or pattern-matching models only, but, as demonstrated in Figure 2, several other factors influenced the process of decision-making.

In their recent paper, Daemers et al. (2017) identified five *clinician-related factors* that influence midwives' decisions. These include 1) attitude towards physiology 2) attitude towards woman centredness and shared decision-making 3) midwives' experience and intuition 4) attitude toward collaboration and 5) personal circumstances. Concepts such as attitude towards birth (Everly 2012), personal level of risk-perception (Cheyne et al. 2012; Orme & Maggs 1993) and self-confidence (Sookhoo & Biott 2002) were supported by other studies as well. Intuition as another concept, was described as a way of making decisions rooted in both knowledge and experience. Intuition included pattern-matching as well; in pattern-matching, patterns of a case were identified, and matched to a previous similar situation, which then assisted the midwife to make quicker decisions (Burvill 2002; Jefford & Fahy 2015; Orme & Maggs 1993; Weltens, de Nooijer & Nieuwenhuijze 2018).

In terms of *woman-related factors*, the importance of the woman's expectations, needs/preferences and her willingness/ability in shared decision-making were highlighted in several studies (Cheyne, Dowding & Hundley 2006; Freeman et al. 2006; Porter et al. 2007; Weltens, de Nooijer & Nieuwenhuijze 2018). When making clinical judgements, midwives reported taking into account the woman's physical cues and the psycho-social context (Daemers et al. 2017). The significance of *organisational factors* were also evident in the literature. Cheyne et al. (2006) explained that as midwives have to work within the framework of an institution, some factors are imposed by the organisation such as work load, policies, guidelines, model of care and the in-charge midwife. Other studies pointed out that the setting, the risk-taking culture of a workplace and medical dominance influenced the

decisions as well (Everly 2012; Mead & Kornbrot 2004; Porter et al. 2007). In *profession-related factors*, a major issue was the legal concern as a by-product of traumatic experiences. Fear of not practising according to the guidelines and fear of litigation, influenced midwives' approaches to practice (Porter et al. 2007). Midwives were more likely to take preventative actions when considering medico-legal precautions (Cheyne et al. 2012).

Table 2. Definition of clinical decision-making and the subthemes in the included studies

Study	Definition	Subtheme (Influencer in decision-making)
Burvill 2002 Sookhoo 2002 Cheyne 2006 Chodzaza 2018	Decision-making on the diagnosis or progress of normal labour	Intuition and gut-feeling Self-confidence Work load Guidelines Physical assessment Woman's preferences Model of care Attitude towards supporting normality
Orme 1993 Cioffi 1997 Porter 2007	General process of decision-making in midwifery	Knowledge Previous experiences Legal/ethical issues Heuristic decision-making Fear of decision-making Management strategies Work load Medical dominance Policies Level of experience
Daemers 2017	Influencers of decision-making in midwifery	Attitude to the physiologic process Personal characteristics, feelings, conditions Previous experiences Intuition
Everly 2012	Facilitators/barriers of decision-making during labour and birth	Woman's preferences Attitude to the normal process Workplace setting
Styles 2011 Cheyne 2012 Patterson 2015 Weltens 2018	Intrapartum transfer and in-labour referral decisions	Recent adverse events Personal risk tolerance Work load Physical and psychological factors Knowledge and clinical experience Needs and wishes of the woman Fear of being held responsible
Freeman 20006	Impact of birthplace and model of care on management of low-risk labour	Woman's needs Birth place

Table 2. Definition of clinical decision-making and the subthemes in the included studies

Mead 2004, Healy 2017	Impact of medicalisation and risk-perception in managing low-risk women	Level of risk perception Risk taking culture Degree of trust in midwives' practice
Jefford 2015	Clinical reasoning as a way of decision-making during second stage of labour	Intuition, pattern-matching
Danerek 2001	The phenomenon of problem solving in critical situations	The facet of problem solving in midwifery: Listening, assessment, making fast decisions, possessing knowledge and experience, intuition, identification of a problem and finding a solution, cooperation, engagement, purposefulness, flow, concentration, euphoria, consideration, control

Interactions between traumatic experiences and clinical decisions

Based on the literature, birth trauma could change midwives' attitudes towards the normal physiology of birth, could impact upon their risk assessment skills and could cause them to become guarded in practice (Beck, LoGiudice & Gable 2015). Birth trauma directed midwives to become over-anxious, hyper-vigilant, defensive and risk-averse. On the other hand, decisions were influenced by clinicians' emotions, feelings, level of risk-perception, risk-tolerance (Cheyne et al. 2012), and the risk-taking environment in which midwives were working (Mead & Kornbrot 2004). Trauma could also destroy the individual's trust in their skillsets which had an impact on their decision-making (Fry & MacGregor 2014; Schroder et al. 2016). These interactions are shown by dotted lines in Figure 2. Although in non-urgent situations, decisions appeared to be made based on the knowledge, experience, evidence and shared decision-making, the process was more complicated in emergencies where fast decisions were needed.

2.6 Discussion

In this scoping review, we explored the question of whether birth trauma affects decision-making in midwives. The review of literature indicates that traumatic experiences could change feelings, self-confidence and clinical judgement of midwives. Making clinical decisions was a complex process, influenced by factors such as knowledge, skills, previous experiences, level of risk-perception, self-confidence and legal/ethical issues. Experience of a traumatic birth event could influence decisions; however, the impact had a broad range.

Literature showed that experience of a birth trauma can influence the subsequent perception and estimation of clinical risk. Following traumatic birth, midwives expressed that they may have lost their trust in physiological birth and may have become suspicious towards birth (Beck & Gable 2012). Excessive anxiety after traumatic birth, even in low-risk situations, led clinicians to over-diagnose the conditions that could be managed conservatively (U.S. Congress Office of Technology Assessment 1994).

When the practitioner uses the lessons learnt from past experiences to make a judgment in similar situations, intuitive pattern-matching occurs (Mok & Stevens 2005). Despite being a valuable source of decision-making, pattern recognition may lack cognitive reasoning, and can lead to poor and emotional judgement rather than a pure cognitive judgement (Benner 2001; Croskerry, Abbass & Wu 2008; Jefford, Fahy & Sundin 2010). Although clinicians may not be aware of making their decisions under the influence of affective states, in fact, daily clinical decisions are inevitably a mixture of rationality and emotion (head and heart) (Croskerry, Abbass & Wu 2008; Luo & Yu 2015).

The evidence was strong that fear and anxiety may result in deterioration of effective care, and contribute to negative birth outcomes (Kennedy & Shannon 2004). Fear is a protective factor per se; however, the consequence of undirected fear would no longer be protection against birth complications, but may be detrimental (Dahlen 2010). Excessive fear after experiencing clinical trauma alters the risk perception and can make clinicians defensive. Wrong assumption of normal birth as abnormal can then be associated with defensiveness, which is likely to increase the rate of interventions and surveillance (Healy, Humphreys & Kennedy 2016) and contribute to more “just in case” interventions (Morris 2005).

In the literature, there was an interaction between fear of litigation and practice change. Having an experience of a lawsuit or even witnessing colleagues’ experiences of litigation can cause clinicians to act in a more interventive manner (Zhu 2018). This might be physiologically justified through the fact that fear is learnt by the brain, and even when there is no direct experience (e.g. only by hearing the adverse stories of colleagues), practice can be negatively impacted (Vaas & R 2004).

Involvement in the court was another distressful experience for midwives. Findings from an Australian study showed that those midwives who appeared in court to give witness felt “unprotected” and “scapegoated” even if they were not being litigated (Hood, Fenwick & Butt 2010). Fear of being sued is a common response to traumatic birth, but it causes clinicians to act defensively to avoid repetition of a failure, especially if the litigation has been accompanied by public exposure (Symon 2006). Determination of the extent to which litigation causes defensiveness is difficult, but it has been claimed as an underlying reason for higher rates of medically unjustifiable procedures and interventions such as caesarean section, continuous monitoring and induction of labour (Symon 2000a; Symon 2000b).

Despite being almost a universal fear among midwives, it was interesting to find that fear of a lawsuit after adverse outcomes may be less in some communities. Certain subcultures (such as the Amish/Mennonite community in the US) accept loss or disability after childbirth more easily and make less accusations against the accoucheur (McCool et al. 2009).

Apart from the negative consequences, birth trauma was accompanied with some positive outcomes as well. The personal and professional growth acquired following trauma is said to be beyond mere resilience or hardiness, and has the capability of improving function (Tedeschi & Calhoun 2004). Successful management of trauma and lessons learned after the event can provoke positive emotions which can promote optimal functioning, broaden cognition and expand attention (Fredrickson 2004).

A number of strategies which could be employed to minimize the impact of birth trauma on midwives, and to convert the traumatic event to a learning experience, were identified in the literature. First, midwives emphasized the importance of their undertaking follow-up meetings with the mother as a way of decreasing feelings of guilt after the event (Lindberg, Mella & Johansson 2013). Second, collegial (peer) support including psychological debriefings were considered important contributors to professional development after the traumatic experience (Calvert & Benn 2015). Midwives noted that being criticized by colleagues resulted in feeling unprofessional (Lindberg, Mella & Johansson 2013), whereas

working in a supportive environment (with the opportunity for psychological post-trauma conversations) helped them to better cope with birth trauma (Edqvist, Lindgren & Lundgren 2014; Sheen, Spiby & Slade 2016). Third, building and improving resilience in clinicians was considered as an effective strategy in recovering after trauma. It was suggested that midwives need to be prepared for traumatic experiences through workshops focusing on resilience building (Calvert & Benn 2015; Sheen, Spiby & Slade 2016). Finally, the provision of adequate clinical supervision, in a safe and blame-free environment, was recommended to be part of post-trauma policies to help midwives easily express their fears and concerns after traumatic events (Goldbort et al. 2011).

Strengths and limitations

To our knowledge, this is the first study to explore the literature on the impact of birth trauma on decisions of midwives. However, the literature was subject to certain limitations which can direct future research. A majority of the included studies focused on the emotional responses after traumas rather than the professional responses. Almost all papers discussed decision-making in non-urgent conditions and irrespective of having a history of traumatic events. Also, some studies used scenario vignettes to elicit responses which may not reflect decision-making processes in real situations.

2.7 Conclusion

Birth traumas can occur and cause emotional responses and psychological disturbances in midwives. Changes in feelings and emotions may change the professional behaviour of clinicians, and may impact on the care provided to the mother/baby. Identifying these impacts can assist clinicians to avoid being unconsciously influenced by them. All these can contribute to more accurate and less affective decisions at birth. The consequences of a birth trauma also necessitate the provision of better mental and educational support for the affected midwives. Future studies are needed to investigate why a very situation may turn into a PTSD for one midwife and to a post-traumatic growth for another midwife, and how the midwife's negative perception of a birth trauma can be alleviated or used as an opportunity for positive professional growth.

Author contributions

SM and MF conceived the review. SM extracted data. SM and DS assessed the quality of included studies. SM, AC, DS, JT and MF drafted the article. All authors read, revised and approved the final manuscript.

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2.9 Appendices

Supplementary Table 1. Search Strategy			
Database	Search strategy	Date	Hits
Medline (Ovid)	1. midwi*.mp. 2. nurse.mp. or Nurses/ 3. nurse midwives.mp. or Nurse Midwives/ 4. shoulder dystocia.mp. 5. obstetric emergency.mp. 6. Stress Disorders, Post-Traumatic/ or traumatic birth.mp. 7. birth trauma.mp. 8. stressful childbirth situations.mp. 9. secondary trauma.mp. or Compassion Fatigue/ 10. childbirth experience.mp. 11. midwifery practice.mp. 12. professional behaviour.mp. 13. Decision Making/ or Clinical Decision-Making/ 14. 1 or 2 or 3 15. 11 or 12 or 13 16. 4 or 5 or 6 or 7 or 8 or 9 or 10 17. 15 and 16 18. 14 and 16 19. 17 or 18 20. limit 19 to (english language and humans and yr="1990 -Current")	1990-Aug 2018	686
Scopus (Elsevier)	(TITLE-ABS-KEY (clinical AND decision-making)) AND ((((TITLE-ABS KEY (shoulder AND dystocia)) OR (TITLE-ABS KEY (obstetric AND emergency)) OR (TITLE-ABS-KEY (traumatic AND birth)) OR (TITLE-ABS-KEY (post-traumatic AND stress AND disorder)) OR (TITLE-ABS-	1990-Aug 2018	113

Supplementary Table 1. Search Strategy			
	KEY (posttraumatic AND stress AND disorder)) OR (TITLE-ABS KEY (birth AND trauma)) OR (TITLE-ABS- KEY (stressful AND childbirth AND situations))) OR (TITLE-ABS- KEY (secondary AND trauma)) OR (TITLE-ABS- KEY (compassion AND fatigue)) OR (TITLE-ABS- KEY (childbirth AND experience))) AND ((TITLE-ABS- KEY (midwi*)) OR (TITLE-ABS- KEY (nurse AND midwives)))) AND (LIMIT- TO (LANGUAGE , "English"))		
CINAHL	S22. S19 OR S20 S21. S19 OR S20 S20. S17 AND S18 S19. S16 AND S18 S18. S4 OR S5 OR S6 OR S7 OR S8 OR S10 OR S11 OR S12 S17. S13 OR S14 OR S15 S16. S1 OR S2 OR S3 S15. (MH "Decision Making, Clinical") OR "Clinical Decision-Making" S14. "professional behaviour" S13. "midwifery practice" S12. "childbirth experience" S11. (MH "Compassion Fatigue") OR "secondary traumatic stress" S10. "secondary trauma" S9. "stressful childbirth situations" S8. "birth trauma" S7. (MH "Stress Disorders, Post-Traumatic") OR "traumatic birth" S6. "obstetric emergency" OR (MH "Obstetric Emergencies") S5. "obstetric emergency" S4. (MH "Shoulder Dystocia") OR "shoulder dystocia" S3. (MH "Nurse Midwives") OR "nurse midwives" S2. "nurse" S1. "midwi*"	1990- Aug 2018	866
ProQuest	((("nurse midwives" AND "birth trauma") OR ("midwife" AND "traumatic birth" AND "clinical decision making") OR ("nurse midwives" AND "post- traumatic stress disorder") OR ("shoulder dystocia" AND "post-traumatic stress disorder" AND "midwives") OR (("shoulder dystocia" AND "post- traumatic stress disorder" AND "traumatic birth") AND midwife)) AND (la.exact("ENG") AND pd(19900101-20180829))	1990- Aug 2018	417

Supplementary Table 2. Quality assessment of qualitative studies based on COREQ checklist

Studies	Domain 1 Research Team and Reflexivity		Domain 2 Study Design				Domain 3 Analysis and Findings	
	Personal characteristics	Relationship with participants	Theoretical framework	Participant selection	Setting	Data collection	Data analysis	Reporting
McCool 2009	×	-	√	√	√	×	×	√
Goldbort 2011	×	-	√	×	×	×	×	√
Halperin 2011	×	×	√	√	√	×	×	√
Ansell Irving 2012	√	√	√	√	√	×	×	√
Beck 2013	×	-	√	√	√	×	×	√
Lindberg 2013	-	-	√	√	√	×	×	√
Rice 2013	√	×	√	√	×	×	×	√
Edqvist 2014	-	-	√	×	√	×	×	√
Calvert 2015	√	-	√	×	×	×	×	√
Sheen 2016	√	×	√	√	√	×	×	√
Orme 1993	-	-	-	×	-	-	×	×
Danerek 2001	×	-	√	×	√	×	×	√
Sookhoo 2002	-	-	√	×	×	×	×	√
Burvil 2002	×	-	√	×	-	×	×	×
Cheyne 2006	×	×	√	√	×	×	×	√
Porter 2007	-	-	√	×	√	×	×	√
Everly 2012	-	-	√	√	√	×	×	√
Jefford 2015	×	-	√	√	√	×	×	√
Patterson 2015	-	-	√	√	√	×	×	√
Daemers 2017	√	√	√	√	√	×	×	√
Healy 2017	√	×	√	√	√	×	×	√
Chodzaza 2018	√	×	√	×	√	×	×	√
Weltens 2018	×	-	√	×	√	×	×	√

√: Completely fulfilled
 ×: Partially fulfilled
 -: Not fulfilled

Supplementary Table 3. Quality assessment of quantitative studies based on NIH checklist

Studies	Mea d 2004	Style s 2011	Shee n 2015	Hamama -Raz 2016	Schrode r 2016	Cohe n 2017	Leinwebe r 2017 (response s)	Leinweber 2017 (socioecologic al model)	Wahlber g 2017
NIH_1	√	√	√	√	√	√	√	√	√
NIH_2	√	√	√	-	√	-	-	√	√
NIH_3	-	√	-	NR	√	-	-	-	-
NIH_4	-	√	√	√	√	√	√	√	√
NIH_5	-	√	-	-	√	-	-	-	NA
NIH_6	NA	√	√	-	-	√	√	√	NA
NIH_7	NR	NR	NA	NR	√	NR	NR	-	NA
NIH_8	√	NA	NA	NA	NA	√	√	√	√
NIH_9	-	√	√	√	√	√	-	√	√
NIH_10	NA	NA	NA	NA	NA	NA	NA	NA	NA
NIH_11	-	√	√	√	√	√	√	√	√
NIH_12	NA	NA	NA	NA	NA	NA	NA	NA	NA
NIH_13	NA	NA	NA	NA	NA	NA	NA	NA	NA
NIH_14	-	-	√	√	√	-	-	√	√

√: Yes

-: No

NA: Not applicable

NR: Not reported

NIH_1: Was the research question or objective in this paper clearly stated?

NIH_2: Was the study population clearly specified and defined?

NIH_3: Was the participation rate of eligible persons at least 50%?

NIH_4: Were all the subjects selected or recruited from the same or similar populations (including the same time period)? Were inclusion and exclusion criteria for being in the study prespecified and applied uniformly to all participants?

NIH_5: Was a sample size justification, power description, or variance and effect estimates provided?

NIH_6: For the analyses in this paper, were the exposure(s) of interest measured prior to the outcome(s) being measured?

NIH_7: Was the timeframe sufficient so that one could reasonably expect to see an association between exposure and outcome if it existed?

NIH_8: For exposures that can vary in amount or level, did the study examine different levels of the exposure as related to the outcome (e.g., categories of exposure, or exposure measured as continuous variable)?

NIH_9: Were the exposure measures (independent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?

NIH_10: Was the exposure(s) assessed more than once over time?

NIH_11: Were the outcome measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?

NIH_12: Were the outcome assessors blinded to the exposure status of participants?

NIH_13: Was loss to follow-up after baseline 20% or less?

NIH_14: Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)?

Supplementary Table 4. Quality assessment of mixed-methods studies based on MMAT checklist

Studies	Cioffi 1997	Freeman 2006	Cheyne 2012	Beck 2012	Beck 2015	Schroder 2016	Beck 2017	Toohil 2018
Checklist items								
MMAT_ Screening 1	√	√	CD	√	√	√	√	√
MMAT_ Screening 2	√	√	√	√	√	√	√	√
MMAT_ 1.1	√	√	√	√	√	√	√	√
MMAT_ 1.2	√	√	√	√	√	√	√	√
MMAT_ 1.3	-	-	-	-	-	√	CD	-
MMAT_ 1.4	-	-	-	-	-	CD	CD	-
MMAT_ 4.1	√	-	√	√	-	√	√	√
MMAT_ 4.2	-	√	√	√	√	√	√	-
MMAT_ 4.3	√	-	√	√	√	√	√	√
MMAT_ 4.4	NR	NR	√	-	-	√	-	√
MMAT_ 5.1	√	√	√	√	√	√	√	√
MMAT_ 5.2	√	√	√	√	√	√	√	√
MMAT_ 5.3	-	CD	-	CD	√	-	√	CD

√: Yes

-: No

CD: Cannot determine

NR: Not reported

 MMAT_ Screening 1: Are there clear qualitative and quantitative research questions (or objectives*), or a clear mixed methods question (or objective*)?

MMAT_ Screening 2: Do the collected data allow address the research question (objective)? E.g., consider whether the follow-up period is long enough for the outcome to occur (for longitudinal studies or study components).

MMAT_ 1.1: Are the sources of qualitative data (archives, documents, informants, observations) relevant to address the research question (objective)?

MMAT_ 1.2: Is the process for analysing qualitative data relevant to address the research question (objective)?

MMAT_ 1.3: Is appropriate consideration given to how findings relate to the context, e.g., the setting, in which the data were collected?

MMAT_ 1.4: Is appropriate consideration given to how findings relate to researchers' influence, e.g., through their interactions with participants?

MMAT_ 4.1: Is the sampling strategy relevant to address the quantitative research question (quantitative aspect of the mixed methods question)?

MMAT_ 4.2: Is the sample representative of the population understudy?

MMAT_ 4.3: Are measurements appropriate (clear origin, or validity known, or standard instrument)?

MMAT_ 4.4: Is there an acceptable response rate (60% or above)?

MMAT_ 5.1: Is the mixed methods research design relevant to address the qualitative and quantitative research questions (or objectives), or the qualitative and quantitative aspects of the mixed methods question (or objective)?

MMAT_ 5.2: Is the integration of qualitative and quantitative data (or results*) relevant to address the research question (objective)?

MMAT_ 5.3: Is appropriate consideration given to the limitations associated with this integration, e.g., the divergence of qualitative and quantitative data (or results*) in a triangulation design?

Supplementary Table 5. Summary of literature review; the impact of traumatic birth events on midwives

Study ID (Country)	Title	Study Design (Data Collection)	Aim	Participants	Findings
McCool 2009 (US-North/south America-Asia-Europe and Africa)	The pain that binds us: midwives' experiences of loss and adverse outcomes around the world	Qualitative (Interviews)	To explore common experiences and coping methods of midwives involved in adverse perinatal outcomes	- 12 midwives from US and 10 from six other continents - with at least 5 years of active practice experience	Concerns in developed nations: 1) fear of litigation 2) the need for personal healing Concerns in developing nations: 1) loss of livelihood 2) fear of public exposure 3) continual need for the development of preventive measures
Goldbort 2011 US	Intrapartum nurses' lived experience in a traumatic birthing process	Qualitative-descriptive phenomenology (Semi-structured, audio-taped interviews)	To explore the impact of traumatic birthing process on intrapartum nurses	9 nurses from the Association of Women's Health, Obstetric and Neonatal Nurses	Main theme identified: "From Behind Closed Doors" 6 subthemes identified: (1) Feeling the Chaos (2) Expect the Unexpected (3) It's Hard to Forget (4) All Hands on Deck (necessity of teamwork)(5) Becoming (learning and growing) (6) For the Love of OB (Obstetrics)
Halperin 2011 Israel	Stressful childbirth situations: a qualitative study of midwives	Qualitative (Individual semi-structured, in-depth interviews)	To explore the situations perceived as stressful by midwives and to find out midwives' coping strategies towards those stressful experiences	- 18 midwives in 6 labour and delivery units in Israeli hospitals recruited using purposive convenience sampling of information-rich informants - with midwifery certification of at least 2 years and full/part-time employment in a labour and delivery unit	Two themes identified: (1) Reactions to stressful situations Categories; - All of a sudden: (functioning professionally in an unexpected reality) - Feeling like a failure: (emotional reactions) - Your blood boils. . . your whole body is paralyzed: (physical reactions) - Long-term effects Categories; (2) Coping with stressful situations Categories;

Supplementary Table 5. Summary of literature review; the impact of traumatic birth events on midwives

Study ID (Country)	Title	Study Design (Data Collection)	Aim	Participants	Findings
					<ul style="list-style-type: none"> - That marks you for the rest of your life: (coping difficulties) - I needed my colleagues to be my support: (colleagues' reactions) - Midwives' feelings about supervisory staff support - Like treatment for posttraumatic syndrome: (midwives' suggestions for meeting expressed needs)
Ansell Irving New Zealand	Shoulder dystocia: a qualitative exploration of what works	Qualitative-interpretive (In-depth interviews)	To find out the methods used by experienced clinicians to deal with SD (through eliciting stories from expert clinicians)	4 midwives and 1 obstetrician - with significant experience in the management of SD, working in high risk maternity practice	Main themes identified: - Management of SD has been influenced by HELPERR and practitioners follow this mnemonic despite being inappropriate for everyone. - Discovering what works and discovering a different way (discovery of and the use of axillary traction as an alternative manoeuvre to resolve SD)
Beck 2012 US	A mixed methods study of secondary traumatic stress in labour and delivery nurses	Mixed-methods (Quantitative; secondary traumatic stress scale Qualitative; open-ended question)	To determine the prevalence and severity of secondary traumatic stress in labour and delivery nurses and the nurses' descriptions of their experiences	Random sample of 464 labour and delivery nurses recruited from the Association of Women's Health, Obstetric and Neonatal Nurses. - 464 returned the survey (quantitative portion) and 70% of these (n=322), took part in the qualitative portion of the study.	35% of the participants were found to have moderate to severe secondary traumatic stress. The most traumatic birth events were described as infant/fetal demise, maternal death and SD. Themes obtained from the nurses' traumatic experiences: - magnifying the exposure to traumatic births

Supplementary Table 5. Summary of literature review; the impact of traumatic birth events on midwives

Study ID (Country)	Title	Study Design (Data Collection)	Aim	Participants	Findings
					<ul style="list-style-type: none"> - struggling to maintain a professional role while with traumatised patients - agonizing over what should have been - mitigating the aftermath of exposure to traumatic births - haunted by secondary traumatic stress symptoms - considering foregoing careers in labour and delivery to survive
Beck 2013 US	The obstetric nightmare of shoulder dystocia: a tale from two perspectives	Qualitative (Merge of 1- a previously undertaken mixed method study, ⁹³ and 2- a qualitative study on women with experience of SD) (Internet-based and in person interviews)	To explore and compare the experiences of SD in mothers and nurses working in labour and delivery unit	<ul style="list-style-type: none"> - By online notice, 23 mothers with children having obstetrical brachial plexus injuries were recruited from the United Brachial Plexus Network and - Random sample of 464 labour and delivery nurses recruited from the Association of Women's Health, Obstetric and Neonatal Nurses 	<p>Comparable themes between the both groups were:</p> <ul style="list-style-type: none"> - in the midst of the obstetric nightmare - reeling from the trauma that just transpired - enduring heartbreak: the heavy toll on mothers - haunted by memories: the heavy toll on nurses
Lindberg 2013 Sweden	Midwives' experiences of sphincter tears	Qualitative (Semi-structured interview)	To investigate the experiences of midwives who attended births with sphincter rupture	<ul style="list-style-type: none"> 8 midwives from two maternity hospitals, northern Sweden (purposive sampling) - were registered nurse midwives with at least 1-year experience - had experience of a delivery with a sphincter tear 	<p>Main themes identified:</p> <ul style="list-style-type: none"> - feeling guilt, shame and failure - working through feelings - needing support from colleagues - feeling confident with their skills
Rice 2013 Australia	Bearing witness: Midwives experiences of witnessing traumatic birth	Qualitative (Interview)	To explore midwives' experiences of witnessing traumatic birth	<ul style="list-style-type: none"> 10 currently or previously registered midwives with varying amounts of experience (through snow-balling) 	<p>Main themes identified:</p> <ul style="list-style-type: none"> - stuck between two philosophies - what could I have done differently - feeling for the woman
Edqvist 2014 Sweden	Midwives' lived experience of a birth where the	Qualitative-phenomenological study	To explore midwives' lived experiences of	<ul style="list-style-type: none"> 13 midwives from 3 different delivery 	<ul style="list-style-type: none"> - Midwives explained as being stuck between two conditions 1)

Supplementary Table 5. Summary of literature review; the impact of traumatic birth events on midwives

Study ID (Country)	Title	Study Design (Data Collection)	Aim	Participants	Findings
	woman suffers an obstetric anal sphincter injury- a phenomenological study	(In-depth interviews)	births with obstetric anal sphincter injury	wards in Stockholm and Gothenburg - who had recently managed a spontaneous birth resulting in sphincter injury (in the past 2 wks-6 months) (participants were found through searching delivery wards' database or logbook)	severe perineal trauma can be prevented in the hand of skilled midwife, and 2) sphincter injuries cannot always be prevented - Perceived feelings were guilt, trying to find the underlying reason, fear of being judged (so not disclosing what has happened), and finally accepting the occurrence of injury but without definite answers for that
Beck 2015 US	A mixed-methods study of secondary traumatic stress in certified nurse-midwives: shaken belief in the birth process	Mixed-methods (Quantitative: secondary traumatic stress scale Qualitative: open-ended question)	To determine the prevalence and severity of secondary traumatic stress in certified nurse-midwives and their experiences of attending traumatic births	473 and 264 certified nurse-midwives who had attended at least one traumatic birth completed the quantitative and qualitative strands of this study, respectively - midwives willing to participate returned survey e-mail which was sent to all members of the American Midwifery Certification Board (SurveyMonkey)	- Approximately 30% participants reported high to severe secondary traumatic stress. - Top traumatic birth events perceived by the nurse-midwives were: fetal demise/neonatal death, SD, and infant resuscitation - Main themes identified were: 1) protecting my patients: agonizing sense of powerlessness and helplessness 2) wreaking havoc: trio of posttraumatic stress symptoms 3) circling the wagons: it takes a team to provide support or not 4) litigation: nowhere to go to unburden our souls (5) shaken belief in the birth process: impacting midwifery practice 6) moving on: where do I go from here?

Supplementary Table 5. Summary of literature review; the impact of traumatic birth events on midwives

Study ID (Country)	Title	Study Design (Data Collection)	Aim	Participants	Findings
Calvert 2015 New Zealand	Trauma and the effects on the midwife	Qualitative (Adapted biographical narrative interview method)	To explore the traumatic birth impacts on midwives	16 core and lay midwives were recruited through purposeful sampling -self-identified as having experienced traumatic birth (after 1990)	Following traumatic birth midwives -experienced loss and grief, need for support/constructive debriefing sessions -were subjected to violence or bullying from women/staff -changed practice or gave up midwifery
Sheen 2015 UK	Exposure to traumatic perinatal experiences and posttraumatic stress symptoms in midwives: Prevalence and association with burnout	Quantitative (A national postal survey: 3 scales and 1 survey were used to measure PTSD, empathy, the nature of worldview beliefs and symptoms of burnout)	To investigate midwives' experiences of traumatic perinatal events	421 midwives with experience of traumatic perinatal events (causing a feeling of fear, helplessness and horror) -were currently employed in the UK	- PTSD was reported in 33% of the participants. - The study indicated relationship between posttraumatic stress and negative worldview beliefs and burnout. - More severe PTSD was associated with higher emotional exhaustion. - Following traumatic events, midwives considered leaving midwifery or changing their professional allocation.
Hamam-Raz 2016 Israel	Comorbidity of post-traumatic stress symptoms and depressive symptoms among obstetric nurses with perinatal death exposure	Quantitative-national cross-sectional survey	To explore the comorbidity of PTSD and depressive symptoms, and the relationship between coping strategies/social support and the depressive symptoms	After random selection of hospitals in Israel, 118 obstetric nurses currently working in delivery units and with experience of perinatal death were recruited.	PTSD severity was positively associated with depressive symptoms and age, and had negative association with coping self-efficacy.
Schroder 2016 Denmark	Blame and guilt—a mixed methods study of obstetricians' and midwives' experiences and existential considerations after involvement in traumatic childbirth	Mixed-methods (Quantitative: national survey Qualitative: interview)	To investigate the number and proportion of midwives/obstetricians involved in traumatic birth and their experiences following traumatic events	All obstetricians/midwives registered with the Danish medical association and the association of midwives were invited to the survey - 1237 responded to the survey - 14 were recruited for individual semi-structured interview	- 85% (n=1027) of the participants had experienced a traumatic childbirth. - Apart from fear/experience of being blamed by the mother or clinical peers, the feeling of guilt and existential considerations were dominant. - A large proportion of the participants reported

Supplementary Table 5. Summary of literature review; the impact of traumatic birth events on midwives

Study ID (Country)	Title	Study Design (Data Collection)	Aim	Participants	Findings
					that the event led them to think about the meaning of life and made them a better clinician.
Schroder 2016 Denmark	Psychosocial health and well-being among obstetricians and midwives involved in traumatic childbirth	Quantitative: a national questionnaire survey (using six scales from the Copenhagen Psychosocial Questionnaire on burnout, sleep disorders, general stress, depressive symptoms, somatic stress and cognitive stress)	To investigate the self-reported psychological health of midwives/obstetricians following a traumatic birth event	<ul style="list-style-type: none"> - All obstetricians/midwives registered with the Danish medical association and the association of midwives were invited to the survey - 1237 responded to the survey 	<ul style="list-style-type: none"> - 85% (n=1027) of the participants had experienced a traumatic childbirth. - Midwives reported higher level of psychological problems compared to obstetricians. The rate was higher among the participants who had left labour ward compared to those who didn't give up working in labour following birth traumas.
Sheen 2016 UK	The experience and impact of traumatic perinatal event experiences in midwives: A qualitative investigation	Qualitative (Semi-structured telephone interviews)	To investigate midwives' experiences of traumatic perinatal events	<ul style="list-style-type: none"> - A random sample of midwives were contacted via the Royal College of Midwives- purposive sampling after a previous postal survey was conducted. - 35 midwives with an experience of traumatic perinatal event were recruited. 	<ul style="list-style-type: none"> - Midwives reported emotional upset, self-blame and vulnerability to investigative procedures. - Midwives with high PTSD symptomatology were more affected personally and professionally after the traumatic events. - All midwives, especially those with posttraumatic stress symptoms, expressed the need for talking about the event with peers and the need for senior colleagues' support. <p>Initial impact:</p> <ul style="list-style-type: none"> - Emotionally distraught; feelings of shock and despair - Self-blame and guilt, feelings of vulnerability and judgement - Attempting to make sense of what happened

Supplementary Table 5. Summary of literature review; the impact of traumatic birth events on midwives

Study ID (Country)	Title	Study Design (Data Collection)	Aim	Participants	Findings
					<ul style="list-style-type: none"> - A permeating impact on professional life - An enduring psychological impact Helpful aspects - Taking steps to prevent a similar occurrence from happening again - Helpful strategies to manage responses in personal lives - Wanting to talk about it: accessing and receiving helpful support from peers - Perceived absence or inappropriateness of support
<p>Wahlberg 2017 Sweden</p>	<p>Post-traumatic stress symptoms in Swedish obstetricians and midwives after severe obstetric events: a cross-sectional retrospective survey</p>	<p>Quantitative: cross-sectional online survey</p>	<p>To examine post-traumatic stress reactions among obstetricians and midwives, experiences of support and professional consequences after severe events in the labour ward</p>	<p>A web survey sent to all members of the Swedish Society of Obstetrics and Gynaecology (n=1498) and the Swedish Association of Midwives (n=3849) who were <67 y and had an email address</p> <p>1459 midwives and 706 obstetricians responded the survey.</p>	<ul style="list-style-type: none"> - Eighty-four percent of the obstetricians and 71% of the midwives reported experiencing at least one severe event on the delivery ward. Fifteen percent of both professions reported symptoms indicative of partial PTSD - Respondents reported emotions of intense fear, helplessness, panic, guilt and symptoms of arousal and avoidance - Clinicians with this disorder were more likely to change their work.
<p>Beck 2017 US</p>	<p>A mixed-methods study of vicarious posttraumatic growth in certified nurse-midwives</p>	<p>Mixed-methods (Quantitative: online survey using Posttraumatic Growth Inventory and the Core Beliefs Inventory</p>	<p>To investigate vicarious posttraumatic growth in certified nurse-midwives after a traumatic birth event</p>	<p>All certified nurse-midwives were invited to an online survey by the American College of Nurse-Midwives.</p> <p>425 and 315 completed the quantitative and</p>	<ul style="list-style-type: none"> - The core beliefs and vicarious posttraumatic growth of the participants were not highly disrupted following traumatic events.

Supplementary Table 5. Summary of literature review; the impact of traumatic birth events on midwives

Study ID (Country)	Title	Study Design (Data Collection)	Aim	Participants	Findings
		Qualitative: an open-ended statement about positive change in life following traumatic births)		qualitative parts, respectively.	Out of a 5-dimension posttraumatic growth inventory, the highest growth was reported in personal strength followed by appreciation of life, relating to others, spiritual change, and new possibilities
Cohen 2017 Israel	Exposure to traumatic events at work, posttraumatic symptoms and professional quality of life among midwives	Quantitative (Survey)	To evaluate midwives' professional quality of life following traumatic events through measuring the compassion satisfaction, compassion fatigue and prevalence of PTSD	93 midwives who agreed to participate in the study and were working in 4 medical centres of Israel	- PTSD with clinical significance was reported in 16% of the participants, and was positively related with burnout. - Midwives reported high levels of compassion satisfaction that could to some extent balance the compassion fatigue.
Leinweber 2017 Australia	Responses to birth trauma and prevalence of posttraumatic stress among Australian midwives	Quantitative (A cross-sectional online survey)	To assess exposure to different types of birth trauma, peritraumatic reactions and prevalence of posttraumatic stress	Out of 4578 midwives who were sent an e-mail by the Australian College of Midwives, 687 completed the online survey, and of these 601 completed the PTSD scale.	- 67% had witnessed a traumatic birth. - 17% were likely to develop PTSD. - Feelings of horror and guilt were dominantly reported in midwives.
Leinweber 2017 Australia	A socioecological model of posttraumatic stress among Australian midwives	Quantitative (Cross-sectional online survey)	To generate a risk factor model for PTSDs following traumatic births (considering personal and trauma/work-related factors)	- An email invitation was sent to the currently registered members of the Australian College of Midwives. - 601 midwives responded to the survey.	Factors associated with potential PTSDs were intention to leave the profession, a peritraumatic reaction of horror, peritraumatic feelings of guilt, and a personal traumatic birth experience.
Toohil 2018 Australia	Trauma and fear in Australian midwives	Mixed-methods (Quantitative: online survey- Qualitative: written descriptions of	To explore the prevalence and experiences of birth trauma/fear in midwives	- Practising midwives in Queensland who had nominated to join an email list for education and research purposes	- Personal trauma included experiencing assault, intervention and stillbirth and was experienced by 40% of the participants.

Supplementary Table 5. Summary of literature review; the impact of traumatic birth events on midwives

Study ID (Country)	Title	Study Design (Data Collection)	Aim	Participants	Findings
		birth trauma experiences)		- 249 completed the survey, and 170 wrote their descriptions on personal/professional traumatic experiences	<p>- Professional trauma included as witnessing/experiencing disrespectful care and was experienced by 90% of the participants.</p> <p>- High fear was associated with practice concerns and lower confidence in supporting women.</p> <p>Traumatic experience was exacerbated by feeling of being unsupported and fear of litigation.</p>
SD; shoulder dystocia, PTSD; posttraumatic stress disorder					

Supplementary Table 6. Summary of literature review: the factors influencing midwives' clinical decision-making

Study ID	Title	Study Design and Data Collection	Aim	Participants	Findings
Orme 1993 UK	Decision-making in clinical practice: how do expert nurses, midwives and health visitors make decisions?	Qualitative (Group discussion)	To understand the decision-making process in clinical practice	12 expert clinicians - from different settings (NHS, public, private and community sectors) - who were registered for at least 5 years	Sound decision-making is based on knowledge, and needs a supportive environment for decisions involving risk-takings.
Cioffi 1997 Australia	Clinical decision-making by midwives: managing case complexity	Mixed-methods (Scoring the number of heuristic processes used through interviewing-think aloud technique for two simulation cases of patient assessment)	To assess the relationship between heuristic decision-making and task complexity in midwifery clinical decision-making	-30 volunteer midwives - with different levels of experiences - from midwifery units of hospitals	Heuristic decision-making was increased when cases were more complex and less clinical information were available (the higher complexity of the cases, the more proportion of heuristic decision-making).
Danerek 2001 Sweden	The meaning of problem solving in critical situations	Qualitative (Phenomenology-interview)	To explore the meaning of problem solving in midwifery, when the midwife is faced with a critical situation in the absence of an obstetrician or any other physician	- 7 midwives working in delivery wards or clinics of south Sweden - All had at least one specific case of critical situation where they were alone (either in antenatal or intrapartum care) - with different levels of experience (9-37 years)	Problem solving was a multifaceted phenomenon, including listening, assessing, making fast decisions, possessing knowledge and experience, using intuition, identification and solving of problems, cooperation, engagement, purposefulness, concentration, euphoria, consideration and control
Sookhoo 2002 UK	Learning at work: midwives judging progress in labour	Qualitative (In-depth unstructured interviews)	To examine 1) the midwives' knowledge and skills in assessing labour progress 2) the dilemmas and consequences of opting different assessment methods	5 experienced (?) midwives	New midwives relied on intrusive methods to assess labour progress; whereas, expert midwives used a holistic approach to assess the progress, based on their previous learnings, skills, experiences and the confidence they had in their ability in accurate decision-making.

Burvill 2002 European Countries	Midwifery diagnosis of labour onset	Qualitative (Grounded theory- focus group and in-depth interview)	To find out how midwives diagnose labour onset and to create a model of that knowledge	8 midwives (Msc. student/ midwifery lecturer) - with different levels of experience - from different settings/ different European countries	The focus group identified three areas of physiological criteria for labour onset, psychological processes in decision-making and socio-political and philosophical perspectives in midwifery practice.
Mead 2004 UK	The influence of maternity units' intrapartum intervention rates and midwives' risk perception for women suitable for midwifery-led care	Quantitative (Survey)	To examine whether midwives working in high intervention units have higher perception of risk for midwifery-led care compared to their counterparts working in low intervention units and to test the accuracy of their perceptions	- By analysing the intervention rate of intrapartum care, 11 maternity units were categorised as low or high intervention - Only the midwives who cared for Caucasian women were selected - 828 midwives were sent questionnaires; 249 returned the responses (137 from 5 low intervention units, and 112 from 6 high intervention units)	- Intrapartum risks were perceived higher by midwives working in units with high intervention rate compared to their colleagues in low intervention units. - Irrespective of the units' categorisation, midwives generally underestimated the ability of women in normal progress of labour, and overestimated the benefits of technological interventions.
Cheyne 2006 UK	Making the diagnosis of labour: midwives' diagnostic judgement and management decisions	Qualitative (Focus group)	To explore midwives' perceptions of labour diagnosis and management	- Convenience sampling of midwives working in a maternity unit in the North of England in 2002 - 13 midwives participated in the focus groups	The information cues that midwives used were categorised as - factors related to the woman (physical signs, distress/coping strategies, expectations and familial/social determinants) - factors related to the institution (such as workload, guidelines, model of care and midwife in charge)
Freeman 2006 New Zealand	The influence of the birthplace and models of care on midwifery practice for the	Mixed-methods (Quantitative: questionnaire Qualitative: open-ended questions)	To assess the impact of the settings (Birthplace in England Collaborative Group) and models of care on	- 104 independent, team and hospital based midwives (=100 low-risk nulliparous women)	Models of care did not influence the care; however, the birthplace had impact on the midwives' practice (the influence of interventions and the need for technology in large obstetric hospitals).

	management of women in labour		midwives' decision-making in management of labour		
Porter 2007 UK	New midwifery? A qualitative analysis of midwives' decision-making strategies	Qualitative descriptive (Focus group interview and observation of participants)	to explore the reasons why midwives decided to adopt observed decision-making strategies relating to the use of technology	Midwives were included if they had - personal responsibility for caring for or managing individual women in labour - completed their preceptorship - worked on the unit for more than 6 months and had consented to participate - The study participants consisted of a convenience sample of 16 midwives, and a focus group of 8 midwives	Observation of midwives' practices indicated three types of decision-makings: 1- new professional decision-making (partnership between midwife and mother) 2- bureaucratic decision-making (according to the written policies and procedures)- the most prevalent type 3- professional decision-making (unilateral decision-making based on midwives' own discretion) The reasons for opting each of these approaches depended on the context, fear of litigation, level of experience, medical dominance of the setting, workload pressures and women's characteristics.
Styles 2011 Scotland	The Scottish Trial of Refer or Keep (the STORK study): midwives' intrapartum decision-making	Quantitative (web-based questionnaire and vignette)	to explore midwives' intrapartum referral decisions in relation to their personal risk tendency	102 midwives from consultant-led and community maternity units from four Scottish health areas	- No association was found between referral scores and measures of risk, personality, years of experience and settings. - Presence of recent adverse events influenced midwives' referral behaviour and made them more cautious.
Cheyne 2012 Scotland	Risk assessment and decision-making about in-labour transfer from rural maternity care: a social judgment	Mixed-methods (Quantitative: vignettes Qualitative: interview)	To examine how midwives and obstetricians make intrapartum transfer decisions	Stratified random sampling was applied to recruit participants from 5 midwife led units and 22 community midwife led units in Scotland (Two thirds was drawn from community midwife led and one third from midwife led units).	Based on the vignettes presented, similar risk assessments were made by midwives of different settings and obstetricians. - Decisions on transfer varied widely across the participants suggesting that the reason for variations may be the differences in personal

	and signal detection analysis			Stage 1- Identification of factors contributing to in-labour transfer decisions: 20 midwives and 4 obstetricians Stage 2- Stage 2: Development of vignettes Stage 3- Completion of the vignette task: 122 midwives and 12 obstetricians	risk-tolerance rather than risk assessment.
Everly 2012 US	Facilitators and barriers of independent decisions by midwives during labour and birth	Qualitative (Interview)	To explore the factors that affect labour management decisions in hospitals and freestanding birth centers	10 volunteer midwives - with labour management experience from hospitals and freestanding birth centers - were recruited from the American College of Nurse-Midwives Annual Meeting and Exposition in 2009 and 2010	Themes identified; Trust birth, the woman, the team and the environment
Jefford 2015 Australia	Midwives' clinical reasoning during second stage labour: Report on an interpretive study	Qualitative-feminist methodology. (Interview)	To explore if midwives use clinical reasoning processes in their decision-makings during the second stage of labour, and if so to what extent?	20 midwives practising in L&D ward from different models of care were recruited through dissemination of advertisement (purposive sampling)	- 7 midwives used non-analytical decision-making - 13 midwives used analytical clinical reasoning, of whom only 9 completed the process to make the final decision. - Intuition was found to be a useful way of knowing, however, not recommended to replace the clinical reasoning process.
Patterson 2015 New Zealand	Midwives' decision-making about transfers for 'slow' labour in rural New Zealand	Qualitative (Interview)	To explore midwives' decision-making on transfer decisions from rural areas to specialist care	- 15 rural midwives who provided lead maternity care services were recruited through dissemination of advertisement and flyers (purposive sampling)	Themes identified: Making the mind shift, sitting on the boundary, timing the transfer and the community interest in birth
Daemers 2017 Netherland	Factors influencing the clinical decision-	Qualitative (In-depth interview- think aloud method)	To explore the factors influencing clinical	11 primary care midwives across Netherland (with different baseline	- Themes identified: The pregnant woman as a whole person, sources of knowledge, the

	making of midwives: a qualitative study		decision-making of independent midwives	characteristics) (purposive sampling)	midwife as a whole person, the collaboration between maternity care professionals and the organisation of care - Midwives' decisions were influenced by their experiences, intuitions, personal circumstances, attitudes, shared decision-making (with woman) and collaboration with colleagues
Healy 2017 Ireland	A qualitative exploration of how midwives' and obstetricians' perception of risk affects care practices for low-risk women and normal birth	Qualitative (Interview)	To understand midwives'/ obstetricians' perceptions of risk in low-risk birth and investigate how this affects decision-making	25 midwives/obstetricians from three maternity settings in Ireland from different settings and models of care (purposive sampling) Participants - had to be working in a birthing environment - had to have at least six months' experience working in their current birth environment - had to have at least six months of experience in their current role	- Key influencing factors and the main themes identified were as follows: Professional autonomy and hierarchy in maternity care, midwifery-led care as an undervalued and unsupported aspiration, a shift in focus from striving for normality to risk management, and viewing pregnancy through a 'risk-lens'
Chodzaza 2018 Malawi	Cue acquisition: A feature of Malawian midwives' decision-making process to support normality during the first stage of labour	Qualitative (Focused ethnography)	To explore how Malawian midwives make decisions during the care of women in first stage of labour in a hospital setting	9 nurse-midwives with different years of clinical experience in the real setting of an urban and semi urban hospital (using 27 participant observations and 27 post-observation in-depth interviews)	The identified six stages of decision-making were as follows; baseline for labour, deciding to admit a woman to labour ward, ascertaining the normal physiological progress of labour, supporting the normal physiological progress of labour, embracing uncertainty. - The whole process was conceptualised as the 'role of cue acquisition'.
Weltens 2018 Netherland	Influencing factors in midwives' decision-making during	Qualitative (In-depth interview)	To understand the influencing factors on midwives' decisions in	10 registered midwives who were attending childbirth in midwifery-led care (purposive sampling)	Emerged themes: knowledge, experience, environment, influences of others (colleagues) and subjective factors (liability)

	childbirth: A qualitative study in the Netherlands		women's referral from midwifery-led to obstetric-led care		
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2.10 Summary

This chapter reviewed the evidence from quantitative, qualitative and mixed methods studies regarding the impact of birth trauma on professional behaviour and decision-making of clinicians. The review identified four main categories regarding the impact of birth trauma 1) psychological issues 2) professional concerns 3) changes in practice and 4) positive impact. Clinical decision-making may be influenced by past traumatic birth experiences. The review identified some gaps in the literature. An important gap was that the majority of included studies assessed the impact of non-emergency traumatic events which are indeed different from emergency events such as SD. Also, the underlying factors which could determine the pathway after the trauma (either Post Traumatic Stress Disorder or professional development) were not well addressed. These gaps necessitate further research on the association between birth trauma and the clinical practice of midwives. The next chapter presents the design and methodology of the two-phase study detailed in this thesis including the methods for recruitment, data collection and analysis which were used to address each of the research questions. The chapter also addresses the ethical concerns requiring to be addressed for each of the two phases of the study.

Chapter Three: Study Design and Methodology

The previous two chapters, presented the epidemiological information on SD, including its definition, incidence, risk factors, outcomes and management. The perspective of SD as a traumatic birth, and the impact it has on personal and professional lives of midwives were also discussed. As described this thesis aimed at 1) exploring the experiences of midwives about SD, and 2) investigating the epidemiology of SD at one tertiary referral hospital in Sydney, NSW, Australia. This chapter outlines the methodology of the thesis and the rationale for the choice of study design. It describes sampling, recruitment of participants, data collection and data analysis methods. The study was conducted in two phases which are explained separately.

3.1 Study Design

3.1.1 Mixed Methods Study

This thesis was conducted using a mixed methods study design. I aimed to explore midwives' experiences of shoulder dystocia (SD) (phase one) and investigate the epidemiology of SD at one hospital in metropolitan Sydney over the period 2013-2018 (Phase two). The two different research questions required different research approaches. The phenomena which deal with experiences, behaviours, views and descriptions of events cannot be easily handled by statistical approaches (Bogdan & Biklen 1997). As such, exploring the experiences of midwives could best be achieved through a qualitative research approach. On the other hand, to determine the incidence and trend of SD, as well as its risk factors and outcomes, a numerical approach was required. To address both areas, a mixed methods study was the most appropriate approach (Tariq & Woodman 2013).

In a mixed methods study, both quantitative and qualitative data are collected, analysed and integrated in a single study to complement each other in answering the research question(s) (Creswell & Clark 2007). Mixed methods studies are valuable and ideal for complex topics, which neither quantitative nor qualitative methodologies can address alone (Creswell & Creswell 2017). Shoulder dystocia is a complex, multifactorial and, in most cases, a

subjective birth emergency (Menticoglou 2018). The incidence of SD is not dependent on only one single factor, but is determined by a variety of factors including fetal, maternal and labour risk factors as well as how accurately clinicians diagnose it (Menticoglou 2018; Sahrphillips, Van Hoover & health 2020).

Using a mixed methods design in this thesis helped to decrease the potential bias of using only one single research methodology (Tashakkori, Teddlie & Teddlie 1998). This type of study integrates the strengths of both qualitative (e.g. in-depth descriptions) and quantitative (e.g. large sample size, and statistical measurements) methodologies which lead to a richer understanding of the topic (Creswell & Clark 2017). Both approaches were utilised in this thesis and the findings were integrated at the presentation stage. Combining qualitative and quantitative findings through a process of triangulation, which is described later in this chapter, increased the trustworthiness of the results (Schoonenboom & Johnson 2017).

Sequential Exploratory Mixed Methods Study

For the purpose of this thesis, a sequential exploratory mixed methods study was conducted. In a sequential study, qualitative and quantitative components are not conducted concurrently. Simultaneity and dependence are two main aspects of a mixed methods study (Schoonenboom & Johnson 2017). The main focus of this research was on the first phase of the study (qualitative phase), meaning that conduct of the second phase was dependent on the findings from the first phase of the study (Schoonenboom & Johnson 2017). In other words, this research was a qualitative-dominant study, with more weight and value placed on the qualitative phase (Johnson, Onwuegbuzie & Turner 2007). The themes obtained from the qualitative study informed me about the necessity of conducting the quantitative study (Morse & Niehaus 2009).

Mixed methods design was not planned from the beginning of the thesis, but arose following the conduct of the first phase. This type of mixed methods study is called ‘emergent’, as it develops during the course of the study (Creswell & Clark 2011). Here, I explain the rationale for conducting the sequential exploratory study. In the following paragraphs, I explain the

findings of the qualitative study in brief, and why those findings prompted me to undertake the quantitative component.

The initial question of this thesis was whether midwives are affected by the experience of traumatic births, and if the answer was yes, how their feelings and practice may be influenced by those births. As there was little evidence available about the research question, the priority was to first gather information from the key informants (midwives) who had personal experience and attitudes about the topic (Lincoln, Guba & Pilotta 1985). I explored the answer through conducting a qualitative study, and undertaking semi-structured interviews with midwives to learn about their stories and experiences of SD (DeJonckheere & Vaughn 2019). Collected data were thematically analysed, and the identified concepts were categorised into themes and sub-themes.

Part of the qualitative findings revealed that previous experience of SD could affect how midwives diagnose and manage future SDs. I found that the traumatic experience could potentially affect the emotions of midwives and increase their level of vigilance in practice. Experience of a traumatic SD could impact midwives' diagnosis of SD in future birth(s). Details of this study have been presented in the next chapter. The fact that how midwives diagnose SD-complicated births can directly influence the incidence of SD in the birthing population. Higher diagnosis rate of SD, results in its higher incidence rate in the population. Currently, there is no official report regarding the incidence of SD in the Australian context. Since measuring the incidence rate was not feasible in a qualitative study, I decided to conduct a quantitative study to gain insights about this rate. In other words, I aimed to investigate how often midwives experience SD?

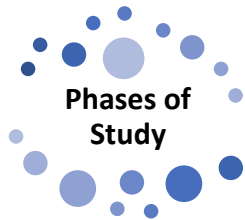
As indicated earlier, this thesis was an emergent mixed-methods study, because the decision to conduct the second phase of the study was made after I obtained the results of the first phase. For the second phase, I conducted a retrospective cohort study using the medical records of women and babies. These records could provide me with epidemiological information on SD such as incidence, trend, risk factors and outcomes. Access to/ and

analysis of data at a national level was beyond the scope of this thesis. Therefore, one tertiary women-specialist hospital in Sydney was chosen.

To determine the incidence of SD, the ideal approach could be assessing the rate of SD at the national level and through accessing a larger maternity database. Access to such a dataset was not feasible for the purpose of this PhD project. I acknowledge it as a limitation of this thesis. Prior to contacting the chosen tertiary maternity hospital in Sydney, several other sources of large maternity datasets were contacted to inquire about the possibility of access to a larger dataset. These centres included the Centre for Health Record Linkage (CHeReL) and Women's Healthcare Australasia (WHA). Unfortunately, no data could be provided by any of these centres. Further, I initially attempted to include a dataset with higher number of records collected through a longer time period (i.e., 10 years) from a different tertiary hospital in NSW. Despite undertaking every requirement (including multiple ethics and SSA applications), the data collection process was delayed (partly due to Covid-19 situation) and finally cancelled by the hospital. In chapter seven, section 7.8, I have acknowledged that results of the quantitative phase present a snapshot of SD in one tertiary referral hospital, and different results could have been generated had data been collected 1) at state/ or national level or, 2) from a primary or a secondary care hospital or, 3) if larger time periods had been studied.

An important point that I kept in mind throughout the study was that the incidence rate of SD is a multifactorial issue. The previous traumatic experience, although may affect the diagnosis and the overall incidence in the population, it is not the only responsible factor for a high or a low incidence rate. The incidence of SD is in fact an interaction between the physical factors and the diagnosis of clinician, which may sometimes be subjective. Addressing such broad and complex topics can ideally be achieved through mixed methods studies (Creswell & Clark 2017). The information from both phases can enhance knowledge about the interaction between midwives' emotions and their performance at birth, and can provide a basis for future research to measure the effect of midwives' fear and anxiety on their accurate diagnosis of SD.

Connection and integration of qualitative and quantitative components in a mixed methods research may take place at different stages including conceptualisation, data collection, data analysis or after data analysis (result point) (Morse & Niehaus 2009; Tashakkori, Johnson & Teddlie 2020). In this thesis, I collected and analysed data sequentially, and integrated findings after the completion of the data analysis of both phases (integration at result point) (Morse & Niehaus 2009). Figure 1 illustrates the sequences and methods used in the two phases of the study, and includes the objectives, study population, data collection and data analysis. Results of the two phases are presented separately in chapters four to six, and integration of the findings are presented in chapter seven. In the next section, the study design and the methods used for the two phases of the study are described.



• Objectives



**Qualitative Phase 1
Qualitative Descriptive Study**

- 1) To describe the impact of SD on feelings and emotions of midwives
- 2) To explore the impact of experiencing SD on birth orientation and clinical practice of midwives
- 3) To investigate the professional pathway which may occur for midwives following the experience of shoulder dystocia births.
- 4) To identify the factors which may improve or worsen the experience of SD births.



**Quantitative Phase 2
Retrospective Cohort Study**

- 1) To determine the incidence and trend of SD in a tertiary hospital over the period 2013-2018
- 2) To investigate the risk factors for SD
- 3) To investigate the maternal and fetal outcomes of SD

• Data Collection

- Semi-structured interviews

• Study Population

- Midwives who were members of the Australian College of Midwives

• Data Analysis

- Thematic analysis

- De-identified routinely collected data through access to maternity databases

- Pairs of women and babies

- Descriptive and inferential statistical analysis

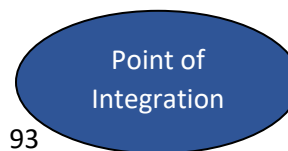


Figure 1 Outline of the study design

3.2 Phase One

Exploring the Impact of Shoulder Dystocia Complicated Births on the Clinical Practice of Midwives

3.2.1 Study Design: Qualitative Descriptive Study

The first phase of this thesis was a qualitative study that included one-on-one interviews with registered midwives across Australia. Malterud defines qualitative research as “*the systematic collection, organization, and interpretation of textual material derived from talk or conversation. It is used in the exploration of meanings of social phenomena as experienced by individuals themselves, in their natural context*” (Malterud 2001, p. 483). The phenomenon in this study was SD as a traumatic birth experience for midwives. This phase of the study was designed to address the first, second and third research questions of the thesis. Qualitative research is the preferred methodological approach when the researcher aims to study the stories of individuals (Creswell & Poth 2016). The research question of this thesis could be best addressed through a descriptive qualitative study, since I aimed to discover the *who*, *what* and *where* of the experiences (Sandelowski 2000).

My intent was to identify new relevant concepts, but not to generate new theories as in the grounded theory method (Corbin & Strauss 2008), nor to directly observe a certain group of midwives in their natural setting as in ethnography (LeCompte & Schensul 2010), nor to reach to the philosophical roots of the experiences or decision-making process as in phenomenology (Paley 1997). Further, my aim was to seek the experiences of a group of midwives from different settings and models of care rather than the stories of a few as would occur in narrative inquiry (Polkinghorne 1995).

The flexibility of qualitative descriptive research, and the fact that there are no clear boundaries in designing the study, produces rich, straight-forward and comprehensive description of experiences and events (Sandelowski 2010). A merit of the qualitative

descriptive approach is its inductive nature, meaning that it does not generate nor interpret data based on existing theories or pre-defined conceptual frameworks (Neergaard et al. 2009). This feature can be considered as an advantage when the purpose of the study is to only describe a phenomenon. Without a theoretical framework, the analysis stays close to the data and to the views of the participants (Neergaard et al. 2009). However, without a theoretical framework the analysis may be subjective, which therefore necessitates involvement of a group of researchers in the process of data analysis. Another advantage of the qualitative descriptive approach is that it can be learned and used by health researchers, without a formal theoretical education, but with a supervision from trained qualitative researchers (Neergaard et al. 2009).

Over the past decades, there has been a growing recognition of the value of qualitative methodology in health research. Qualitative research is no longer viewed as a less valued research approach compared to the quantitative methodology (Chafe 2017). Also, the number of studies that integrate both quantitative and qualitative approaches in a single study have grown significantly over the past few decades (Tariq & Woodman 2013). As Bogdan and Biklen (1997) stated, quantitative researchers may criticise qualitative design for a number of reasons, including generalisability of qualitative research, the influences of the prejudices and biases of the qualitative researcher and reliability of qualitative research (Bogdan & Biklen 1997). However, using trustworthiness criteria will improve the quality of data and the rigour of the study. The quality criteria used for this thesis (i.e., credibility, dependability, confirmability, and transferability) are discussed in section 3.2.9 of this chapter.

3.2.2 Study Setting

In Australia, SD is referred to as the most feared maternity emergency (Dahlen & Caplice 2014) and one of the greatest fears among midwives (Dahlen 2010). Fear of SD appears to be a national issue which is not restricted to a specific setting, model of care or state, and therefore, in this study, I decided to gather data from midwives across Australia. Due to the high accessibility of the data collection method, which was video communication, it was possible to recruit midwives from different states. Midwives who participated were working or had previously worked in different workplaces and models of care including academia,

public or private hospitals, birth suite, birth centre, caseload midwifery and homebirth. Recruiting participants from different workplaces, models of care and states ensured coverage of a range of experiences and contributed to an increased transferability of the study findings (Lincoln, Guba & Pilotta 1985).

3.2.3 Participants

I conducted in-depth interviews with registered midwives. A registered midwife is a person who is “*educated, competent and authorised to provide safe, effective delivery of quality services that promote health and wellbeing for pregnancy, birth, the postnatal period and transition to parenting*” (Nursing and Midwifery Board 2018). Shoulder dystocia, as described previously, is a common fear for midwives in Australia (Dahlen & Caplice 2014). I aimed to gain a comprehensive understanding of the experiences of all midwives across the country, so I approached midwives through the Australian College of Midwives (ACM). The ACM is a national membership organisation and the professional body for Australian midwives, with registered members from all states and territories of Australia (ACM 2021).

Regarding the characteristics of the midwifery workforce, in 2015, the Australian Institute of Health and Welfare (AIHW) reported 28,211 registered midwives, including midwives who “*reported working some hours in either midwifery or nursing in the week prior to completing the workforce survey*” (AIHW 2016). The report showed that 98.6% of employed midwives were female, 88.5% held a nursing registration. The mean age of midwives was 47.9 years, with 52.3% aged 50 and over. Of these midwives, 38.8% reported attending a birth as the primary midwife in past year. In 97.8% of these births, the place of birth was a hospital, 5.0% of births were in a birth centre, 2.2% were at home, and 1.4% were classified as another place (AIHW 2016). The AIHW information included registered midwives who were not necessarily members of the ACM. This study only invited those who were members of the ACM, totalling 5,000 midwives at the time of data collection.

As it was a qualitative study, determination of sample size adequacy was relative, because the events and experiences were the focus of the research rather than the individuals (Sandelowski 1995). I required rich data, but not necessarily a large sample size. Based on

the eligibility criteria of participants described below, purposive sampling was undertaken. In purposive sampling, key informants who suit the purpose of the study are recruited (Bernard 2017). In this study midwives who experienced SD were considered as the key informants.

3.2.4 Eligibility Criteria

The ACM members were invited to the study irrespective of their workplace, model of maternity care, years of experience, university qualification, age or other basic characteristics. Participants who had experienced at least one case of SD during their working career were recruited. Shoulder dystocia in this project was defined as a case with one of the following criteria:

1. A case which needed at least one obstetric manoeuvre to release the bony impaction of the shoulder after the head had been born and gentle traction on the neck had failed; or
2. A case with delayed birth of shoulders which resulted in neonatal complications (bone fractures, brachial plexus injury, hypoxic ischaemic encephalopathy); or
3. A case which was perceived as a traumatic SD by the accoucheur.

3.2.5 Recruitment

Formal approval was sought from the ACM to distribute an invitation email to all registered midwives who were members of ACM. From different advertising options, the electronic direct mail was chosen as it had 35% open rate and 2.5% click through rate, and could be sent nationally or state-wise (there are 6 states and 2 territories in Australia and ACM members are located in all 8 locations). Direct email option also had a better chance of receiving response from the members, compared to the monthly newsletter. Midwives who were eligible and expressed interest in taking part in the study were asked to respond to the invitation email. The invitation to the ACM members described the aim of the study and the eligibility criteria for participation. Copies of the email and the flyer which were sent to the midwives are provided in the Appendix 3. The email was distributed on 11 April 2019. An administrative fee for distributing the electronic direct mail was paid to ACM.

3.2.6 Data Collection

To interview midwives from different states/territories, the Zoom platform (a video conferencing program) was used which enabled the researcher to build a good rapport with the interviewee almost similar to face-to-face interviews (Zoom Video Communications, Version 4.4.5, 2019) (Zoom Video Conferencing 2019). Zoom interviewing also provided a comfortable condition for interviewees in terms of the time and place of interview. Using video webcam also assisted the researcher to observe the interviewee's visual cues (facial expressions or body movements), and therefore to be able to reflect on the feelings of the interviewee, and to be able to decide when to discontinue the conversation in case the interviewee felt uncomfortable. Although Zoom interviews were the preferred option, based on the participant's preference and lack of access to a visual medium, telephone interviews were also conducted.

A day before the scheduled interview time, an email notification was sent to the participant to increase the participation rate. For those who agreed to visual interview, an email containing information on how to use Zoom was sent. Zoom could be accessed from different devices (desktop, tablet or smartphone), and with different operating systems; therefore, it created convenience for the participants to choose the time/place of the interview.

A participant information sheet, explaining the purpose of the study, as well as a written informed consent form and withdrawal of consent form (Appendices 4 and 5) were sent via email. Participants were asked to sign the consent and complete the form before the interview. The forms could be electronically signed and completed without the need for printing. The demographic questionnaire was completed during the interview and covered information about the midwives' age, highest qualification, years of experience, current setting and model of care and the setting in which the case of SD occurred (if different). Prior to initiation of data collection, the appropriateness and order of the interview questions were discussed with the supervisory team and advice were sought on the interview skills necessary for achieving rich data.

The most common methods of data collection in qualitative descriptive research are semi-structured, individual and/or focus group interviews as well as observations of the events (Sandelowski 2000). As it was likely that participants may describe stories about potentially unsuccessful SD cases, adverse outcomes or failures, it was assumed that individual interview would provide a more confidential and comfortable condition for the midwives than a focus group. Also, the purpose of this study was to find the individual experiences after SD both in the short and long term, which could be ideally achieved through one-to-one interviews. In addition, focus group is the preferred method for exploring the differences of opinion (Tausch & Menold 2016), which was not the intent of present study.

I undertook in-depth semi-structured interviews using open-ended questions (provided in Table 1). At the end of each interview, I noted my reflections and feelings. Interviews were audio-recorded. I interviewed midwives until data saturation was obtained meaning that no new data emerged from the interviews (Grady 1998). Data collection continued for five more interviews after the data saturation point to ensure that there were no new themes emerging. I transcribed the interviews verbatim.

Table 1. Interview questions

Could you please tell me about your experiences of births complicated by shoulder dystocia?
How did you feel when shoulder dystocia happened?
What were you feeling when the baby was born?
Can you tell me about your feelings in the next births?
Can you tell me about the support you received after that birth?

3.2.7 Data Analysis

Data collection and data analysis were conducted in tandem. Transcripts were analysed by thematic analysis (Thomas & Harden 2008), using the Braun and Clarke six-phase guide (Braun & Clarke 2006). The six steps included:

1) Familiarising oneself with your data: For me, the process of familiarisation began by transcribing the audio recordings, reviewing my notes which were taken during and after interviews, and initial reading of transcripts. I transcribed all audio recordings, except for two recordings which were transcribed by a trusted transcription institute (to expedite the process of transcription during conducting interviews and to guide the direction of next interviews). Transcribing the interviews helped me to recall the interviews, think about the concepts and develop an understanding about the data that I had collected. Then, I read and re-read quotations line-by-line.

2) Generating initial codes: Following the first stage, I gained an insight about the main patterns of data and found what the important things in the data were. I conducted multiple-cycle coding both manually and using NVivo 12 Software (QSR International Pty Ltd. Version 12, 2020). I used NVivo to organise, store and map the data and to create a coding tree. Although I had the research questions in my mind while coding the data, I approached the data in an inductive way, without limiting myself to code only around the research questions. Almost all sections of the interviews were coded, and even if they were not directly relevant to the research questions; I put a note beside these to be reviewed later.

3) Searching for themes: To find connections between the concepts and to identify the themes, I used post-it notes to group similar concepts into one category. Up to this stage, I had four general categories: a) feelings and perceptions after SD b) positive outcomes c) negative outcomes, and d) improving the experience. Each of these categories consisted of two to three sub-themes.

4) Reviewing the themes: In this phase, I re-read the extracted quotes and reviewed their connections with sub-themes and themes. Those quotes which did not fit into any category were taken out. At this stage when the main concepts of the data had been identified, I read all transcripts once again to search for any new coding. Moving codes from one sub-theme to another sub-theme, refining the sub-themes, merging sub-themes or separating codes from themes, all occurred in this phase, and through ongoing discussions with my supervisory panel.

5) Defining and naming themes: Up to this phase, I had explored how midwives made sense about SD and what the patterns of impact were. In this step, I reviewed and revised the titles of themes based on their entire content. Prior to each theme/ sub-theme, I put an explanatory paragraph which defined its content. Explanations were written in a way to keep the flow of the story.

6) Producing the report: In this phase, I wrote a structured narrative for the extracted codes, sub-themes and themes. Through narrating the midwives' stories about SD, I embedded the responses to my research questions. Themes have been reported in two separate publications which are presented in chapters four and five.

3.2.8 Theoretical Framework

An important feature of thematic analysis is that it does not require the researcher to fit the themes into an existing theoretical framework. This feature offers a more flexible approach to analysis of data (Braun & Clarke 2006). This inductive approach to analysis meant that new concepts and themes were data-driven and were not supposed to fit into a pre-defined theoretical framework (Pope, Ziebland & Mays 2000). However, the appropriate theoretical framework which fitted into the themes was chosen throughout the process of collection and analysis of data. The chosen framework was the Post-traumatic Growth Theory which is explained in detail, along with the findings in chapter five.

3.2.9 Data Quality (Trustworthiness)

Trustworthiness simply means whether the findings of the research can be trusted (Lincoln, Guba & Pilotta 1985), in terms of both robust methodology and accurate interpretation and analysis of data (Leung 2015). Different measures have been proposed to evaluate trustworthiness in qualitative research, which encompass different stages of the research such as procedures, sampling and interpretation (Kitto, Chesters & Grbich 2008). However, the more comprehensive and accepted criteria for trustworthiness are proposed by Lincoln and Guba (1986) which include 1) credibility 2) dependability 3) confirmability and 4) transferability.

3.2.9.1 Credibility

Credibility in qualitative research, or internal validity as in quantitative research, indicates that the study is measuring exactly what it has intended to measure. In other words, it indicates that findings are true and credible through using rigorous research methods and accurate data analysis (Lincoln, Guba & Pilotta 1985; Patton 1999). In this thesis, credibility was ensured through taking the following approaches:

- 1) Identifying an appropriate research methodology: After defining the research question and identifying key-informant midwives as the most appropriate participants for this study, one-to-one interviews and thematic analysis were chosen as the most robust methods of data collection and analysis.
- 2) Interviewing process and technique: Preliminary interviews were conducted with two colleague midwives to ensure construct validity of the interview questions and to see how midwives interpreted the interview questions and whether their responses conformed with what I intended to explore. The interview questions were formulated in a way that addressed the research concepts (Tong, Sainsbury & Craig 2007).
- 3) Member checking: Once all interviews were conducted, transcripts were returned to midwives for feedback and potential corrections (Birt et al. 2016).
- 4) Triangulation: Triangulation is the use of different methods, investigators, theories or sources of data to enhance the credibility of findings (Patton 1999). In this study, I used data source triangulation by interviewing different midwives with different levels of experience, settings and models of care (*triangulation of sources*). Differences between participants were compared and analysed to determine how a single birth trauma such as SD could differently affect individual midwives. Variation in responses of participants informed me of two different pathways which may occur following the experience of SD: 1) post-traumatic growth 2) snowball effect. These pathways are discussed separately in chapters four and five. Triangulation can also be practised through having multiple data analysts (*analyst triangulation*) (Patton

1999). As a PhD student, I shared my notes, reflections, transcripts and the extracted themes with my supervisors, and we had multiple discussions in this regard. Triangulation of analysis ensured that the data were critically evaluated by a team of researchers which indeed reduced the risk of data interpretation being affected by personal biases of the primary researcher (Patton 1999).

- 5) Ensuring honesty in key informants: Participants should be free in participating or refusing to take part in the study in order to share their experiences free from fear of losing credibility at work (Shenton 2004). Participants were informed in the consent forms as well as at the beginning of the interview sessions that they can discontinue or cancel the interview at any time they liked. Midwives were also provided with the opportunity of withdrawing from the study at any point after data collection and before publication of data.
- 6) Having frequent debriefing sessions with supervisors: During the process of data collection and analysis, I met regularly with my supervisors and discussed the process of interviewing, my reflections and the identified themes (Shenton 2004).
- 7) Background, qualifications and experience of researcher: As a midwife, I had experienced multiple severe cases of SD in my career, both as an independent midwife and as a clinical tutor working with midwifery students. I had sufficient knowledge about SD and its outcomes for babies, women and midwives. My research background in clinical and medical fields, also, enabled me to design and conduct a study with robust methodology (Patton 1990).

3.2.9.2 Dependability

Dependability determines whether the qualitative research is repeatable if conducted in the same context and with the same participants and investigators (Lincoln & Guba 1986). To ensure the dependability of this study, the strategy of an audit trail was followed (Korstjens & Moser 2018). This indicates that all steps taken from the beginning of the protocol design to the completion of the study and dissemination of findings were explained in detail. The

recruitment strategy, sampling, interview process and the steps of thematic data analysis were addressed to increase the transparency of the research (Korstjens & Moser 2018). To achieve consistent content, I asked the same interview questions (with slight differences depending on the issues discussed during each interview). These strategies help future researchers to repeat the same study step by step. However, they may not obtain exactly the same results, as in qualitative research the phenomena may change over time which may lead to different findings (Shenton 2004).

3.2.9.3 Transferability

Transferability refers to the degree that qualitative research findings can be transferred to other contexts and settings (Lincoln, Guba & Pilotta 1985). A high degree of transferability is achieved through a dense description of experiences and contexts, so that upon reading the findings and conclusions, the readers will decide about the applicability of the findings to their contexts (Shenton 2004). In this study, I presented the descriptive data about participants and their contexts to facilitate the readers' judgement on transferability. This information included the demographic characteristics of the participants, sample size, sampling strategy, interview questions, settings in which SD occurred and time period of data collection (Korstjens & Moser 2018).

3.2.9.4 Confirmability

Confirmability, as another aspect of trustworthiness, determines whether the results of the qualitative study can be confirmed by other researchers (Lincoln, Guba & Pilotta 1985). According to Denzin (1989), every researcher has their own preconceptions and interpretations about the topic of the study which indicates the difficulty of conducting value-free research (Denzin 1989). Confirmability indicates the neutrality of the researchers, and how successful they have been in preventing the study findings from being affected by their personal biases. In other words, confirmability confirms that the findings are data-driven, and not based on the researcher's imagination (Lincoln, Guba & Pilotta 1985).

3.2.10 Critical reflection of my positioning as a researcher

A key factor to ensure confirmability is the researcher's acknowledgment of her/ his predispositions (Miles & Huberman 1994). This is an essential part of qualitative research to ensure rigour and validity of data. Self-knowledge and reflection were two main strategies that I used to limit the influence of my assumptions on the interview process and data analysis (Sorsa et al. 2015). I acknowledged my clinical background as a midwife who had worked for several years in labour and birth units. I experienced many cases of SD which were a trigger for me to conduct a study on the emotional and professional outcomes of SD for midwives. I used a reflective journal to write my thoughts, views and feelings about the interviews and the experiences and feelings of participants. Also, having regular meetings with the supervisory panel and discussing the interview quotes with them, ensured that the findings were produced in a data-oriented and neutral approach, rather than based on my personal assumptions.

My experience in complicated birth emergencies, and specifically SD, provided me with insider knowledge. Insider knowledge occurs when research is conducted in a community in which the researcher is a member. Being an insider helped me to better fit in with midwives and to build trust during interviews (Burns et al. 2012). I shared feelings and thoughts with participants which provided a sense of connection for both myself and the midwives. Insider knowledge also helped me to better approach the research question and to frame the interview questions.

Having said that, I was aware that I should not judge midwives or interpret their experiences based on my personal experiences which had motivated me to do this project. I acknowledge that, as researchers have previously confirmed, it is almost impossible to set aside all personal experiences while collecting and analysing qualitative data. However, the goal was to focus on midwives' perspectives and to create new understanding of the topic (Sorsa et al. 2015). To minimise personal biases, I sought outside readers (my supervisory team). (Fischer 2009).

3.2.11 Ethical Considerations

The ethics application was approved by the Human Research Ethics Committee (HREC) of the University of Technology Sydney (UTS HREC ETH18-3088/ 14th Jan 2019) (provided in Appendix 6). The main ethical issue was the risk of midwives being re-traumatised during the interviews due to thinking about SD and recalling their traumatic experiences, especially if the births were associated with an injury to the woman or baby. It could be a source of distress for midwives during or after the interviews. However, the likelihood of this potential risk was slight because midwives were asked about the impact of SD on their subsequent clinical decisions and practice, rather than about the outcome of the birth, e.g. injury or death of women or babies. The interview questions were not designed to investigate the details of the event or to hold midwives responsible for a failure or an undesirable birth outcome.

During the interviews, none of the participants felt distressed; however, supportive strategies were planned in case I perceived discomfort or distress in the interviewee. These strategies included: discontinuation of the interview or re-starting it after a short break; asking the interviewees if they needed counselling; ensuring that they had someone to talk with at home/work in case they needed immediate support; asking for the phone number of that person (or their psychologist/counsellor); making a follow-up phone call on the same/next day to ensure that the participant did not feel distressed any more, and providing details about appropriate counselling services for them to seek following the interview. If the participant was employed in a health service or other organisation, I would ask if they had access to an Employee Assistance Program (EAP).

Thinking and talking about birth trauma could cause distress for myself as well. To minimise this effect, I had contact with my supervisors, and in case I needed counselling, I had the opportunity to schedule an appointment with an expert to discuss my concerns. Furthermore, I followed the rules and guidelines outlined in the Distress and Safety Protocol for both participant and researcher (Appendix 7).

Following the ethics approval, the ACM was contacted regarding the recruitment of participants. The ACM was requested to send an invitation email and a flyer to all its

members explaining the aim and eligibility criteria of the study (Appendix 3). Responding to the invitation email was voluntary; therefore, it indicated an implicit consent to participate in the study. An interview session was scheduled with interested midwives who were eligible to participate in the study. Before each interview session, midwives received participant information sheet, informed consent form and withdrawal of consent form. Midwives were asked to sign the consent form electronically and sent it back to me. In cases where midwives were not able to sign the form electronically, at the start of the interview, they were asked verbally about their consent to participate in the study. The verbal consent was recorded. Also, at the beginning of the interview, participants were informed that the interview would be audio-recorded.

3.2.12 Confidentiality

Participants were assured that their data would be de-identified and used only for the research purposes of this project. Pseudonyms were used to minimise the participants' risk of being identified. As the data collector, I was not working at any health setting in Australia and the data collection was conducted through Zoom or telephone interviews, all of which decreased the possibility of participants being identified in their workplace by their colleagues or supervisors. I was the only person who knew the identity of the participants, and even my supervisors were provided with pseudonyms. Electronic data were stored in a personal laptop and saved in the University password-protected CloudStor software. Data will be retained for a minimum of five years from the date of publication and then securely disposed.

3.3 Phase Two

Investigation of the Incidence, Trend, Risk Factors and Outcomes of Shoulder Dystocia in a Tertiary Hospital in Sydney, NSW

As explained in chapter one, there is currently no official report on the incidence of SD in Australia. Determining the incidence and the rate of obstetric manoeuvres may reflect the potential for over- or under-diagnosis of SD. However, obviously, high or low incidence rates are multi-factorial and can be attributed to a variety of factors. The second phase of the study provided information on the trends in use of obstetric manoeuvres over 2013-2018 at one

tertiary referral hospital in Sydney. This section presents the design of the study, setting, participants, process of collection, cleaning and analysis of data, and ethical considerations, and finally storage and security of data.

3.3.1 Study Design: Retrospective Cohort

The second phase of the study aimed at addressing the fourth, fifth and sixth research questions regarding the incidence of SD, its trend, risk factors and outcomes. The study design was a retrospective cohort study using medical record review conducted through online hospital databases. The hypothesis of this study was that there will be an increasing trend in the incidence of SD over the past six years.

3.3.2 Study Setting

Data were collected from one large metropolitan tertiary referral hospital in Sydney, Australia. Tertiary hospitals provide specialised consultative care in units such as cardiology and intensive care, and have specialized staff and technical equipment. Referral hospitals “*provide complex clinical care to patients referred from lower levels*” (Hensher, Price & Adomakoh 2006, p.1231). The size of these hospitals ranges from 300 to 1,500 beds (Hensher, Price & Adomakoh 2006). The selected hospital is one of Australia’s main specialist hospitals for women and babies with an annual rate of 4,200 births. The hospital provides intensive care to more than 600 premature babies each year. It was the first women’s hospital in Australia, as well as the Australia’s first lying-in hospital. The hospital is also the only women’s hospital in New South Wales (NSW). Due to the high annual birth rate, this hospital could provide sufficient cohort of women and babies with valid and generalisable data for this thesis. Issues about the validity of data are discussed in the following sections.

The hospital is set in the Eastern Suburbs of Sydney which, based on the Socio-Economic Indexes for Areas (SEIFA), is considered as a relatively high socio-economic area of Sydney. Socio-Economic Indexes for Areas are indicators of relative socio-economic advantage and

disadvantage of a region, and are based on four indexes (Australian Bureau of Statistics 2016).

The SEIFA score for the majority of suburbs in Australia lies between 900 and 1,100 (Australian Bureau of Statistics 2016). Based on the latest census in 2016, details and scores of SEIFA for the Randwick area in which the hospital is located are presented below:

1. **Index of Relative Socio-economic Disadvantage (IRSD) Distribution:** This index includes the data on a) proportion of low income households in the area; b) proportion of people who do not speak English well; c) proportion of households who pay low rent; and d) proportion of people with no post-school qualifications. Randwick's score for this index is 1,087 which is close to the upper limit of 1,100. Also the percentile for this index for Randwick is 91 which indicates that 91% of NSW suburbs have a SEIFA index lower than this area.
2. **Index of Relative Socio-economic Advantage and Disadvantage (IRSAD) Distribution:** This index measures the socio-economic status based on the main categories of a) proportion of high income households in the area; b) proportion of low income households in the area; c) proportion of households with broadband internet connection; and d) proportion of households without access to the internet. Randwick's score for this index is 1,133 which is above the upper limit of 1,100. The percentile for this index for Randwick is 96 which indicates that 96% of NSW suburbs have a SEIFA index lower than this area.
3. **Index of Economic Resources (IER) Distribution:** The variables included for this index focus on the categories of a) proportion of high income households in the area; b) proportion of low income households in the area; c) proportion of home owners in the area; and d) proportion of unemployed people in the area. Randwick's score for this index is 995 which lies between the average of 900 and the upper limit of 1,100. The percentile for this index for Randwick is 30 which indicates that 30% of NSW suburbs have a SEIFA index of lower than this area.
4. **Index of Education and Occupation (IEO) Distribution:** This index measures variables that focus on a) proportion of people with a diploma qualification; b) proportion of people with no post-school qualifications; c) proportion of people

employed in a job classified in occupation-skill group 1 (such as managerial and professional jobs); and d) proportion of people employed in a job classified in occupation-skill group 5 (such as some labouring and sales jobs). Randwick's score for this index is 1,072 which is close to the upper limit of 1,100. The percentile for this index for Randwick is 83 which indicates that 83% of NSW suburbs have a SEIFA index of lower than this area.

Except for the IER, the suburb of Randwick has a high SEIFA score for all indexes compared to many other suburbs of NSW. Socio-economic status is an influencing factor on maternal health. Women who live in disadvantaged suburbs are more likely to experience maternal morbidity outcomes (Lindquist et al. 2015). Low socio-economic status has significant association with gestational diabetes mellitus (GDM) (Anna et al. 2008), obesity (Ghosh, Charlton & Batterham 2016) and overuse of obstetric interventions (Fox et al. 2019) which all are among the main risk factors for SD.

3.3.3 Time frame

Data were recruited from 2013 to 2018. This time frame was chosen as it could provide information on trends of SD and associated risk factors over several years. This information could not be achieved had we chosen a time frame of a single year. In addition, as this thesis was a mixed methods study, and also due to the limitations of a PhD project in terms of time and resources, choosing a larger time frame was not feasible.

3.3.4 Participants

The study population included all women who experienced a vaginal birth in one hospital in Sydney over the period 2013-2018 and their neonates (woman-baby pairs). To assess the risk factors and outcomes of SD, women who were diagnosed with SD were considered as "cases" and those who were not diagnosed were treated as "controls".

3.3.5 Data Source

Two databases of ObstetriX and eMaternity were used. ObstetriX is an electronic maternity surveillance system that provides perinatal data collection and reporting for inpatient documentation and outpatient electronic medical records. The database is maintained by the data custodians of each Local Health District (LHD). In 2017, ObstetriX was upgraded to a new version called eMaternity. For the purpose of this thesis, data from both ObstetriX (2013-2017) and eMaternity (2017-2018) databases were used.

3.3.5.1 Accuracy of ObstetriX and eMaternity Databases

Accurate recording and reporting of electronic health data are essential not only for patients' care (or women's care specifically in maternity care), but are also critical for quality improvement and clinical research purposes (Weiskopf & Weng 2013; Wuerdeman et al. 2005). To ensure consistent management of data, all agencies across NSW, including the health sector, are required to follow the "Data Quality Framework" developed by the NSW government (NSW Government 2015). This framework outlines seven dimensions for data quality which include: 1) Institutional environment 2) Relevance 3) Timeliness 4) Accuracy 5) Coherence 6) Interpretability and 7) Accessibility. The dimension of accuracy "*refers to the degree to which the data correctly describe what they were designed to measure, monitor or report*" (NSW Government 2015). Data accuracy ensures that the data have undergone the quality assurance processes such as checking for errors, missing records and non-responses at the stages of data collection and data entry (NSW Government 2015). Across all NSW LHDs, data custodians are responsible for ensuring that the data quality framework is in line with the core elements of integrity, accuracy, completeness, timeliness, relevance, consistency and reliability of the data. Data quality checks are regularly undertaken in order to identify incomplete records or records with errors (NSW Government 2020).

ObstetriX and eMaternity are parts of the electronic Perinatal Data Collection (PDC) surveillance system. The PDC system, which was formerly known as the Midwives Data Collection (MDC), records perinatal data across NSW. For every birth, the attending clinician completes a form which provides demographic, medical and obstetric data about women,

infants and labour and birth. All forms are sent to the Data Integrity and Governance Unit, Information Management and Quality, in the System Information and Analytics Branch of the NSW Ministry of Health (Centre for Health Record Linkage (CHeReL) 2021). This unit follows mandatory standards to manage data quality and accuracy.

So far, several studies have been conducted to assess the validity of PDC data. A descriptive study assessed the coding concordance of birth outcome and discharge status between the NSW MDC and Admitted Patient Data Collection (APDC) (Lam 2011). The study found that only 3% of confirmed hospital births were not recorded in the APDC. The likelihood of births not being recorded in the APDC was lower in tertiary hospitals compared to small hospitals. There was a high level of coding concordance between the APDC and MDC datasets. The study reported good quality for the obstetric data recorded in the APDC. A similar study examined the accuracy and reliability of the reporting of diagnoses and procedures related to childbirth in hospital data (Roberts et al. 2009). The study used population health data which were obtained from MDC and APDC. Results showed that for a majority of diagnoses and procedures during labour and birth, there was a high level of accuracy and consistency.

Overall, electronic data may be subject to inaccuracy; in particular, due to the subjective nature of SD diagnosis. However, based on the described reports, the PDC data, especially when collected in a tertiary hospital such as the one in this study, appear to be a reliable source of obstetric data.

3.3.6 Outcome Variables

The primary outcomes were the incidence of SD and trends over time. The secondary outcomes were the antepartum and intrapartum risk factors as well as maternal and neonatal outcomes. The assessed risk factors included: maternal BMI, pre-existing diabetes mellitus, GDM, previous history of SD, induction/augmentation of labour, use of analgesia and neonatal birthweight. The maternal and neonatal outcomes of interest included: perineal status (episiotomy/tears), post-partum haemorrhage, mode of birth, APGAR score minute 1 and 5, neonatal admission to neonatal intensive care unit (NICU), neonatal resuscitation, neonatal bone/neurological injury and stillbirth due to SD.

In the dataset, SD was defined as a birth where the anterior fetal shoulder cannot be extracted following the normal amount of axial traction from the birth accoucheur. The management form that is used in NSW to record all the actions and manoeuvres during and after SD is provided in Appendix 8. Analgesia was defined as the use of any type of pharmacological and/or non-pharmacological pain relief during labour and birth. These included epidural analgesia, spinal analgesia, intramuscular or intravenous narcotics, nitrous oxide gas, pudendal block, subcutaneous sterile water injection and water immersion. In majority of cases a combination of all types of pain relief was administered; therefore, separate analysis of each of these techniques was not feasible. Perineal and genital tract tears included a large range of tears starting from graze to 1st, 2nd, 3rd and 4th degree tears, anterior tear and labial, vaginal and cervical tear or a combination of some or all of them. Mode of birth was defined as normal vaginal birth or caesarean section. Births with breech and compound presentations and also instrumental deliveries were categorised as vaginal birth. Admission to NICU was defined as admission at birth (≤ 6 hours after birth) or postnatal admission (≥ 6 hours and up to 48 hours after birth).

3.3.7 Data Cleaning

Data were recorded in the ObstetriX database which changed to e-Maternity in 2017. Therefore, for the purpose of this study and over the duration of 2013-2018, data from the two databases were merged. The process of data cleaning included merging the two databases and making the variables consistent in terms of coding, names and labels. Also, the records which did not meet the inclusion criteria were excluded. As SD occurs in vaginal births with cephalic presentation, therefore, the records which contained the following data were removed: 1) caesarean sections 2) breech and compound presentations 3) multiple pregnancies 4) births before 20 weeks of gestation 5) stillbirths (as the incidence of SD was calculated in live births). Cross-tabulation of neonatal outcome with SD manoeuvre showed that SD manoeuvres were used for two stillbirth cases. However, further assessment showed that the two cases were due to intrauterine fetal deaths which had occurred before the birth, and were not categorised as SD-related neonatal death. The number of records which were removed due to the above reasons cannot be provided as there is an overlap between some

of them, e.g, the records that were excluded due to both multiple pregnancy and caesarean section.

3.3.8 Statistical Analysis

Descriptive statistics were used to present the basic characteristics of the women and neonates. Chi-square test and independent t-test were used to compare proportions and means, respectively. Logistic regression was used to estimate the Odds Ratio (OR) of risk factors. Case and control groups were compared in terms of demographics, risk factors and the birth outcomes. P value < 0.05 was considered as the level of significance. Analysis was performed with SPSS version 25.0 (IBM Corp., Armonk, NY, US).

3.3.9 Ethical Considerations

The human research ethics application was approved by the Hunter New England Local Health District through the Research Ethics Governance Information System (REGIS) (2019/ETH13438/ 6th Dec 2019) (Appendix 6). The external ethics approval was ratified by the UTS Human Research Ethics Committee (ETH19-4528/ 19th Feb 2020). Following ethics approval, a Site Specific Assessment (SSA) application was submitted to the South Eastern Sydney Local Health District and approval was obtained from the maternity head of the hospital (2020/STE01998/ 1st Jul 2020).

For this phase of the study, a waiver of consent was requested due to the following reasons:

- i. In this project, retrospective data which were already collected and stored in online maternity databases were accessed, and therefore, there was no face-to-face contact between the research team and the participants.
- ii. Data in this project carried no more than low risk to participants. The waiver of consent did not adversely affect the rights and welfare of the women/neonates. There was no foreseeable risk of harm or discomfort for the participants whose data were used.
- iii. There was an adequate plan to protect the confidentiality of data and privacy of participants. The data custodian at the hospital removed any identifying

information from the dataset before it was provided to the research team. Data were transferred to the research team through password-protected files.

- iv. Given the number of records over the period of 2013-2018, it was impractical to contact the individual participants in order to obtain consent.
- v. The waiver was not prohibited by State, Federal, or International Law.

3.3.10 Data Storage and Data Security

De-identified data were used for analysis. Data were stored in a password-protected personal laptop. The laptop was kept in a locked cabinet. Related hard copies were kept in a locked cabinet at the University of Technology Sydney. Files related to the project were also saved in CloudStor, a secure cloud platform for data storage. A Research Data Management Plan (RDMP) was created in Stash and was updated throughout the study. Stash is a UTS provided program, originally developed by the Australian National Data Service that assists in managing and maintaining research data and covers items including collection, analysis, storage, retention and disposal of data as well as issues on data access, rights and ethics. Data will be retained for a minimum of five years and then securely disposed.

3.3.11 Summary

This chapter addressed the sequential exploratory design of the two-phase study. Recruitment of participants, sampling, setting, data collection tools, ethical issues and storage and confidentiality of data were explained. The study was conducted in two phases with results presented in the next three chapters. Chapters four and five are presented as separate published papers, therefore there may be some repetition in their methodology and demographic result sections.

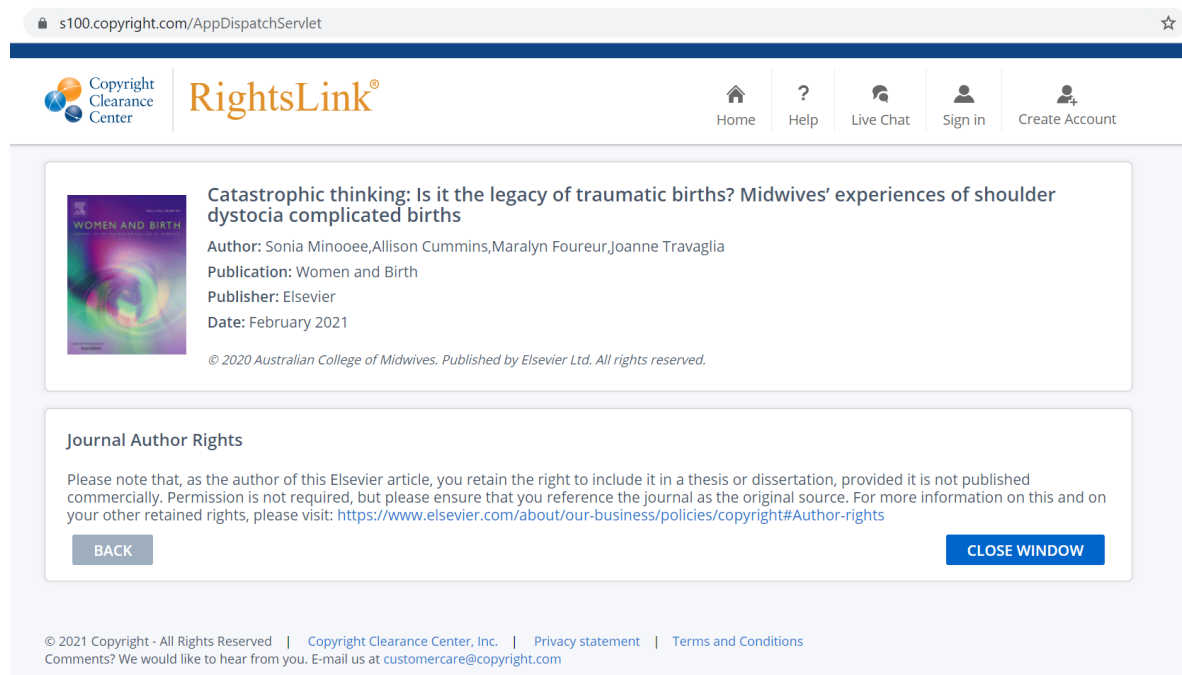
Chapter Four: Results of Phase One

Catastrophic Thinking: Is It the Legacy of Traumatic Births?

Midwives' Experiences of Shoulder Dystocia Complicated Births

4.1 Chapter Preface

As explained in the previous chapter, the first phase of this thesis explored midwives' experiences about Shoulder Dystocia (SD). The findings and concepts that emerged out of this phase informed me how SD can influence midwives' practice. Shoulder dystocia as a traumatic birth experience was conceptualised by midwives as either negatively influencing their thoughts and practice or positively influencing the participants' professional development and learning. This chapter describes the potential negative consequences of experiencing a traumatic Shoulder Dystocia (SD) on midwives' mental health and the ways of perceiving normal birth in the aftermath of the event. Results presented in this chapter address the first, second and third research questions of the thesis regarding how midwives view SD effected births? What are the outcomes of such births for midwives? and, how, if any, potential negative outcomes can be improved? This paper is published in the journal *Women and Birth*, and the accepted manuscript is reproduced in this chapter with permission.



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Catastrophic thinking: Is it the legacy of traumatic births? Midwives' experiences of shoulder dystocia complicated births
Author: Sonia Minooe, Allison Cummins, Maralyn Foureur, Joanne Travaglia
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4.2 Abstract

Background: Shoulder dystocia (SD) is considered one of the most traumatic birth experiences not only for women, but for clinicians involved as well. Adverse effects of birth trauma on the emotions and psyche of midwives have been well established.

Aim: To explore the impact of SD, as a birth trauma, on midwives' orientation towards normal births and on their clinical practice and the factors which may deteriorate or improve the experience of SD.

Methods: In a qualitative descriptive study design, 25 in-depth interviews were undertaken with Australian midwives who had experienced at least one case of SD. Data were analysed thematically.

Findings: A total of four themes emerged: 1) an unforgettable birth; a wake-up call, 2) from passion to caution, 3) factors worsening the experience, and 4) factors soothing the experience. Fear, anxiety and doubt about their professional competence were the most common feelings experienced by midwives after SD. For many, the first exposure to SD left them contemplating their previous attitude towards normal birth. Disturbed orientation of normal birth shifted midwives towards hypervigilance in practice. Not having effective relationships with women and receiving poor support from colleagues were perceived to worsen the traumatic experience, whereas working in a midwifery continuity of care model and the sense of being appreciated improved midwives' experience after the trauma.

Conclusion: Shoulder dystocia is a birth emergency that midwives will inevitably experience. Involvement in such births can potentially direct midwives towards a 'worst case scenario' mentality and affect the way they provide care for women in future.

Key words: shoulder dystocia, birth, catastrophising, clinical practice, midwives, trauma

Statement of significance

Problem

Evidence is limited on the impact of traumatic births on midwives' orientation towards normal birth.

What is already known?

Birth complicated by shoulder dystocia is considered as a traumatic birth by midwives. Traumatic births are associated with adverse emotional outcomes. Fear after trauma affects the risk perception of midwives.

What this paper adds?

Constant negative thoughts and a disturbed perception of normal birth after shoulder dystocia can shift midwives towards hypervigilance in practice, which impacts on the subsequent care they provide for women.

4.3 Introduction

From the perspective of midwives, birth trauma is often described as an incident which involves death, injury, emergency or interpersonal disrespect (Cohen et al. 2017; Leinweber et al. 2017a). Involvement in birth trauma may have long term negative impact on midwives (Beck & Gable 2012). Fear, anxiety, guilt, shame, vulnerability and reduced professional confidence are among the most common feelings experienced by midwives after a traumatic birth (Beck, LoGiudice & Gable 2015; McDaniel, Morris & Health 2020; Rice & Warland 2013; Sheen, Spiby & Slade 2016; Wahlberg, Högberg & Emmelin 2019). Adverse outcomes may go beyond these, and include post-trauma stress disorder (PTSD), compassion fatigue, burnout and workforce attrition (Leinweber et al. 2017b; Sheen, Spiby & Slade 2016). Altogether, these consequences shape the phenomenon which is known as the ‘second victim’. Introduced by Wu in 2000, the term refers to the healthcare professionals who are victimised by unanticipated adverse patient-related incidents, and are personally and/or professionally affected by the event (Wu 2000).

Traumatic incidents may expose individuals to some secondary outcomes as well. In the general population, Beck reported that anxiety and depression places the affected individuals at an increased risk of developing cognitive distortion (Beck 1963; Beck 1986). This is a state in which the person suffers from exaggerated and irrational beliefs, such as *overgeneralisation* (thinking that negative outcomes will happen in similar future events) or *catastrophisation* (thinking about the worst possible outcome) (Beck et al. 1979). These exaggerated beliefs are not supported by sufficient evidence and can interrupt the way individuals interpret the events (Beck 1979). Such unrealistic thoughts are more likely to occur in stressful situations (Beck 1979).

Evidence is limited as to whether birth trauma performs in the same manner, and whether repeated exposures may trigger cognitive distortion in midwives. However, some studies have reported that the experience of a traumatic perinatal event can influence the risk perception and risk assessment of midwives (Beck, LoGiudice & Gable 2015; Sheen, Spiby & Slade 2016). As a result of this, their clinical judgement and the interventions they undertake for women may be affected (Healy, Humphreys & Kennedy 2017). Therefore, trauma, risk perception, and clinical practice appear to be interrelated.

Studies conducted among emergency nurses reported hyperarousal behaviour after witnessing traumatic events (Lavoie, Talbot & Mathieu 2011). Increased arousal symptoms refer to a state of high alert and exaggerated responses due to thinking about the trauma (American Psychiatric Association 2013). Similar findings from physicians also suggested that the experience of adverse patient incidents increase the likelihood of suboptimal patient care (Schwappach & Boluarte 2009). Therefore, we hypothesised that, in the same manner, traumatic births may influence the threshold of risk perception in midwives, and so, affect the care they provide for women.

Understanding the impact of traumatic birth on midwives will provide insight into the way emotions have been shaped as a result of previous traumatic births. These emotions may disrupt the perception and practice of midwives regarding normal birth which will necessitate supportive approaches to ensure midwives' well-being.

For the purpose of this study, we explored the experiences of midwives following births complicated by shoulder dystocia (SD). Shoulder dystocia is known as one of the most traumatic births for midwives; studies in US and Australia show that it is ranked among the top three birth traumas for midwives (Beck, LoGiudice & Gable 2015; Dahlen & Caplice 2014). The terms such as “*obstetric nightmare*” [from the viewpoint of midwives] or “*Achilles' heel of obstetricians*” which are used to describe SD, indicate how significant this experience might be for clinicians (Beck 2013; O'Leary 2009). We explored the impact of experiencing SD on midwives' orientation and clinical practice, and the factors which may improve or exacerbate this experience.

4.4 Methods

Study design and participants

A qualitative study was employed to explore the experiences of midwives who had encountered births complicated by SD. Qualitative research is the preferred methodological approach when the researcher aims to study the stories of individuals (Creswell & Poth 2016). Among different approaches for qualitative research, the qualitative descriptive approach (Sandelowski 2000) was chosen to explore the *who*, *what* and *where* of the event, that is midwives' experiences of SD. Midwives were invited to the study through the Australian College of Midwives (ACM). An invitation email was sent to all 5000 midwives who were members of ACM. Midwives were invited to participate in the study irrespective of their workplace, model of maternity care, years of experience or university degree. Participants who had experienced at least one case of SD during their working career were invited. Shoulder dystocia in this study was defined as a case with either of the following criteria;

1. A case which needed at least one manoeuvre to release the bony impaction of the shoulder after the head has been born and gentle traction on the neck has failed (The American College of Obstetricians and Gynaecologists 2017);
2. A case with delayed birth of shoulders which resulted in neonatal complications (bone fractures, brachial plexus injury, hypoxic ischaemic encephalopathy);
3. A case which was perceived as a traumatic SD by the accoucheur.

Data collection

Semi-structured in-depth interviews were conducted by the primary researcher between April and June 2019. On average, interviews lasted 35 minutes. To interview, we used Zoom (The university's teleconferencing program) which enabled the researcher to build rapport with the interviewee similar to face-to-face interviews. Due to the participant's preference and lack of access to a visual medium, telephone interviews were conducted with five participants.

Purposive sampling was undertaken, meaning that based on the objective of the study, key-informants who suit the purpose of the study were recruited (Bernard 2017). Data saturation was reached at the 20th interview; data collection continued for five more interviews to ensure that there were no new themes emerging.

In this study, the researcher was a graduate midwife who had experience working in labour and birth settings and was familiar with the midwifery issues in traumatic birth emergencies (insider knowledge). This helped the researcher, to better approach the research question, frame the interview questions and engage with the participants. However, the researcher was not working in the health system of Australia and was not involved in the working environments of the participants, which therefore, helped her to address the balance between the insider/outsider positions.

Interview questions were based on the first author's experience as a midwife and from the literature review. Questions included: a description of the birth complicated by SD; feelings of midwives during and after the birth; emotions and thoughts which were developed after the birth; and the potential impact of these thoughts on the next births. The appropriateness of the questions were discussed with two midwifery experts from the University of Technology Sydney. Questions were revised and tested during preliminary interviews which were conducted with two midwives. At the end of each interview, reflections and feelings of the researcher were noted. Interviews were audio/videotaped and transcribed verbatim by the first author.

In terms of *rigour*, the main concept of this study was well defined, and the design, sampling and choice of data collection method were in line with the desired outcome of the study. To ensure the construct validity, preliminary interviews were conducted with midwives who had an experience of SD, to see what the participants interpret from our questions and whether there was a conformity between their responses with what we had in mind. To achieve consistent content, the same researcher asked the same questions during interviews. After completion of interviews, transcripts were returned to midwives for their comment and/or corrections. Of a total 25 participants, 11 midwives returned their transcripts having edited or corrected some portion.

Data analysis

An inductive approach was used to analyse data, meaning that we did not use pre-determined categories, and new themes were driven by data (Pope, Ziebland & Mays 2000). Data were analysed thematically. To do this, the researcher read and re-read the quotations line-by-line to familiarise herself with the data. NVivo 12 software was used to store, code and map data. This step was followed by multiple-cycle coding to create a coding tree, and then grouping the

similar concepts into one category, and finally generating analytical themes (Thomas & Harden 2008).

Ethics Approval

The study was approved by the University of Technology Sydney (HREC ETH18-3088). Participants were reassured about the confidentiality of data. An informed consent document was sent via email. Participants were asked to sign the consent form before the interview. All participants gave freely informed consent.

4.5 Results

Demographic details of the participants are provided in Table 1. A total of 25 midwives aged from 22 to 60 participated in the study. Participants had a range of post-qualification experience from two to 42 years. The majority had a Bachelor’s (40%) or Master’s degree (40%), 12% had a PhD and 8% a certificate or diploma as their highest qualification. Most of the participants were working in hospitals (56%). Four themes emerged from the data which included “an unforgettable birth; a wake-up call”, “from passion to caution”, “factors worsening the experience” and, “factors soothing the experience”. These themes are explored in more detail below.

Demographic variables Participants*	Age (years)	Highest qualification	Experience post qualification (years)	Place of shoulder dystocia occurrence	Current workplace	Role during the index birth
Emma	31	Bachelor degree	9	Hospital	Hospital	Primary Midwife
Isabella	22	Bachelor degree	2	Hospital	Hospital	Second** Midwife
Charlotte	59	PhD	33	Multiple settings	Academia	Primary Midwife
Amelia	60	Masters degree	30	Birth Center	Birth Center	Primary Midwife
Abigail	37	Masters degree	3	Hospital	Hospital	Primary Midwife
Camila	55	Masters degree	24	Hospital	Hospital	Primary Midwife
Victoria	59	Masters degree	33	Hospital	Hospital	Primary Midwife
Nora	49	Masters degree	11	Home Birth	Academia	Primary Midwife
Claire	47	Masters degree	15	Hospital	Hospital	Second Midwife
Anna	55	Bachelor degree	30	Hospital	Hospital	Primary Midwife
Elena	40	Bachelor degree	13	Hospital	Hospital	Primary Midwife
Alice	65	Masters degree	30	Multiple settings	Drug and alcohol unit	Primary Midwife
Eva	58	Midwifery Diploma (Hospital based training)	29	Hospital	Hospital	Primary Midwife
Lydia	58	Masters degree	18	Hospital	Hospital	Team Leader

Josephine	65	Masters degree	42	Home Birth	Academia	Primary Midwife
Delilah	41	Bachelor degree	10	Hospital	Hospital	Primary Midwife
Liliana	58	Midwifery certificate (Hospital based training)	33	Birth Center	Birth Center	Primary Midwife
Athena	60	Bachelor degree	35	Hospital	Hospital	Primary Midwife
Kylie	45	Bachelor degree	9	Hospital	Hospital	Team Leader
William	58	Bachelor degree Nursing (Midwifery Certificate)	29	Hospital	Remote aboriginal community	Second Midwife
Valeria	48	Bachelor degree	9	Home Birth	Home Birth	Primary Midwife
Lauren	47	Masters degree	12	Birth Center	Academia	Primary Midwife
Daisy	50	PhD	17	Multiple settings	Academia	Primary Midwife
Ashley	29	Bachelor degree	7	Hospital	Hospital	Second Midwife
Alyssa	53	PhD	30	Hospital	Academia	Team Leader

*Names are changed to pseudonyms.
 **Second midwives were registered midwives who assisted the primary midwife at birth.

An unforgettable birth; a wake-up call

Midwives described SD complicated births as emotionally charged events, and in some cases, as a physical trauma. They spoke about high level of fear, anxiety and even shock that they experienced during and after the birth. Shoulder dystocia was seen as traumatic not only for the woman and midwife, but for everybody who was present at the birth. Midwives reported scenarios in which, in spite of several attempts in assisting with the birth of the baby, no progress was made which left them feeling desperate and scared. They described moments of high pressure and responsibility because of the parents' grief. The following quotation provides an example;

“Alarms were ringing. I started to do an episiotomy, the head coming, and you think where the end of this head is? Everyone came on the floor. I did all the internal manoeuvres, and baby just didn't move. I tried to remove [the] posterior arm, but couldn't do anything. Another midwife had another go, we did the manoeuvres fully again and nothing happened. We were looking around. I put almost my whole hand [in]... just trying to get anything to move, and it did finally release, and broke the baby's clavicle in that process. Baby came out incredibly white and floppy. I was shaking. I just thought the baby was dead” [Kylie].

Similar moments of anxiety were depicted by a home birth midwife as she said: *“I was seeing the head which was going quite a nasty colour- I can't move this baby. I went through all the*

manoeuvres. The time was ticking and the ambulance still wasn't there. I just said I need to get this baby out. I do remember swearing" [Nora].

Shoulder dystocia takes place in a few minutes, however, the event appeared to be unforgettable, as almost all midwives claimed that they could recall it vividly in detail years after the event; *"I can remember it like it was yesterday, because you don't really forget the things like that"* [Alyssa, after 22 years]. For some midwives, the fear and anxiety did not end with that birth, and it took them a while to deal with the emotional outcomes. During that time they had to continue suppressing their emotions beyond that birth and had to keep on behaving and appearing as a professional midwife; *"It seemed to me for weeks, I couldn't stop crying. Also, because I was the team leader on birth suite, I actually had to keep continuing on, we had other events. I had a big PPH [postpartum haemorrhage], we had an eclamptic seizure. It was just a horrible team those days"* [Kylie]. For some others, the feeling of fear was claimed to last for years after the event; *"On every birth I attended since that birth [home birth SD], I didn't relax until that baby was born. It left me with a **permanent fear** of shoulder dystocia"* [Alice].

Part of the negative feelings of midwives after SD was due to the reactions of others, in particular the women as the main sufferers, as this midwife shared: *"The mother was very feisty with me. Because I think people look for someone to blame"* [Daisy]. However, regardless of how they were treated by women, midwives felt pressured for the potential grief they had to deal with; *"If this baby dies, I have to live with that and worse I have to live with the grief of these parents that had trusted me"* [Charlotte].

As well as being described as an emotionally charged experience, SD was also referred to as a physical trauma; *"I know that the doctor who did the delivery couldn't physically move her arms any more. If anything else had to be done, her arms had no power left in them. That's how much stress is between your mind and your arms, how much adrenaline?"* [Ashley].

Shoulder dystocia was not only viewed as a memorable birth, but as an event which had impact on the way midwives viewed normal births afterwards. Participants expressed the opinion that births like SD had an impact on their orientation towards the normality of birth. Some midwives spoke about the initial belief they had when they entered this profession and compared it with

the different attitude they gradually gained after experiencing traumatic births. Midwives described that the anxiety grew throughout their career;

*“When I first started midwifery, I was very naïve, and very fresh and just believed that every birth would be normal- a really strong belief in normality. As you go through midwifery each little adverse incident that you have, adds a little bit more anxiety, it’s like a **collective anxiety**. I find that kind of starts from small and then it slowly grows until each birth- there is a certain element of anxiety that is involved in every birth”* [Anna].

From passion to caution

Interviews revealed that stressful births such as SD took their toll on midwives’ attitudes. Some midwives spoke about their initial *passion* towards birth which was gradually converted to *caution* after having experienced a number of traumatic births including SD. This midwife said that the way she used to speak with women changed from an encouraging way of *“We’re going to have a baby! It’s exciting! Great work!”* to a more tempered way of *“At this point we’re going really well”*, *“let’s just keep going”* [Daisy].

As well as becoming cautious in their language, midwives expressed cautiousness in their practice. They reported that being preoccupied with the risk of repetition of SD prompted them to hypervigilant behaviours;

“In a few births straight afterwards, I would just put them in McRoberts, because I was petrified. I probably was falsely identifying them as shoulder dystocia. So, I probably very quickly removed the posterior arm. I had an early recognition” [Kylie].

Some midwives reported that in the next birth(s), they walked into the labour ward as if they were expecting SD. This mentality had an impact on their diagnosis of SD, leading them to potentially over-diagnose SD;

“Anecdotally, I think that we cause most of our shoulder dystocias. I think that we just jump on these scenarios where we think maybe the baby is not going to come or is not going to fit or the baby is going to be in distress. Most of the ones that I have seen, it had been where we haven’t allowed the baby to properly reposition into the position. We are just jumping to the next step, without letting the first step to happen” [Ashley].

Echoed by similar quotes, having the worst case of SD in mind led midwives to label women as high-risk, while they probably were not. This resulted in more ‘just-in-case’ prophylactic interventions;

“There are lots of babies now that people think that shoulder dystocia could happen and so they document that McRoberts is used which was ‘just in case’. This may affect the woman’s subsequent birth because they declared something, when they only used the McRoberts because it [SD] might have developed” [Liliana].

Those midwives who were mindful of their hypervigilant behaviours reported some strategies which could distract them from previous memories. To avoid being overcome by the negative feelings, some midwives expressed that they had to actively stop themselves from doing interventions;

“Probably for the next couple of births I had to tell myself to wait for restitution and not to jump in and panic, because I think sometimes you are not aware that you are worried. I remember with one of them [next births after SD], the head was born, and we were waiting for the next contraction and I was wondering [whether] to step in, and then thinking “no just wait for the restitution”. Having to tell myself “no, it is not that birth. I had to really hold my hands back” [Valeria].

“I just have to use positive talk, and take some deep breaths. Sometimes, even now, I will have a little shake-off, before I go into a room” [Delilah].

Another midwife spoke about her commitment to offset her negative thoughts through both physical and mental attempts. She used the analogy of ‘Murphy’s law’ to say that her practice could have been severely affected, had she not consciously dealt with her negative memories; *“I remember the next birth that I went into in the birth center, same scenario. I actually physically stopped myself at the door, and recharged”*. She accompanied her physical act with a mental concentration through repeating a ‘mantra’; *“I walked into a birth room, I just said to myself I will not let my practice be dictated by fear. I had to say it to myself for a couple of times to really believe it” [Lauren].*

Apart from the impact on clinical practice, midwives reported that in some cases they had to contemplate whether to continue or to leave their clinical role; *“I think these are the moments that make you realise whether you are meant to be doing something or not” [Ashley].*

Another midwife, who no longer works in midwifery-related fields, expressed that she never wants to experience such ‘adrenaline rush’ any more; “*I really don't care if I never have another **adrenaline rush** as long as I live. Because I've had all the adrenaline I need for a lifetime*” [Athena].

“I believe when I came away from working in rural and remote, I escaped PTSD by a hair's breath. I had already resigned when I had a situation that I thought that I wondered if this was going to be my first maternal death at the end of my career. I wondered if I hadn't already resigned, would this be enough to make me resign?” [Athena].

The distress after SD described by many midwives was referred to as a factor for changing the setting;

“The home birth (SD) left me very vulnerable and I think I didn't do many home births after that really. I was more cautious about home birth, particularly home birth on my own” [Charlotte].

“The current hospital, I am working in now, asks me ah, you want to work in a birth suite? but I think I just will stick to postnatal at the time because I feel like birth suite can be really unpredictable, and handling the emergencies there. That's fine if you have got a good team but unless you are working there full-time or regularly it's very stressful” [Camila].

Factors worsening the experience

Shoulder dystocia was described as traumatic, in and of itself, however, some factors were perceived to increase the distress of the experience. These included: self-blaming; a lack of effective communication with the woman; receiving judgemental comments from colleagues; and lack of collegial support. Within this theme, we explore these factors in more detail through two sub-themes of 1) relationship with women and 2) relationship with colleagues.

1) Relationship with women

The experience of SD was considered more stressful for midwives, when they reflected on the emotional and physical impact of the birth on women. Some described the birth room as chaotic and stressful when SD happened, which distracted midwives from being emotionally connected

with women. They regretted the loss of emotional engagement, and felt that they missed women by not effectively communicating with them;

“I am sometimes so engrossed in trying to do the shoulders or do the actions for that medical emergency that I am not present with that woman. She [the woman] didn’t know what was going on. Her experience would have been less traumatic if somebody had been with her to say it’s ok, we delivered the baby, baby is going to be alright, we are giving oxygen, we can hear baby cry, ...” [Abigail].

Midwives felt responsible that the mother-baby bonding was missed in the moments following the birth, especially if the baby was in need of intensive care. This midwife spoke about the *‘first magical hour’* that the mother would have liked to spend with her newborn, but did not happen for her;

“That [birth of the baby] wasn’t the end of the journey, because like all expecting women, I think they imagine bringing their baby up, that first magical hour, she didn’t have that. That unfortunately, I think for me and for her, was wrecked for the next few days” [Daisy].

Midwives also explained that using certain manoeuvres was inevitable for releasing the shoulders. These could be painful and distressing for women. Later when recalling the event, some midwives were upset because of the unintentional physical force they imposed on women. They felt guilty about the fear and the negative memory that women could have taken from that birth;

“I remember it in absolute details, then that probably means the mother does as well. I had to be so physical, I had to use both my hands. I don’t know what the effects of me doing those manoeuvres did on her and on her psyche. She wasn’t numb, she was completely feeling, absolutely everything. I know I swore. I was probably looking horrified while I was trying to focus” [Nora].

The concerns were also about how women and their families would judge midwives’ practice;

“I worried about the mother, if she was concerned that her midwife was incompetent. Six months after this experience, quite by accident, this midwife was looking after the sister of that woman “her sister was very frightened about having a shoulder dystocia as well. I was really concerned, about what her sister might think of me, and whether her sister was fearful of having me as her midwife” [Elena].

2) Relationship with colleagues

The experience of SD could be more traumatising when midwives felt that they were judged or criticised about their *clinical competence* by colleagues or team leaders. Judgements could be in relation to *what was done* or *what could have been done*. Concern about the criticisms of others was explicitly clear in this midwife's quotes where the woman experienced SD plus a 3rd degree tear;

"Just as the baby was born the emergency team came in. So, that was quite good to be able to show ok guys we have done this, this and this, and the baby is out, and I felt quite good about that aspect of it. I guess you just may be worried about your reputation" [Elena].

Not having a supportive environment and lack of emotional understanding from colleagues added to the burden of trauma relating to the birth. This midwife recounted how she relived the experience shortly after her first exposure, but was not supported by her seniors;

"Maybe a week later, I had another birth, on the same day of the week and in the same room, then I saw the senior midwife and I said to her, ah... I am still feeling that birth, the shoulder dystocia that we had the other day, and she said ah, you are still feeling that?!" [Abigail].

She continued that when the senior midwife repeated Abigail's words to the doctor who was standing there, the doctor dismissed it as well in a joking way and said: *"Ach... feelings!"*, as if she was supposed to have forgotten her experience of a traumatic birth.

While recognising the necessity of support for all midwives, the need for support for those who were not fixed members of a team was further emphasised. An example was the casual midwives from an external employment agency who needed to adapt themselves to the new workplace and to develop their network as well as coping with distressing birth events which required extra emotional energy;

"None of the staff wanted to look after her [pregnant woman], because she was quite distressed. I was an agency midwife, and they gave me her, and she was just yelling. [The birth ended up in SD]. When the procedure was finished, the midwife in charge

said ah... that was a good introduction for your first shift here. But it was not an opportunity to debrief, it was more a sarcastic [comment] for me” [Camila].

Midwives also explained that if the process of a birth has been traumatising, a favourable birth outcome should not mislead the senior staff to think that there is no need for debriefing. In other words, midwives remarked on the differentiation between a traumatic birth process and an unfortunate birth outcome. It was reported that even after vocalising their emotions, still some unit managers showed a lack of understanding about the need for debriefing, and were hesitant to organise clinical audit/debriefing sessions;

“Afterwards, I was pretty shaken. I did ask for [a] debrief from my boss at the time, and she popped it off and said look, the way I heard it, it was really well managed and with a great outcome. So, I then didn’t get a debrief. I also wanted it to be brought up in the M & M [mortality and morbidity meeting], because I thought it was really a close call” [Kylie].

Factors soothing the experience

In contrast to the previous theme, some factors were perceived to alleviate the distress after SD. Midwives who had the privilege of one or more of these factors expressed better coping with the event. These included having a favourable birth outcome, working in midwifery continuity of care model, and being appreciated.

1) Favourable birth outcome

Based on what midwives expressed, if the birth outcome was a healthy mother and baby, then the process of birth, even if traumatic, tended to be less painful for the midwife;

“I think the outcome was good in the end, God forbid, if the baby had died, I probably would not even be able to go back to attending the birth for a long time... the fact that he was ok and he doesn’t have any residual problems from it. There was a scary few minutes and then he was completely fine” [Valeria].

“It [birth of the baby] was relief, and also relief that you didn’t need any resuscitation” [Eva].

2) Midwifery continuity of care

The model of care midwives worked in was repeatedly described as an influencing factor in the recovery after the traumatic experience. Midwives invariably expressed that the benefits of continuity of care extend to midwives as well as the women. All of the interviewed midwives made positive references towards having the opportunity to debrief with the woman and her family. Visiting in a continuous manner through a continuity of care model, was reported to be essential in better coping with the birth trauma. Midwives referred to the opportunity of debriefing as a *privilege* and believed that these sessions were *therapeutic* for them; “*I am lucky that in the model of care that I work in, we have the follow-up*” [Abigail].

In contrast, not having follow-ups with the woman was described as having something missed in the process of care, which could delay the process of recovery. One midwife’s quote perhaps sums up the sentiment of many others; ‘*an unfinished business*’ [Nora]. In her story, Nora explained that despite a favourable outcome in a home birth SD, not having the chance of debriefing with the woman has left something at the back of her mind, some unanswered questions, which still annoys her five years after the event. It also left her doubting her ability to build a *trustful relationship with the woman*;

“I never really knew how she felt about the whole thing because we never really got to have a debriefing, apart from initially after the first couple of appointments. I didn’t doubt what I did in the moment but I was worried how that had impacted her ... like an unfinished business... maybe I wasn’t the person that she (the woman) could do that with” [Nora].

3) Being appreciated

Inherent to post-trauma support, was the appreciation of the efforts that midwives made to save the mother and baby. Midwives expressed that they needed to hear from their colleagues or seniors that they had done what they needed to do. They wanted to hear that if they were not present at that birth, the outcome could have been worse. Addressing this need, could help midwives to better cope with the trauma, particularly when the outcome was not as favourable as expected. Like Alyssa who said:

“After it [SD] happened, everyone came to me the next day and said, oh my goodness Alyssa! if you hadn’t have been there, the baby would have died... and I said, really?”

Beyond the appreciation by colleagues, was the need to be valued by women and their families, as Anna shared: *“My first case of shoulder dystocia was probably less traumatic for me because the family were very appreciative of my help and when I explained to them what happened, they were absolutely understanding”*.

Conversely, when their commitment was undervalued by women, midwives felt dissatisfied with the birth. Ignoring their efforts potentially left midwives with emotional scars. They felt dismissed after managing a severe SD but not being recognised as a person who had an impact on that birth.

4.6 Discussion

This study presents new insights on the impact of SD complicated births on birth orientation and clinical practice of midwives. Our findings suggest that fear and anxiety which are shaped after such births can influence the way midwives perceive the risk of SD in subsequent births. Midwives may ruminate on the worst possible scenarios and develop catastrophic thinking. As a result of this, they may tend to over-react in the next births by undertaking procedures that are not indicated.

Catastrophic thinking is an exaggerated negative perception of reality (Ellis 1962). While the concept has been extensively studied in relation to the development of depression and physical pain (Miller, Meints & Hirsh 2018; Moore et al. 2018), almost no study has investigated it in midwifery. The most relevant studies are probably those which have explored the development of hyperarousal and heightened anxiety (as elements of PTSD) after birth trauma (Wahlberg et al. 2017). There are also reports which suggest an increased likelihood of defensive practice following traumatic perinatal events (Sheen, Spiby & Slade 2016). Our findings are in line with those studies. Midwives reported that the fear of repetition of SD shifted them towards future hypervigilant behaviours such as prophylactic interventions. These interventions, although may appear harmless for women and babies, are not supported by evidence and may contribute to future clinical issues for women. As an example, when SD is documented and manoeuvres are used prophylactically, a woman will be treated as having a higher chance of experiencing SD for her next birth. The degree of hypervigilance for some midwives was to an extent that they had to use physical or mental strategies to stop themselves from doing the interventions.

Despite being overwhelmed with negative thoughts, some midwives were mindful of their fears and could manage the catastrophic mentality. To overcome their fear and anxiety, they spoke about the conscious effort they put in stopping themselves from performing interventions. This active engagement represents what Croskerry referred to as the *cognitive de-biasing*. It describes the strategies that clinicians use to counteract incorrect biases and beliefs (Croskerry, Singhal & Mamede 2013). In other words, debiasing is a deliberate suppression of irrational thoughts. Some of these conscious distractors reported by midwives included taking deep breath, shaking at the door, repeating a positive mantra or holding the hand back to avoid doing interventions.

However, it appeared that not all midwives were aware of the impact of trauma on themselves. As an example, some midwives talked about their avoidance behaviours after SD such as avoiding homebirth. But when questions about the consequences of the event on their practice or career were asked, some expressed that the birth was not associated with any negative impact for them. This finding support the unconscious nature of cognitive biases on practice, and highlights that the first step to overcome these biases is to be aware of their existence (Croskerry, Singhal & Mamede 2013).

Our findings also indicated that, for some midwives, anxiety after SD occurred in an accumulative manner. They spoke about the low level of fear and anxiety at the beginning of their career which progressively increased after repeated traumatic exposures. This is similar to what Beck and Gable reported from labour and delivery nurses that “*each traumatic birth adds another scar to my soul*” (Beck & Gable 2012). This situation can be described as the snowball effect which refers to a process when something initiates from small, and gradually increases in amount and importance (Cuthreill 2014). In relation to birth trauma, the initial snowball (first exposure to traumatic birth) was small and able to be ignored, but as it rolled down the hill (over time and with repeated exposures), the snowball became larger and potentially more powerful (engaging catastrophic thinking and hypervigilance). The size and the growth rate of the snowball is dependent on a number of factors, as the distress after traumatic birth is similarly dependent.

Our interviews revealed some of these factors which were perceived to either worsen or improve the experience of SD. These factors as well as a snowball model for catastrophic thinking are depicted in Figure 1. Although, after birth trauma, midwives are at risk of

developing catastrophic thinking, there are factors which, if enhanced, can moderate the negative thoughts and level out the downward slope. This model can guide maternity services about the strategies which can counteract the process of catastrophising.

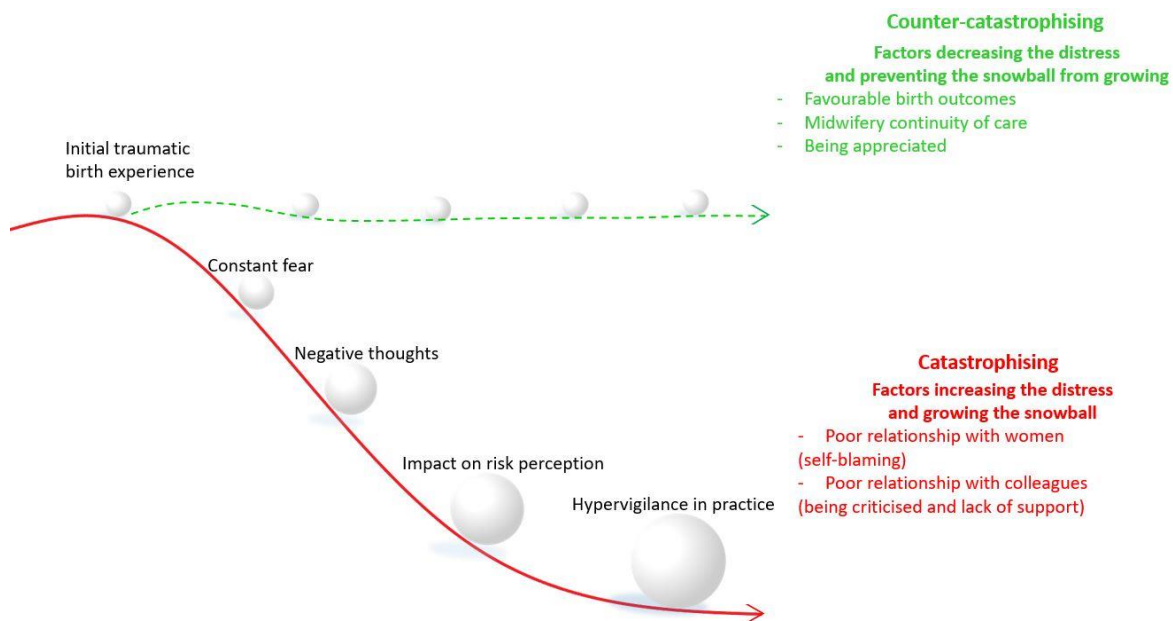


Figure 1. Snowball effect after experiencing shoulder dystocia

Factors worsening the distress after SD

Midwives felt for the women and felt responsible for the birth outcomes. As supported by previous studies, ‘feeling for women’ causes midwives to perceive the event as more traumatic (Rice & Warland 2013). In the same manner, a feeling of responsibility contributes to a higher degree of psychological distress after adverse patient-related events (Van Gerven et al. 2016). Midwives’ concerns were not limited to the short term outcomes of SD only, but included the potential long term grief that parents had to deal with. This is what Beck referred to as the ever-widening ripple effects of a traumatic birth, in which the worry and distress do not end with the birth of the baby but keep continuing and spreading out like ripples when a pebble is dropped into water (Beck 2015).

Some midwives blamed themselves for the poor connection they had with women during and after the birth. They doubted their competence as a midwife in building and maintaining relationships with women. Exposure to the judgmental comments of colleagues, also added to the distress of self-blaming. While working in a blame culture was described distressful, collegial support was reported to be healing. Support from network members helped midwives to speak up about their feelings and concerns and to disclose themselves more easily.

Literature is rich on the importance and benefits of supportive environments after traumatic events. Some of these include a reduced sense of self-blame and incompetence (Elmir et al. 2017), and improved regaining of professional self-image (Wahlberg, Högberg & Emmelin 2019). Working in a supportive environment positively influences clinicians' intentions about leaving their job or leaving their profession altogether (Burlison et al. 2016). However, despite, ongoing research, and emphasis on the importance of support, our results indicated that there were still situations where the role of support after trauma was underestimated by colleagues or seniors. Midwives described scenarios that their request for a debriefing session was dismissed by the unit manager. This lack of emotional understanding made the coping process harder for midwives. This is comparable to the findings of Ullstrom et al. (2014) who reported that the impact of an adverse event on health professionals is not only by the incident itself, but also by the manner in which the incident is handled. This highlights that a prerequisite for receiving collegial support is the acknowledgement of midwives' vulnerability to work-related traumas (Wahlberg, Högberg & Emmelin 2019).

Having said that, we should also acknowledge that repeated exposures to trauma may desensitise midwives and cause them to develop compassion fatigue (Katsantoni et al. 2019). It is a state which affects the ability of healthcare providers in empathising with the victim (here their colleagues) (Katsantoni et al. 2019). This indicates that health care providers, in particular unit managers who might have become used to traumatic events, are vulnerable to developing compassion fatigue and lack of collegial empathy.

Factors soothing the distress after SD

Shoulder dystocia was perceived as less traumatic if it ended in a favourable outcome. It seems to be a natural response, and is explained by two memory biases in psychology, the peak-end rule and the duration-neglect bias. Based on these biases, if a painful event ends up in a happy outcome, no matter how difficult the process was, people tend to consider it as a favourable event (Kahneman et al. 1993). However, a fortunate birth outcome may not be achieved in every SD. Therefore, attention to other soothing factors becomes important.

A huge emphasis was placed on the role of follow-ups with women and the midwifery continuity of care which are also supported by previous studies (Rice & Warland 2013). Midwives liked to support women postnatally and to debrief with them to see how they felt

about their birth, and how they dealt with it. It had a bilateral effect that benefited not just the women, but was healing for midwives as well. Based on the overall interviews, it appeared that when debriefing occurred with the woman, as the main victim of the incident, midwives felt relieved probably more so than debriefing with a colleague. Recognition and acknowledgement of their commitment to their midwives' from the women were also crucial and reassuring for midwives. The sentiment '*an unfinished job*' indicated that midwives felt that they had missed a conclusion to that birth if it was not followed by postnatal meetings. However, for some midwives, the strong connection with women through continuity of care may compound the traumatic experience, since they become upset when they see the woman is upset (Elmir et al. 2017; Rice & Warland 2013). Therefore, follow-ups after a traumatic birth need extra care and support for both women and midwives, compared to postnatal visits in non-traumatic births.

Strengths and limitations

This is the first study exploring the impact of SD on birth orientation and practice of midwives. We recruited midwives from different settings and states in Australia which ensured coverage of a range of experiences. However, the following limitations should be considered while interpreting the findings of this study. First, the experiences that are shared in this study are from the midwives who willingly responded to our email invitation. Therefore, the nonresponse bias may have impacted our findings. Second, although we asked midwives about their specific experiences on SD, it is likely that their descriptions have reflected an accumulation of other traumatic birth incidents. In other words, their experiences might have been shaped or intensified by other birth traumas as well. This is good in terms of the transferability of our findings to other traumatic births, but may limit the main focus of the study. Third, we did not put time interval between the exposure to SD and the time of interview. The interval time ranged from some weeks to several years (with the majority who experienced SD more than three years). The literature is not clear whether over time, catastrophic thinking aggravates or improves. However, it appears that the longer ago the incident occurred, the lower the psychological impact (Van Gerven et al. 2016). Therefore, there may have been more severe outcomes, had we recruited midwives with shorter interval time between the traumatic exposure and the interview. This is important in terms of providing immediate support for midwives, because as time passes, a proportion of midwives may consider leaving the profession. Finally, almost all participants had experienced multiple cases of SD (and most probably other types of birth trauma during their career). Therefore, further research is

recommended to explore development of catastrophic thinking by considering the number and type of traumatic births.

4.7 Conclusion

Disrupted orientation towards birth can occur in midwives following births complicated by SD. Midwives may unconsciously go through the process of catastrophic thinking which affects their practice. Therefore, having continuous reflection on emotions and thoughts following trauma is suggested to prevent emotions overcoming clinical practice. However, not all midwives may develop negative thoughts, and not all will develop it to the same level. There are factors which can either speed up or slow down the process of catastrophising. We found post trauma support as an effective approach in minimising negative thoughts. Support can include a combination of educational and psychological resources as well as peer support in a blame-free environment. The therapeutic role of midwifery continuity of care was also highlighted in this study. Building connection with women and continuing with postnatal debriefings helped midwives to recover more quickly from traumatic experiences. Therefore, strengthening collegial support and continuity of care can moderate catastrophic thinking, and ensure the emotional and professional well-being of midwives. This study can inform midwifery education to empower students in building resilience and mindfulness skills under stressful working conditions. Future research can focus on interventions to alleviate catastrophising and improve emotional endurance in midwives after birth trauma. Intervention studies are also needed to investigate the effect of midwifery continuity of care on the level of stress and anxiety of midwives following traumatic births.

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4.9 Summary

This chapter presented the process of catastrophising and negative thinking in midwives after experiencing SD. The negative mentality which was described through the snowball effect

model had negative impact on how midwives perceived normal birth in future. Altered perception of normal birth and increased risk perception due to the fear and anxiety of previous traumatic births could prompt midwives to perform unnecessary interventions. In other words, defensive practice was identified as an outcome of negative thinking after traumatic births such as SD. Also, this chapter explained some determining factors which could either improve the experience or exacerbate the distress after SD.

In the next chapter, the potential opportunities for professional growth and development are discussed.

Chapter Five: Results of Phase One

Shoulder dystocia: A panic station or an opportunity for post-traumatic growth?

5.1 Chapter Preface

This chapter presents my second article on the impact of experiencing Shoulder Dystocia (SD) on the clinical practice of midwives, although it looks at the experience from a different perspective to that of the previous chapter. Since any traumatic incident may be associated with positive outcomes, this chapter discusses the areas of growth for midwives and the factors which enable them to overcome their distress from the experience. This paper is published in the journal of Midwifery, and the accepted manuscript is reproduced in this chapter with permission.

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Shoulder dystocia: A panic station or an opportunity for post-traumatic growth?
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5.2 Abstract

Background: Traumatic births are considered as challenging events in the professional life of midwives. Negative emotional and psychological consequences of these births on midwives are well-established. However, evidence suggests that in the aftermath of challenging events, such as birth traumas, positive outcomes may emerge as well. Based on the literature, shoulder dystocia (SD) is known as one of the most traumatic birth experiences for midwives. In this study we aimed to explore the impact of experiencing SD complicated births on clinical practice of midwives.

Methods: A qualitative descriptive study was undertaken. Midwives who had an experience of at least one case of SD were invited to the study through the Australian College of Midwives. In-depth interviews were conducted with 25 midwives. Data were analysed using an inductive thematic approach.

Results: Three themes were identified 1) Putting on a brave face 2) Towards the growth zone 3) I am resilient enough to recover, because of Experience of SD was described as a dreadful event in midwives' career. However, on reflection, this experience was considered as a benefit which developed midwives' clinical expertise and contributed to their professional empowerment. Having faith in birth normality, support from workplace, seniority/ years of experience and self-confidence were among the factors which helped midwives in overcoming the stress after SD.

Conclusion: There needs to be greater awareness about the consequences of traumatic births such as SD for midwives. Collegial support has a critical role in helping midwives to have a positive outlook on their traumatic experience and to ease their pathway of professional growth.

Key words: Shoulder dystocia, traumatic birth, midwives, post-traumatic growth

5.3 Introduction

Shoulder dystocia (SD) is known as one of the most traumatic birth events for both women and birth attendants (Beck 2013; Beck, LoGiudice & Gable 2015), and is defined as the need for ancillary manoeuvres to assist the birth of the baby's shoulders, after a gentle traction on the neck is not successful (American College of Obstetricians and Gynaecologists 2017). However, for the birth attendant, the actual scenario is sometimes more dramatic than this definition. The birth attendant sees a baby whose head is born and the body does not follow, and the face is turning blue while there is no outward movement (Morris 1995). It appears that this scenario is significant enough for midwives to rank it as among the top three traumatic birth experiences

in the US, and as the most feared obstetric emergency in Australia (Beck, LoGiudice & Gable 2015; Dahlen & Caplice 2014).

Perception and definition of a traumatic birth is subjective and may differ between women and midwives. While women perceive a traumatic birth as an event which involves with feelings of being un/misinformed, disrespected, lack of support, and having various problems during childbirth and postpartum (Rodríguez-Almagro et al. 2019), midwives describe a traumatic experience as an incident which involves death, injury, emergency or interpersonal disrespect (Beck et al. 2015; Cohen et al. 2017; Leinweber et al. 2017). Evidence is strong on the negative impact of traumatic birth experiences for midwives (Elmir et al. 2017). These births affect the psychological wellbeing of midwives, and may lead to emotional reactions such as anxiety (Kerkman et al. 2019), fear (Toohill et al. 2019), self-blame (Sheen, Spiby & Slade 2016), and guilt (Schröder et al. 2016). Exposure to work-related trauma can also result in more severe consequences such as depression, compassion fatigue, post-traumatic stress disorders (PTSD) or burnout in midwives (Leinweber et al. 2017; Sheen, Spiby & Slade 2015).

At first glance, a traumatic birth experience, with the consequences described above, appears to be a negative experience, and indeed it is. However, looking at it from a different perspective, may reveal some potential benefits for midwives (Beck, Rivera & Gable 2017). Discussed through the theory of post-traumatic growth (PTG), positive transformation may happen in the aftermath of challenging events (Tedeschi & Calhoun 2004). This theory was developed by Tedeschi and Calhoun in the mid 1990s, and explains that trauma can be associated with potential benefits for the traumatised person (Tedeschi & Calhoun 1996). Few studies have explored PTG after traumatic experiences among midwives or labour and delivery nurses (Beck, Eaton & Gable 2016; Beck, Rivera & Gable 2017; Schröder et al. 2016). However, the limited reports available indicate that traumatic experiences can improve midwives' competence and enable them to become better midwives (Schröder et al. 2016). Midwives reported that traumatic experiences made them stronger and more assertive in their practice (Beck, Eaton & Gable 2016).

The importance of PTG or PTSD is due to the fact that the emotional state of midwives can affect the way they practice (Minooee et al. 2020). Depending on whether midwives are left with PTSD or thrived through PTG, their approach in clinical practice may be negatively or positively impacted (Minooee et al. 2020). While the experience of a birth trauma may increase

fear (Toohill et al. 2019) and defensive practice (Elmir et al. 2017) in some midwives, it may improve confidence (Beck, Rivera & Gable 2017) and assertiveness (Sheen, Spiby & Slade 2016). It is noteworthy that PTG and PTSD may co-exist or be independent of each other (Zięba et al. 2019). Therefore, exploring the impact of traumatic experiences on midwives is important to first identify the areas of fear/stress and/or growth, and second, to support midwives in overcoming the stress and facilitating their growth path.

Compared to the many studies which have explored the negative aspects of traumatic birth experiences, few have explored its potential growth elements. Despite being among the top birth traumas, to date, only one study has explored the experiences of clinicians in regard to SD; the study of Beck that compared the experiences of labour and delivery nurses and mothers (Beck 2013). Therefore, the aim of our study is to address this gap. We sought midwives' experiences of SD complicated births, and the impact this experience may have had on their clinical practice.

5.4 Methods

A qualitative descriptive study was employed to explore the experiences of midwives who had encountered SD. Qualitative research is the preferred methodological approach when the researcher aims to study the stories and experiences of the target group (Creswell & Poth 2016). Qualitative description is an ideal method for exploring health related phenomena which aim to discover the *who*, *what* and *where* of an experience (Kim, Sefcik & Bradway 2017; Sandelowski 2000). We intended to identify new relevant concepts, but not to generate new theories as in a grounded theory (Corbin & Strauss 2008) or to reach to the philosophical roots of the experiences as in phenomenology (Paley 1997).

Recruitment

The Australian College of Midwives (ACM) sent an invitation email to all 5000 registered midwives who were members of ACM. The invitation email contained the purpose of the study and the eligibility criteria for participation. Participants who had experienced at least one case of SD during their working career were invited. For the purpose of this study, SD was defined as a case with any of the following criteria:

4. A case which needed at least one obstetric manoeuvre;

5. A case with delayed birth of shoulders which resulted in neonatal complications;
6. A case which was perceived traumatic by the accoucheur.

Data collection

Approval for the study was granted by the University of Technology Sydney (HREC ETH18-3088). In-depth semi-structured interviews were conducted by the primary researcher between April and June 2019. Interview questions are presented in Table 1. On average, interviews lasted 35 minutes. To interview midwives across different states of Australia, we used Zoom (a teleconferencing program) which enabled the researcher to build rapport with the interviewee similar to face-to-face interviews. Using video webcam also assisted the researcher to observe the interviewee's visual cues (facial expressions or body movements), and therefore be able to reflect on the feelings of the interviewee, and to be able to decide when to discontinue the conversation in case the interviewee felt uncomfortable. Although Zoom interviews were the preferred option, based on the participant's preference and access to a visual medium, telephone interviews were conducted with five participants. Based on the eligibility criteria of participants, purposive sampling was undertaken. Data saturation was reached at the 20th interview. Data collection continued for five more interviews to ensure that there were no new themes emerging. Interviews were audio/videotaped and transcribed verbatim by the primary researcher.

Table 1. Interview questions

<p>Could you please tell me about your experiences of births complicated by shoulder dystocia?</p> <p>How did you feel when shoulder dystocia happened?</p> <p>What were you feeling when the baby was born?</p> <p>Can you tell me about your feelings in the next births?</p> <p>Can you tell me about the support you received after that birth?</p>

Data analysis

All transcripts were returned to participants for their comment and/or corrections. Of a total 25 participants, 11 midwives returned their transcripts with corrections/editions. An inductive approach was used, meaning that new concepts and themes were driven by data and were not based on pre-determined categories (Pope, Ziebland & Mays 2000). A feature of qualitative description is its flexibility in having /or not having a theoretical framework at the beginning

of a study (Sandelowski 2010). This is an important feature in relation to the present study, because initially, we did not conduct the interviews with the intension of exploring PTG after SD. However, following data analysis, the positive benefits of experiencing SD dominated the identified themes.

Throughout data analysis, we found that midwives frequently spoke about the lessons they learned from their traumatic experiences and the factors which enabled them to suppress their negative thoughts after trauma. As such the concepts aligned with the Post-traumatic Growth Theory (PTGT) (Tedeschi & Calhoun 1996). In the discussion section we have discussed the potential reasons for midwives' inclination towards professional growth after trauma.

The theory discusses positive transformation after trauma, and that the benefits may happen in relation to the domains shown in Table 2. We used this theory after the data were collected and partially analysed. However, while we were formulating the research questions, and framing the interview questions and also during the process of data collection, we did not disregard the potential theories which were in relation to growth or burnout after a traumatic experience.

Table 2. Dimensions of Post-traumatic Growth Inventory*	
1) Relating to Others	<ul style="list-style-type: none"> - Knowing that I can count on people in times of trouble - A sense of closeness with others - A willingness to express my emotions - Having compassion for others - Putting effort into my relationships - I learned a great deal about how wonderful people are - I accept needing others
2) New Possibilities	<ul style="list-style-type: none"> - I developed new interests - I established a new path for my life - I am able to do better things with my life - New opportunities are available which would not have been otherwise - I am more likely to try to change things which need changing
3) Personal Strength	<ul style="list-style-type: none"> - A feeling of self-reliance - Knowing I can handle difficulties - Being able to accept the way things work out - I discovered that I am stronger than I thought I was
4) Spiritual Change	<ul style="list-style-type: none"> - A better understanding of spiritual matters - I have a stronger religious faith
5) Appreciation of Life	<ul style="list-style-type: none"> - My priorities about what is important in life - An appreciation for the value of my own life - Appreciating each day
<p><i>* Tedeschi RG, Calhoun LG. The Posttraumatic Growth Inventory: Measuring the positive legacy of trauma. Journal of Traumatic Stress. 1996;9(Morris WIC. Shoulder dystocia. Journal of Obstetrics and Gynaecology of the British Empire 62):455-71.</i></p>	

Transcripts were analysed using thematic analysis (Braun & Clarke 2006). To do this, we followed the 6-step guide developed by Braun and Clarke:

1) Familiarising yourself with data: The process of familiarisation began by transcribing the audio recordings, reviewing the notes which were taken during and after interviews, and initial reading of transcripts. Quotations were read and re-read line-by-line 2) Generating initial codes: The first step informed us about the main patterns of data. Multiple-cycle coding was undertaken. In addition to manual coding, NVivo 12 (QSR International 2020) was used to organise, store and map the data and to create a coding tree 3) Searching for themes: This step included finding connections between the concepts, identifying the themes and grouping similar concepts into one category 4) Reviewing the themes: The extracted quotes were reviewed to ensure their connections with subthemes and themes. At this stage when the main concepts of the data had been identified, all transcripts were read once again to search for any new coding. Moving codes from one sub-theme to another sub-theme, refining the sub-themes, merging subthemes or separating codes from themes, all occurred in this phase. Identification of themes was based on ongoing discussion and agreement between all research team members 5) Defining and naming themes: In this step, the titles of themes were reviewed and revised based on their entire content 6) Producing the report: A structured narrative was written for the extracted codes, sub-themes and themes.

5.5 Results

Demographic details of the participants are provided in Table 3. A total of 25 midwives aged from 22 to 60 participated in the study. Participants had a range of post-qualification experience from two to 42 years. The majority had a Bachelor's (40%) or Master's degree (40%), 12% had a PhD and 8% a certificate or diploma as their highest qualification. Most of the participants were working in hospitals (56%). Three themes emerged from the data. These were "Putting on a brave face", "Towards the growth zone" and, "I am resilient enough to recover, because of ...". These themes are explored in more detail below.

Table 3. Basic characteristics of the study participants

Demographic variables Participants*	Age range (years)	Experience post qualification (years)	Place of shoulder dystocia occurrence	Role during the index birth
Elizabeth	31-40	<10	Hospital	Primary Midwife ^a
Mary	51-60	>30	Multiple settings	Primary Midwife
Rosie	51-60	20-30	Birth Center	Primary Midwife
Jane	31-40	<10	Hospital	Primary Midwife
Margaret	51-60	20-30	Hospital	Primary Midwife
Debra	51-60	>30	Hospital	Primary Midwife
Helen	41-50	10-20	Home Birth	Primary Midwife
Pauline	51-60	20-30	Hospital	Primary Midwife
Susan	31-40	10-20	Hospital	Primary Midwife
Diana	61-70	20-30	Multiple settings	Primary Midwife
Lesa	51-60	20-30	Hospital	Primary Midwife
Sandra	61-70	>30	Home Birth	Primary Midwife
Barbara	41-50	10-20	Hospital	Primary Midwife
Annmarie	51-60	>30	Birth Center	Primary Midwife
Samantha	51-60	>30	Hospital	Primary Midwife
Catherine	41-50	<10	Home Birth	Primary Midwife
Amy	41-50	10-20	Birth Center	Primary Midwife
Maggie	41-50	10-20	Multiple settings	Primary Midwife
Laura	51-60	20-30	Hospital	Team Leader ^b
Marta	51-60	10-20	Hospital	Team Leader
Fiona	41-50	<10	Hospital	Team Leader
Tania	21-30	<10	Hospital	Assisting Midwife ^c
Robert	51-60	20-30	Hospital	Assisting Midwife
Judith	21-30	<10	Hospital	Assisting Midwife
Cheryl	41-50	10-20	Hospital	Assisting Midwife

*Names are changed to pseudonyms.

^a Primary midwife: A registered midwife who is the main midwife responsible for providing care to the woman and her baby at birth.

^b Team leader: A registered midwife who is not primarily in charge of caring for the woman in her birth, but supervises the team for the shift. The team leader manages the activities of the primary and assisting midwives and helps them when required.

^c Assisting midwife: A registered midwife who assists the primary midwife at birth.

Putting on a brave face (Theme 1)

Shoulder dystocia was described as a birth associated with feelings of fear and anxiety. Despite the experience of SD having a high emotional burden, midwives reported that they were professionally expected to conceal their emotions during and/or after the event, either to protect professional etiquette or to prevent others (especially parents) from being impacted by their emotions. Being under emotional pressure and simultaneously trying to suppress their emotions

took extra energy from midwives. The two concepts that informed this theme were 1) shoulder dystocia: a panic station and 2) feeling pressure.

1) Shoulder dystocia: a panic station

Births complicated by SD were described as “*panic-station*” [Mary] and among the most scary births midwives ever experienced during their career “*When you have tried a couple of manoeuvres, you feel that **panic** and you can feel the **adrenaline rush** inside you and your heart rate going up*” [Marta]

These few minutes, although short, seem to be enough for emotionally laden births such as SD to be recalled in detail years after the event “*I am still haunted by the voice of the mother ‘get this baby out- get this baby out’, screaming*” [Diana, experienced SD in 1980s]

Midwives experienced a high level of anxiety which was amplified in situations where they found themselves alone or as the only senior person at birth. Experiencing such a situation, midwives felt stripped of their ability to make clear decisions “*I do remember looking around, and thinking, ‘oh my God, I am the most senior person here... I didn’t know what my next move was really. I remember looking at the pale baby at one point and actually shaking my head like I don’t know what else to do*” [Fiona]

2) Feeling pressure

Midwives felt pressured as they held themselves responsible for whatever action they took in that moment realising that it would have an impact on the baby, the parents and themselves as well:

*“I remember thinking - the **weight of all the hopes and anticipations** of this couple and the family outside is about to be snatched from them in a minute if you don't sort this out” [Maggie]*

Despite being under pressure and feeling the adrenaline rush, midwives had to suppress their emotions which made the situation even harder. They had to hide their anxiety and to keep the environment calm and under control as expected. Consistently, midwives referred to the term “*poker face*”, indicating their effort to prevent others, especially the mother, from becoming worried.

*“As with any obstetric emergency, I always had a bit of an **inside panic** but ... [on the] outside I always remained calm, because you know if you are going “Ah sh*t!” Inside, you don’t want to show it to the parent” [Debra]*

Towards the growth zone (Theme 2)

Despite being viewed as traumatic, midwives believed that SD provided them with an opportunity for reflection on their skills and their career. Experience of SD enabled midwives to make better sense of SD in the next births. It made them think about a better clinical action plan for future births. Midwives reported that this experience helped them to take on the challenge of addressing the fear of encountering SD in subsequent births, and assisted them to move towards a higher level of clinical expertise. For those who could overcome it, the event tended to be more like an empowering experience rather than a traumatising event.

However, apart from providing a valuable lesson, events like this highlighted the areas of vulnerability as a midwife. Even after managing the birth, midwives doubted their clinical competence. For some, it caused them to **reflect and return** while for some others to **reject and retire**. Such births made midwives contemplate whether they were meant to remain in this profession *“It gives you that little bit of doubt of your skill. It talks about limitations... that sense of fear...” [Mary]*

This theme was informed by three concepts including situational awareness, internalisation of skills and professional empowerment.

1) Situational awareness

Shoulder dystocia was referred to as an opportunity for developing and strengthening situational awareness. Midwives noted that after exposure to such births, their ability in predicting and preventing birth emergencies increased. Shoulder dystocia made midwives super-aware and proactive and helped them to think ahead of birth

“I am always trying to think who else can I have in the room if I think it’s going to be shoulder dystocia? Do I have people on stand-by?” [Tania]

*“With that woman, when she had the next birth, I **watched her like a hawk**” [Sandra]*

2) Internalisation of skills

Shoulder dystocia was seen as a hands-on learning experience, which helped midwives to make better sense of what they had learnt. Experiencing SD educated midwives to delineate between true SD and just a difficulty in the birth of the shoulders. Understanding this difference can provide benefit in the form of preventing a future hasty diagnosis. Practically doing the manoeuvres during the SD event contributed to deep imprinting of the SD management techniques in the mind.

“I knew what the manoeuvres were, but to actually do them, I think I would never forget them, because of that feeling of pulling either side of shoulders and just nothing moving!” [Helen]

The experience shapes the practice; the more experience, the better midwives would find their ‘go-to practice’ which has worked for them in previous births *“Gaskin manoeuvre is my go-to manoeuvre every time. That’s what I would choose” [Cheryl]*

3) Professional empowerment

Midwives discussed a sense of fear they normally have towards birth emergencies. This fear was reported to be defeated after handling SD. After experiencing SD, they were reassured about their skills, which contributed to a sense of higher clinical expertise. Three main categories were identified for this sub-theme.

○ *Defeating fear: No more what-if thoughts*

The fact that student midwives do not often witness SD during their training, leaves them vulnerable and unprepared in dealing with SD. Even if witnessed, the training may not have sufficiently equipped them to handle SD in real life. One midwife expressed her critical attitude towards the training by saying:

“For me when I was a student midwife, or an early midwife, I was terrified of shoulders. Because of the training, you are taught to be terrified of shoulders and everybody goes into a complete panic” [Pauline]

Midwives reported that even in real life and while working, midwives, in particular juniors, may not be given the chance of managing SD:

“With shoulder dystocia somebody wants to be the hero, to get in there and do the manoeuvres and so midwives get pushed out the way” [Helen]

Therefore, midwives often referred to SD as ‘*a theory*’ for junior midwives, and stated that theory does not make sense for them until they get to practice it in real life:

“I didn’t think shoulder dystocia was that bad before. I was a little bit naïve before that. Then after that situation [SD]- No!” [Elizabeth]

Thinking about birth emergencies that do not frequently happen may provoke fear for midwives. Being afraid and not having the experience of SD in real life, causes midwives to worry about how they can manage SD if it happens. However, having managed a successful SD improved their advanced skill sets and helped them to no longer feel unprepared about it.

- ***Reassurance and optimism***

Common to all midwives was the notion of reinforced confidence after having successfully managed a critical incident *“What it gave me was a sense of confidence that I could recognise shoulder dystocia and manage it. So quiet optimism, or reserved optimism that I had the skill set to manage situations” [Mary]*

‘*Reserved optimism*’ described a fluctuating state between two poles of confidence (optimism) and fear (caution). The successful management of SD shifted the state towards the confidence pole. This was echoed by another midwife *“Once you have managed that situation it gives you a certain level of confidence. It is a little bit of fear and a little bit more confidence” [Susan]*

Self-confidence also prompted midwives to share their knowledge and experience to empower other midwives *“I became really interested in teaching students. That shoulder dystocia really made a mark on me” [Laura]*

Midwives also spoke of their joy after overcoming the fear of SD and considered it as an achievement *“I am glad that I have had a true shoulder dystocia now and managed it pretty much all by myself. When I have the next one, it’s not going to be this unknown quantity” [Susan]*. It was described as a situation where your skill sets are upgraded to a higher level of expertise. As this midwife explained, emergencies such as SD provide an opportunity for actualising the potential midwifery skills which have been learned throughout the years, but may not have been used so far *“It was nice in reflecting back on it [SD] to realise I actually*

did know what to do- all that training actually worked. We go through our yearly drills, but it was nice to know that in a scary situation it actually all kicked in” [Catherine]

After all, the experience of SD helped midwives to gain insights into their integral role as a midwife in ensuring the health of the mother and baby.

“I remember looking at my hands- wow, this is the first time these hands have actually saved the baby and that was validating but strange at the same time. I think it was really connecting me to the power of midwifery” [Helen]

○ **Acknowledging others**

Midwives recognised the support and help they received from the women and their colleagues either at the time when SD occurred or following the birth when it was resolved. They acknowledged the woman’s assistance at birth as a factor for having a good birth outcome, and also colleagues’ support after birth as a source of quick recovery after trauma.

“I asked her [the woman] to get onto her back. She was amazing, she just did whatever position I asked her to do. She got onto her back, and I got her legs right up and she was able to hold them really well into McRoberts” [Helen]

“I felt talking to my colleagues was the biggest help” [Susan]

“I think homebirth midwives network very well, and we are very good at talking to each other. So, yes, with a little group of colleagues we talked about it a lot- a lot... There was lots of online chats, there was a lot of phone calls.

If it was three in the morning and I was worried or scared, there is half a dozen midwife colleagues I think I could ring, for whatever reason, and I think we do that very well” [Catherine]

I am resilient enough to recover, because of ... (Theme 3)

As described above, many of the participants viewed SD as an opportunity for skill actualisation and professional growth. The underlying factors of why a birth trauma experience turns into PTSD for some midwives and PTG for others need further exploration. However, in

this study we found certain factors which underpinned how midwives responded to traumatic SD.

1) Faith in birth normality

Midwives stated that the faith they had in normal birth and in women's ability to birth safeguarded them against the aftermath of trauma. Trusting women helped midwives to minimise their fears from previous births and to better cope with SD *"I try to trust every woman like she is a normal woman going through a normal process"*[Susan]

Comparable comments by other midwives denoted that despite being worried for future births, previous exposure did not undermine their faith in what they were doing (for example water birth in this quote) *"Experience of SD didn't stop me from attending water birth or encouraging women to use water immersion. But I think that there was a time where there was an **added element of stress**"*[Barbara]

2) Workplace culture

Workplace culture was described among the influencing factors on midwives' orientation towards births after a traumatic experience. A particular emphasis was placed on the importance of working in a calm environment with like-minded colleagues who share the same values.

"I work in a [low risk focused] birth centre. Our whole philosophy of birth is normal and it's very much in contradiction to my colleagues who work in a [hospital-based] birth suite. As soon as I walk through the doors of a birth suite, you can feel the anxiety in the air"[Susan]

Being cared for and supported by colleagues was reported to be cathartic after SD. Working in a supportive environment was acknowledged as a force which kept midwives going after distressing events *"We all support each other very well. I think that's what makes us all come back to work every day"*[Tania]

It was commonly expressed that debriefing was constructive as long as it is not carried out in a *"punitive way"*[Mary], *"It is not a blame-game"*[Robert], and therefore, there is no place for destructive comments which may make midwives feel incapable and incompetent in their job.

Comments about the necessity of a supportive environment after trauma were numerous. However, not all midwives spoke of being well supported after SD. Some midwives expressed that they would have liked to have further debrief, whereas, their needs were not fully responded to by their colleagues/seniors.

Sentiments such as “[we have a] deeply ingrained culture that traumatic birth comes and we don’t have feelings here” [Jane] showed midwives’ perception towards their unsupportive workplace and the fact that in these workplace cultures they were forced to ignore their emotions. There appeared to be a lack of emotional understanding in some clinical settings that prohibited midwives from even expressing their feelings. Tackling this culture was deemed necessary in providing faster recovery for midwives after a traumatic experience.

3) Personal and professional factors

Years of experience appeared to be an influencing factor on how midwives dealt with SD. As this midwife said, having worked for almost three decades in midwifery seemed to have protected her against traumatic events.

“It’s my core business to know this stuff. So, maybe 20 years ago I would have said ah... but not anymore, too old for that now” [Rosie with 30 years of working experience]

However, fewer years of experience could make midwives susceptible to replaying negative thoughts. As this midwife described, as a junior midwife, she kept ruminating on negative feelings and needed more debriefing to overcome her experience.

“I think I wanted to go over it much more than the senior midwives. They said it’s probably because you are a lot junior that you just hang on to this case so much. I just wanted to go back and keep thinking about it. They were like ‘no you need to just put it to bed’ ” [Judith, with two years experience who witnessed a SD resulting in a baby with cerebral palsy]

Apart from working experience, midwives commonly referred to some personality features as influencing factors in how they reacted to SD. They also talked about having confidence which re-assured them about their expertise “You have to rationalise in your head that it’s not your fault. You have to think if I hadn’t done what I did, that baby wouldn’t be alive or would be in much poorer state” [Marta]

5.6 Discussion

We found there were three themes related to midwives' experiences after SD birth. Themes included 1) putting on a brave face 2) towards the growth zone 3) I am resilient enough to recover, because of Our findings confirm that despite being viewed as a traumatic birth experience, SD can be associated with positive outcomes for midwives. Participants in this study referred to SD as an experience which made them reflect on their skills, career, and their role as a midwife. Midwives spoke about boosting their confidence, feeling reassured about their skillsets, improving situational awareness, thinking about advancing their career and teaching other midwives, and acknowledging the support they received from their colleagues.

These concepts indicated that traumatic experiences can bring midwives a certain level of growth. The identified themes are all evident in the Post-traumatic Growth Theory (PTGT) (Tedeschi & Calhoun 1996) and we have used this theory to align with the findings to demonstrate that midwives' experiences of traumatic births may enhance their career development and growth. This theory discusses positive changes after experiencing challenging events. This is particularly relevant to midwives as the healthcare professionals who may constantly experience or witness scenes of joy and distress.

As Tedeschi and Calhoun stated in this theory, not all individuals may experience PTG, and not all those who undergo the growth process may develop in all domains. This is similar to what we found; some domains such as Personal Strength had the most and some domains such as Spiritual Change and Appreciation of Life had the least related sentiments from the interviews. However, this could be due to the purpose of our study, as we aimed at exploring the overall impact of SD on clinical practice of midwives. From the beginning of the study, the interview questions and our inductive data analysis approach were not informed by this theory. We discuss briefly below the identified concepts in relation to the five domains of PTGT.

a) Relating to Others

In a majority of cases, midwives expressed that after traumatic SDs, they could count on the support from their colleagues. Peer-support not only helps midwives to better deal with the birth trauma (Elmir et al. 2017) but also is a key influencer on midwives' level of confidence in intrapartum care (Bedwell, McGowan & Lavender 2015). Midwives also acknowledged women's ability during SD, and described scenarios in which, despite being physically and

emotionally traumatised, women performed amazingly. Acknowledging women's capability at birth is an important aspect of strengthening the connection between the midwife and the mother (Beck, Rivera & Gable 2017).

b) New Possibilities

There appears to be an elevated sense of empathy and prosocial behaviour in people who have experienced adverse events, which leads them to benefit others (Lim & DeSteno 2016). Midwives, in particular more experienced midwives, said that SD made them consider empowering others through tutoring midwifery students or providing mental health support for colleagues who are affected by work-related traumas. This confirms previous studies, which showed that traumatic experiences directed midwives towards establishing new paths in their career such as teaching undergraduates, becoming expert witness or advocating for policy change (Beck, Rivera & Gable 2017).

c) Personal Strength

This domain showed the most growth. Common to all midwives was the notion of reinforced confidence and lower fear of encountering future birth emergencies. The improved confidence reassured midwives of their ability and helped them to believe themselves to be stronger than what they had thought. Similar to our findings are the results of Beck et al. (2016) who explored vicarious PTG in labour and delivery nurses (Beck, Eaton & Gable 2016). Participants in their study expressed that the experience of birth trauma helped them to improve their capabilities. A similar study by the same authors reported that in some traumatic birth experiences midwives happen to encounter their worst obstetric fears which contribute to their increased trust in themselves for the next birth emergencies (Beck, Rivera & Gable 2017).

4) Spiritual Change and 5) Appreciation of Life

These two domains had the least relevant segments from the midwives' interviews. Probably because, unlike previous studies (Beck, Eaton & Gable 2016; Beck, Rivera & Gable 2017), we did not use PTGT in a deductive approach to direct our interviews towards all categories of the theory. However, our findings showed that SD enabled midwives to make better sense of the value of midwifery. On reflection, midwives described that those few minutes of handling SD were enough to make them think how powerful they were in their role as a midwife.

Response to trauma varies among individuals; following trauma people may develop PTG, PTSD or both (Zięba et al. 2019). Our findings confirmed this concept, as some midwives viewed the event as a panic station with a consequence of life-long stress, while others bounced back and expressed professional growth. Not all midwives reported the positive aspects of the event, which is in accordance with what Tedeschi and Calhoun reported in their theory that not all traumatised people may experience PTG (Tedeschi & Calhoun 1996).

What we present in this study is what midwives perceived as growth, which may be different to the actual PTG, because the discrimination between the perceived growth and the actual growth is a matter of debate (Boals, Bedford & Callahan 2019). Traumatic events have a subjective outcome which is known as the inner psychological layer of trauma (Palgi et al. 2018). It represents an individual's perception of a traumatic experience (Palgi et al. 2018), since the perception of PTG varies among different people (Tedeschi & Calhoun 1996) and cultures (Centre for Substance Abuse Treatment 2014). In line with this concept was the finding that interpretation of PTG is subjective to midwives, meaning that some viewed SD as an opportunity for professional development, whereas others did not. In other words, not all scenarios of SD were described and perceived as a growth opportunity. As an example, a determining factor of the perception of PTG was the participants' years of experience. In this study, it appeared that greater years of experience could help midwives to view SD more as a learning opportunity rather than a negative event. Therefore, borrowing the idea from Beck (2004) that "birth trauma lies in the eye of the beholder" (Beck 2004, p.28), we assume that post-traumatic growth is similarly viewed.

Certain factors may ease the process of PTG (Tedeschi & Calhoun 2004). This study showed that having faith in the normality of birth and having collegial support helped midwives to better cope with the traumatic experience. This is in line with previous studies that highlighted the importance of support from colleagues and seniors in dealing with traumatic experiences (Halperin et al. 2011). Midwives also spoke about the impact of personality type on the way they perceived and responded to SD. The association between personality type and PTG in midwives is an unexplored topic. However, studies among other populations such as patients with cancer, accident survivors, university students and veterans have reported interrelationships between PTG and resilience, optimism, openness and spirituality (Danhauer et al. 2013; Lee, Yu & Kim 2020; Mattson, James & Engdahl 2018; Tedeschi & Calhoun 1996). Other influencing factor was self-confidence which our participants described as a coping

strategy for bouncing back from trauma. However, self-confidence was described as both cause and outcome for PTG which occurs in a positive feedback loop. This is supported by the literature since working in labour demands a certain degree of confidence (Hunter, Smythe & Spence 2018), and on the other hand, overcoming work-related traumas make midwives more confident (Beck, Rivera & Gable 2017).

Management of complicated birth emergencies may require different skills and expertise compared to uncomplicated births (Singh & Nandi 2012). Birth emergencies require midwives to apply all their already practiced or unpracticed skills. Such births provide midwives with the opportunity of actualising potential skills and upgrading skill sets. Our study showed that midwives treated their management of SD as an achievement in their career, which was associated with a feeling of satisfaction and optimism. This confirms the evidence that improved knowledge and broadened competence, as parts of professional development (Nursing and Midwifery Board 2016), may contribute to job satisfaction (Nedvědová et al. 2017). This feeling of satisfaction was probably a reason which prompted midwives to share their experiences in this study.

For the purpose of this study, the initial assumption of the primary researcher was that midwives would have viewed SD as a life-changing event with negative impact on their clinical practice. However, contrary to this assumption, the identified concepts indicated that our participants mostly viewed SD as an opportunity to learn and grow. Although, some midwives expressed that SD made them hypervigilant, the overall viewpoints were more inclined towards what they gained after SD rather than what they lost.

In this regard, we should acknowledge two issues about our participants which may have directed our findings towards the PTG theory. First, participants who responded positively to our interview invitation were most probably those midwives who had overcome their traumatic experience and who had recovered from the post trauma stress (if there was any). During the interview sessions, the interviewees looked completely relaxed and without any obvious stress related to their experience of SD. It was something that the researcher could see and feel in the face and voice of participants as well as in the way they talked about the event. Participants self-selected to participate in this study, so, we assume that those midwives who were extensively traumatised and not recovered, may have simply ignored our invitation.

Second, another reason influencing midwives' way of viewing SD, could be their years of experience. The mean age in our study group was 50 years, which is of course reflective of the mean age of Australian midwives (Australian Institute of Health and Welfare 2016). Of a total 25 participants, 11 had approximately 30 or more years of working experience. Only six of our participants had been working for less than 10 years as a registered midwife. More experienced midwives expressed better recovery after the traumatic experience and viewed SD more as a lesson rather than a stressful event. Midwives with greater years of experience are more likely to have experienced a higher number of traumatic experiences across their career. Higher exposure over time can be both good and bad; good in terms of adaptability and bad in terms of desensitisation. Greater years of experience helps clinicians to better adapt to stressful clinical environments (Gillespie, Chaboyer & Wallis 2009). However, on the other hand, repeated exposures to emotionally challenging situations can desensitise individuals towards such events, and affect the way they view the event (Upton 2018). As such, we believe that the two factors of age and years of experience could have influenced the way our participants perceived and expressed their experience about SD. Meanwhile, the relationship between years of experience and midwives' perception of birth trauma warrants further exploration.

Based on the findings of this study, we propose a growth model following the experience of SD (figure 1). This figure depicts that births such as those complicated by SD are similar to a seed with potential capabilities, which are not yet actualised. Depending on a number of factors, the seed (SD) may grow (PTG) or die (PTSD). This model can inform health institutes to enhance post trauma support in order to direct traumatic experiences towards the growth path.

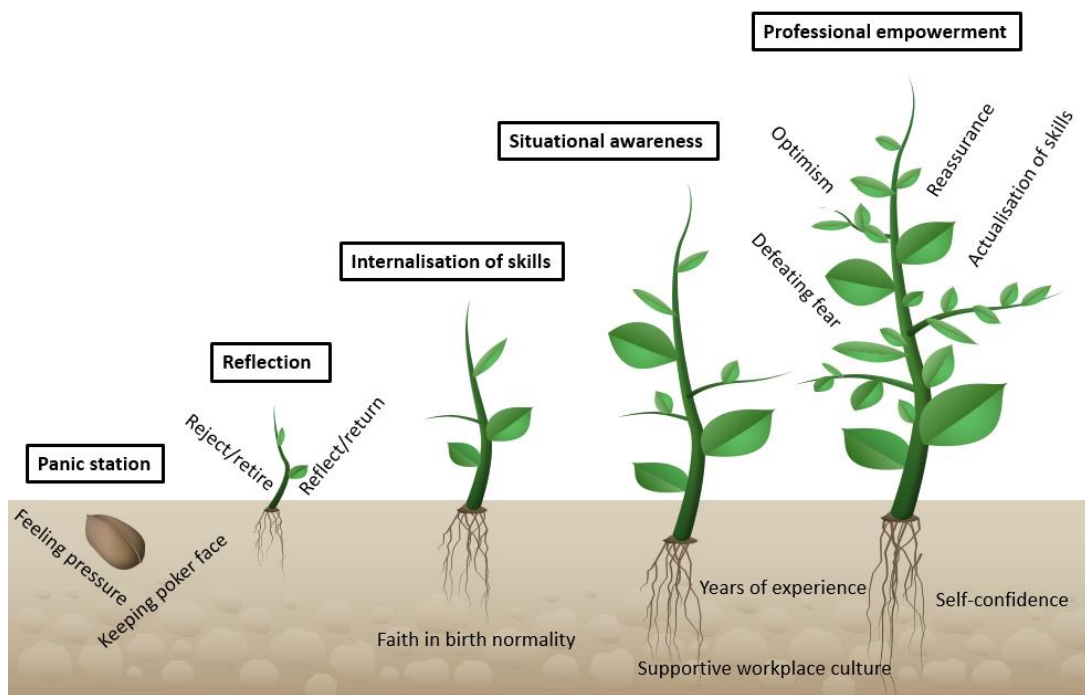


Figure 1. A model of Post-traumatic growth following shoulder dystocia

Strengths and limitations

This is the first study exploring the impact of SD on the clinical practice of midwives. We recruited midwives from different settings and states in Australia which ensured coverage of a range of experiences. However, this study is subject to some limitations. First, we recruited our participants through an email invitation, therefore, nonresponse bias may have impacted our findings. This study indicated only the experiences of those midwives who willingly responded to our recruitment invitation. Second, we did not apply any timespan limitation for recruiting participants, meaning that midwives were invited to the study regardless of when they had experienced the event. Timespan was not applied because the literature indicated that traumatic birth experiences can keep replaying in the mind decades after the event (Beck & Gable 2012). Also, because the aim of this study was to identify the impact of the experience on clinical practice whether or not it had occurred recently. However, over time, there is the chance of adjustment and growth after trauma (Staudinger & Kunzmann 2005) which in turn, may influence the way midwives' perceive and describe the event. Therefore, further studies considering the timespan between the event and interview are recommended. Third, participants in this study were from different settings and had different years of clinical experience. While some midwives expressed having experienced multiple cases of shoulder

dystocia in their career, some others spoke about only one case which was memorable in their mind and prompted them to take part in this study. Therefore, as the backgrounds and years of experience of the participants were not consistent, it was not possible to provide an average number of SD that each midwife had experienced. Fourth, we had an inductive approach in collecting and analysing data. Therefore, some dimensions of PTGT such as Spiritual Change or Appreciation of Life were not discussed adequately during the interviews.

5.7 Conclusion

A question that might be raised in conclusion is whether midwives should embrace the learning associated with experiencing traumatic births such as those complicated by SD. This way of thinking does not ignore the traumatic aspects of the experience, but focuses on the opportunity for learning and upgrading skills that such events can offer. While acknowledging that birth complicated by SD is a stressful birth, midwives need to be supported to view it as a potential opportunity for professional growth.

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5.9 Summary

This chapter explained that SD, which is primarily considered as a terrifying birth event, can bring positive outcomes for midwives as well. Boosting self-confidence, internalising the emergency skills, actualising potential skills and increasing midwives' satisfaction in the work they are doing, were the main positive outcomes which were depicted in the growth model. Huge emphasis was placed on the importance of workplace culture in enabling midwives to bounce back quickly after the traumatic incident.

In chapter four, I discussed that midwives expressed cautiousness in their practice after traumatic experience of SD. They reported that being preoccupied with the risk of repetition of SD prompted them to use hypervigilant behaviours such as use of prophylactic manoeuvres. In chapter five, I discussed a different, concept, situational awareness. Midwives referred to situational awareness as an ability to predict and think ahead of birth emergencies. The two concepts (i.e., hyper-vigilance and situational awareness) may look similar, but in fact one is the outcome of catastrophic thinking and the other is the outcome of growth mindset after trauma. Situational awareness is the perception of information, comprehension of situation and projection of events in future, especially in highly stressful situations (Schulz et al. 2013). Situational awareness creates a sound picture of the situation and increases the ability of the clinician to make the best decision to ensure patient safety (Green et al. 2017). In situational awareness, the clinician may, or may not take an action, but unlike hypervigilance the action is taken when needed, and is not based on the fear, stress or inability to manage the situation.

Integration of both the snowball effect model (chapter four) and the growth model (chapter five) is discussed in the discussion chapter. The next chapter will discuss the quantitative analysis of SD based on the retrospective data recruited from the tertiary hospital.

Chapter Six: Results of Phase Two

Incidence, Trend, Risk Factors and Outcomes of Shoulder Dystocia

6.1 Chapter Preface

The qualitative first phase of this study which included interviews with midwives, provided an in-depth perspective on how Shoulder Dystocia (SD) impacts on midwives' professional knowledge and practice. However, this phase did not provide any insight into the incidence of this traumatic birth experience that has long lasting effects on midwives' thinking and behaviour. Therefore the second phase of the study was to conduct a retrospective study to examine the prevalence of SD, its risk factors and outcomes.

6.2 Results

6.2.1 Demographic Characteristics

The initial dataset included a total of 24,277 pregnancies with 24,929 born babies within the period 1 January 2013 to 31 December 2018 (19,089 births recorded in ObstetriX, and 5,188 in eMaternity). Following data cleaning and exclusion of twin and multiple pregnancies as well as stillborn babies and those delivered by caesarean section, a total of 16,050 vaginal births were included in the initial data analysis. This number indicates the babies born in singleton pregnancies by 13,612 women. Discrepancy between the numbers of 16,050 and 13,612 is because a total of 2,438 women gave birth to more than one baby during this time period.

The basic characteristics of all included births are demonstrated in Table 1. On average, women were aged 32.4 ± 4.7 years and most had term pregnancies (93.2%).

Table 1. Demographic characteristics of the women and babies included in the study

Characteristics		Included birth records (n=16,050)
Maternal age (years) ^a		32.4 ± 4.7
Body mass index (kg/m ²) ^a		22.86 ± 4.0
Gestational age (week) ^a		39.29 ± 2.0
Type of pregnancy ^b	Preterm	982 (6.1%)
	Term [*]	14,963 (93.2%)
	Post-term ^{**}	104 (0.6%)
Pre-existing diabetes mellitus ^b		48 (0.29%)
Gestational diabetes mellitus ^b		1,400 (8.72%)
Analgesia during stage one of labour ^b	Using analgesia	13,360 (83.2%)
	Not using analgesia	2,250 (14%)
Labour induction/ augmentation ^b	No induction	8,165 (50.9%)
	Induction	7,363 (45.9%)
	Spontaneous labour with augmentation	521 (3.2%)
Non Aboriginal, non Torres Strait Islander ethnicity ^b		15,699 (97.8%)
Newborn birthweight (g) ^a		3,350 ± 538.16
Newborn gender ^b	Female	7,842 (48.9%)
	Male	8,208 (51.1%)
^a Mean ± standard deviation		
^b Number (percentage)		
[*] Term pregnancy: 37 weeks - 41 weeks and 6 days		
^{**} Post-term: > 42 weeks of gestation		

Table 2 presents the same characteristics as in Table 1, differentiated based on the births with and without SD. There were no significant differences in mean± standard deviation of maternal age, BMI and gestational age between births with and without SD. Of a total 1,077 births complicated by SD, 24 (2.22%) had previous history of SD. More than 97% of births with SD and 92% of births without SD followed a term pregnancy. Gestational diabetes mellitus was diagnosed in 10.12% and 8.62% of the women whose births were and were not complicated by SD, respectively (p<0.0001).

Table 2. Characteristics of women, neonates and type of labour, births with and without SD, 2013-2018

		Births with SD (n=1,077)	Births without SD (n= 14,973)	p-value
Maternal age (years) ^a		32.39 ± 4.99	32.4 ± 4.68	0.94
Body mass index (kg/m ²) ^a		23.42 ± 4.17	22.82 ± 4.03	0.6
Gestational age (week) ^a		39.89 ± 1.21	39.25 ± 2.04	0.64
Type of pregnancy ^b	Preterm	15 (1.4%)	967 (6.5%)	<0.0001
	Term	1,052 (97.7%)	13,911 (92.9%)	
	Post term	10 (0.9%)	94 (0.6%)	
Pre-existing diabetes ^b		9 (0.83%)	41 (0.27%)	<0.0001
Gestational diabetes mellitus ^b		109 (10.12%)	1,291 (8.62%)	<0.0001
Analgesia during stage one of labour ^b		982 (91.26%)	12,378 (82.69%)	<0.0001
Labour induction/ augmentation ^b	Induction	632 (58.68%)	6,731 (44.95%)	<0.0001
	Spontaneous labour with augmentation	63 (5.84%)	458 (3.05%)	<0.0001
Assisted birth with instruments (obstetric vacuum or forceps)		644 (59.79%)	3,468 (23.16%)	<0.0001
Duration of second stage of labour (more than 2 hours) ^c		290 (36.98%)	1,865 (15.97%)	<0.0001
Newborn birthweight (g) ^a		3,754.09 ± 459.9	3,320.54 ± 531.63	<0.0001
SD: shoulder dystocia				
^a Mean ± standard deviation: T-test is used to compare means ± standard deviations.				
^b Number (percentage): Chi-square test is used to compare numbers (percentages).				
^c Values include the births during 2013-2017 (During this period, out of a total 12462 births, 784 were complicated by SD).				
P-value <0.05 was considered as level of statistical significance.				

6.2.2 Incidence

Over the period from 2013 to 2018, a total of 1,077 births were documented with one or more than one SD manoeuvres (6.7% of the included births). Despite a decreasing rate of births annually, a higher number of SD cases was diagnosed in recent years (2016-2018), compared to earlier years (2013 and 2014) (Table 3).

Table 3. Number of shoulder dystocia complicated births per year, 2013-2018

Year of birth	Births with SD	Births without SD	Total
2013	149 (5.36%)	2,627 (94.63%)	2,776
2014	151 (5.50%)	2,591 (94.49%)	2,742
2015	161 (5.88%)	2,573 (94.11%)	2,734
2016	222 (8.02%)	2,546 (91.97%)	2,768
2017	203 (7.94%)	2,352 (92.05%)	2,555
2018	191 (7.71%)	2,284 (92.28%)	2,475
Total	1,077 (6.7%)	14,973 (93.3%)	16,050

6.2.3 Trend of Shoulder Dystocia

Table 4 shows the number of births complicated by SD based on the severity of SD per year. Definitions of mild, moderate and severe SD are presented in the footnote of the table. A significant association was shown between the severity of SD and years of SD occurrence (Chi-square test, p-value <0.0001). The incidence of mild SD ranged from 3% to 6%, whereas, the rate of moderate SD was lower, and remained at 1% during the studied time period.

Table 4. Number of shoulder dystocia births per year, by severity

Year of birth	Mild ^a SD N (%)	Moderate ^b SD N (%)	Severe ^c SD N	Overall rate of SD	Total vaginal births [*]
2013	112 (4%)	37 (1%)	0	5%	2,776
2014	109 (3%)	42 (1%)	0	5%	2,742
2015	128 (4%)	33 (1%)	0	5%	2,734
2016	167 (6%)	55 (1%)	0	8%	2,768
2017	162 (6%)	40 (1%)	1	7%	2,555
2018	158 (6%)	32 (1%)	1	7%	2,475
Total	836 (5%)	239 (1%)	2	6%	16,050

SD: shoulder dystocia

^aMild defined as using McRoberts manoeuvre and/or suprapubic pressure

^bModerate defined as using Rubin, Woods or reverse Woods manoeuvre, posterior shoulder delivery

^cSevere defined as fracture of clavicle or humerus

* Indicates total number of vaginal births in that year including births both with and without SD

Separate Chi-square analysis between subgroups of SD (mild, moderate and severe) and years of occurrence showed significant association only for mild SD which increased over time (p-value < 0.0001). This finding suggests that the frequency of using obstetric manoeuvres to resolve mild SD was higher over the period 2016 to 2018 compared to the years 2013 and 2014. (Figure 1).

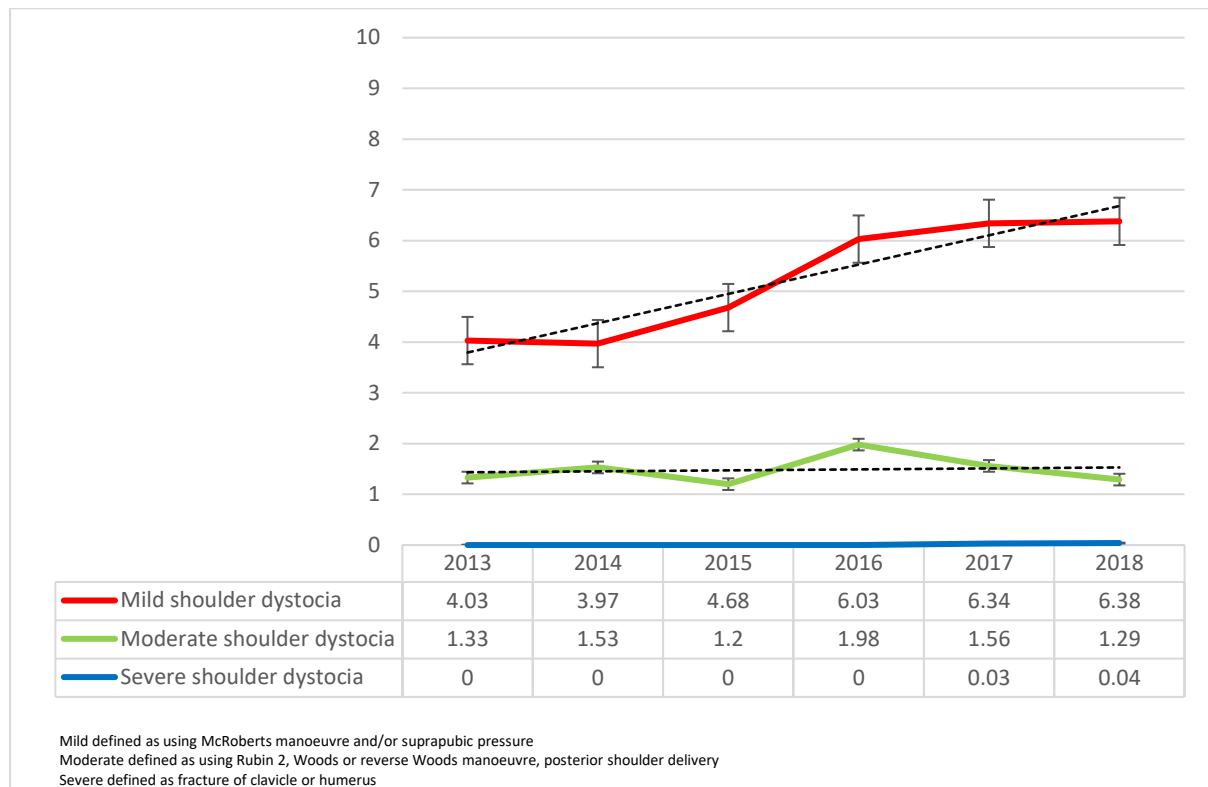


Figure 1. Proportion of births complicated by shoulder dystocia, 2013-2018

6.2.4 Outcomes

Table 5 compares the maternal and neonatal outcomes between births with and without SD. Findings revealed that, except for the risk of maternal third and fourth degree tears, there were significant associations between SD and other maternal and neonatal outcomes including postpartum haemorrhage (p<0.0001), APGAR score <7 at the 1st and 5th minute (p<0.0001) and neonatal resuscitation and admission to NICU (p <0.0001).

Blood loss was significantly higher in all three categories of $\geq 500 < 1000$ ml, $\geq 1000 \leq 1500$ ml, and > 1500 ml in women with SD compared to women without SD (p<0.0001). Overall, 36.2% of women with SD complicated births, and 16.8% of women without SD complicated births

had blood loss of greater than 500 ml (defined as postpartum haemorrhage). The odds of postpartum haemorrhage in SD was 2.82 (95% CI 2.47- 3.21). Episiotomy and/or episiotomy+graze was recorded for 122 (11%) women with SD and for 599 (4%) women without SD. Women with SD had higher rate of 3rd and 4th degree tears compared with women without SD (7.98% vs 3.7% and 0.83% vs 0.17%, respectively). However, the difference was not statistically significant (Table 5).

Neonates whose births were complicated by SD had poorer outcomes compared to neonates without SD. In SD group, 25.1% of neonates had 1st minute APGAR score < 7, and 74.9% had APGAR score ≥ 7. In non-SD group, 7.8% of neonates had 1st minute APGAR score < 7, and 92.2% had APGAR score ≥ 7. Neonates without SD were less likely to have 1st minute APGAR score less than 7 (OR: 0.25, 95% CI: 0.21-0.29). In SD group, 3.8% of neonates had 5th minute APGAR score < 7, and 96.2% had APGAR score ≥ 7. In non-SD group, 1.7% of neonates had 5th minute APGAR score < 7, and 98.3% had APGAR score ≥ 7. Neonates without SD were less likely to have 5th minute APGAR score less than 7 (OR: 0.44, 95% CI: 0.31-0.61).

Admission to NICU or SCN (special care nursery) was categorised and coded in different ways in the two databases of ObstetriX and eMaternity. Therefore, results of this variable has been presented separately based on the databases (Table 5). Overall, neonates with SD had significantly higher rate of admission to NICU/ SCN compared to neonates without SD (p<0.0001).

Table 5. Maternal and neonatal outcomes of SD, births with and without SD, 2013-2018

		Births with SD (n=1,077)	Births without SD (n= 14,973)	p-value
Postpartum haemorrhage (ml)	≥500<1000	232 (21.54%)	1,638 (10.94%)	<0.0001
	≥1000≤1500	90 (8.35%)	561 (3.74%)	
	>1500	68 (6.31%)	309 (2.06%)	
Perineal/ anorectal tears	3 rd degree tears	86 (7.98%)	555 (3.7%)	0.07
	4 th degree tears	9 (0.83%)	26 (0.17%)	
Apgar score 1 st minute	<7	270 (25.1%)	1,153 (7.8%)	<0.0001
Apgar score 5 th minute	<7	41 (3.80%)	256 (1.71%)	<0.0001
No/minimal neonatal resuscitation required		578 (53.7%)	12,260 (81.9%)	<0.0001
Admission to NICU or SCN (ObstetriX database: 2013-2017)*	At birth ^a	141 (17.58%)	1,143 (9.55%)	<0.0001
	Postnatal ^b	75 (9.35%)	612 (5.11%)	<0.0001
Admission to NICU (eMaternity database: 2017-2018)**	At birth ^a	22 (8%)	208 (6.92%)	<0.0001
	Postnatal ^b	8 (2.9%)	57 (1.89%)	<0.0001
	Both at birth and postnatal	1 (0.36%)	2 (0.06%)	<0.0001
SD: shoulder dystocia; NICU: neonatal intensive care unit; SCN: special care nursery				
* Including 12,771 records; 802 births with SD; 11968 without SD				
** Including 3,279 records; 275 births with SD; 3004 without SD				
^a Admission to NICU (at birth): ≤ 6 hours after birth				
^b Admission to NICU (postnatal): ≥ 6 hours and up to 48 hours after birth				

6.2.5 Risk Factors

Binary logistic regression showed that SD was significantly associated with antenatal and intrapartum risk factors. The main risk factors for SD included post-term pregnancy (OR: 1.36, 95% CI: 1.29-1.44), maternal pre-existing diabetes/ Gestational Diabetes Mellitus (GDM) (OR: 1.57, 95% CI: 1.05-1.27), labour induction/ augmentation (OR: 1.63, 95% CI: 1.40-1.90) and duration of second stage of labour (more than two hours) (OR: 2.80, 95% CI: 2.40-3.27) (Table 6).

Table 6. Regression equation of shoulder dystocia risk factors

	B	Standard Error	Wald	df	Significance	Exp(B)	95% confidence interval for Exp(B)	
							Lower limit	Upper limit
Gestational age	.313	.027	130.053	1	.000	1.367	1.295	1.442
Maternal diabetes	.146	.048	9.182	1	.002	1.157	1.053	1.272
Labour induction	.491	.078	39.521	1	.000	1.634	1.402	1.904
Analgesia	.099	.079	1.577	1	.209	1.104	.946	1.288
Duration of the second stage of labour	1.032	.079	168.431	1	.000	2.806	2.401	3.279

B: Logistic regression coefficient; df: Degree of freedom; Exp(B): Exponentiation of the B coefficient (Exp (B) is the Odds ratio).
Wald: Wald chi-square test

Based on the results of logistic regression (Table 6), separate analysis was conducted to investigate the trend of risk factors over the period of past six years. Results indicated that the rate of maternal gestational diabetes and use of analgesia were the factors which showed significant changes over the years 2013-2016. These trends are shown in Tables 7 and 8 and Figures 2 and 3. The rate of maternal gestational diabetes significantly increased from 2013 to 2018 ($p < 0.0001$). No significant changes were observed in the rate of pre-existing diabetes (Table 7 and Figure 2).

Table 7. Number of women with pre-existing and gestational diabetes, 2013-2018

	Pre-existing diabetes	Gestational diabetes mellitus	Total births*
2013	8	209	2,776
2014	10	213	2,742
2015	8	235	2,734
2016	9	256	2,768
2017	10	222	2,555
2018	5	265	2,475
Total	50	1400	16,050

* Indicates total number of pregnancies in that year, regardless of diabetes status

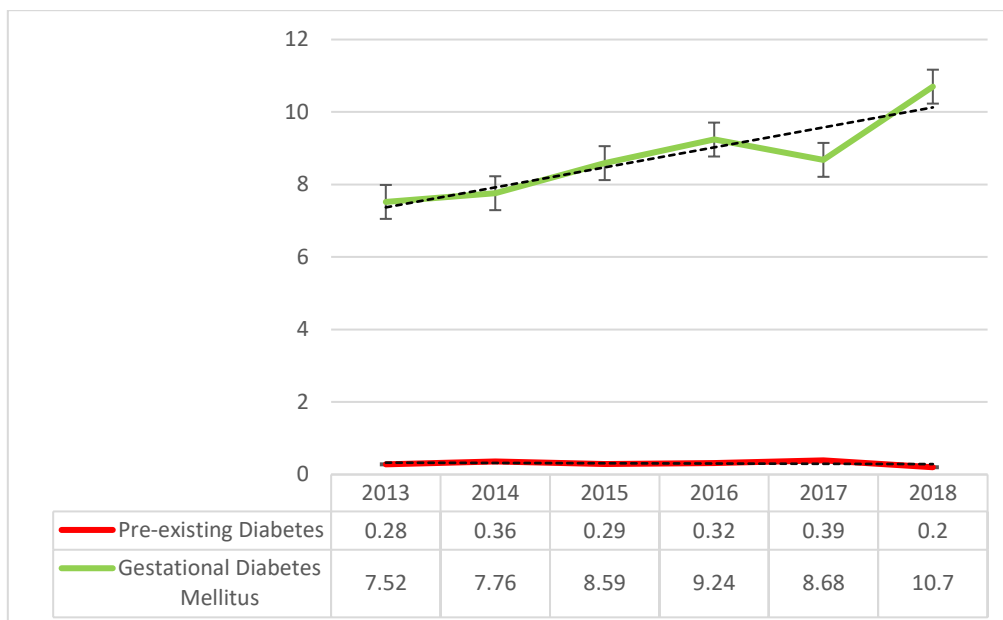


Figure 2. Proportion of pregnancies complicated by pre-existing or gestational diabetes, 2013-2018

The overall trend of using analgesia during labour showed an increase within the six-year period, with slight variations between the years 2013 and 2018 (Table 8 and Figure 3). Analgesia was defined as the use of any type of pharmacological and/or non-pharmacological pain relief during labour and birth. These included epidural analgesia, spinal analgesia, intramuscular or intravenous narcotics, nitrous oxide gas, pudendal block, subcutaneous sterile water injection and water immersion. In a majority of cases a combination of different methods of pain relief was administered; therefore, separate presentation of each of these techniques was not feasible.

Table 8. Number of women who received analgesia, 2013-2018

	No analgesia	Analgesia	Total births*
2013	483	2,187	2,776
2014	403	2,257	2,742
2015	434	2,202	2,734
2016	426	2,260	2,768
2017	322	2,176	2,555
2018	182	2,278	2,475
Total	2,250	13,360	16,050

* Indicates total number of pregnancies in that year

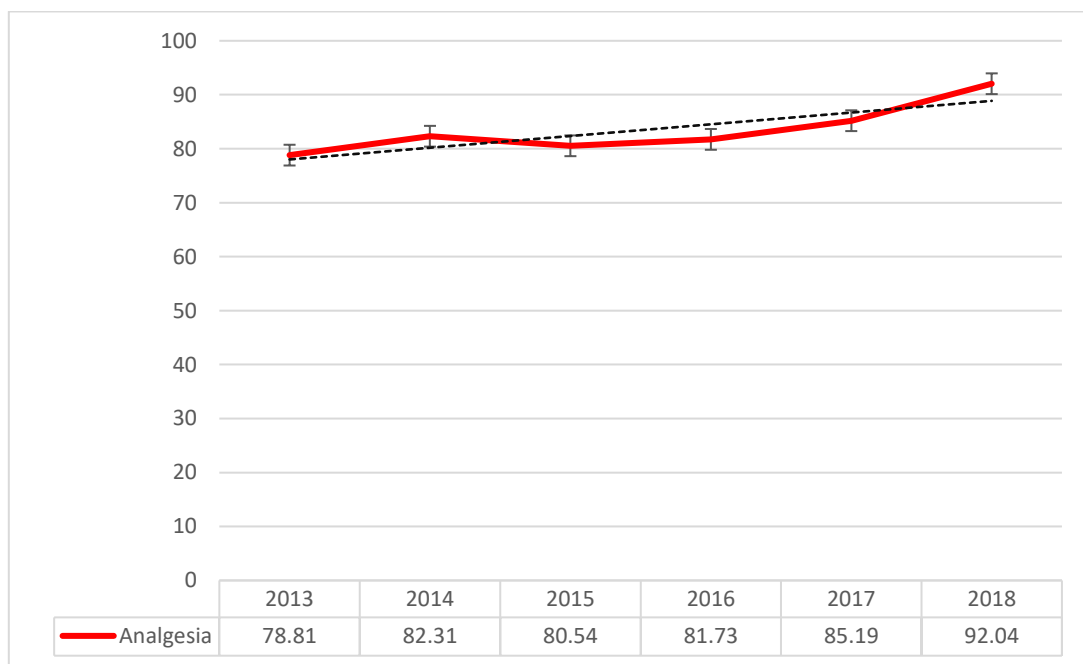


Figure 3. Proportion of women who received analgesia, 2013-2018

There was a significant difference between the mean birthweight of the babies who had SD and those who did not ($p < 0.0001$). Table 9 shows the mean birthweight of babies differentiated by the year of birth. No significant changes were observed in the trend of birthweight over time in either group.

Table 9. Mean birthweight, 2013-2018

Year of birth	Births with SD (n= 1,077)		Births without SD (n= 14,973)		p-value**	Total number of births
	Number of births	Birthweight (gr)	Number of births	Birthweight (gr)		
2013	149	3,761.38 ± 477.60*	2,627	3,342.33 ± 541.86	<0.0001	2,776
2014	151	3,758.14 ± 476.56	2,591	3,336.29 ± 526.56	<0.0001	2,742
2015	161	3,756.66 ± 444.73	2,573	3,324.77 ± 534.82	<0.0001	2,734
2016	222	3,772.13 ± 479.02	2,546	3,312.89 ± 521.74	<0.0001	2,768
2017	203	3,751.17 ± 457.16	2,352	3,301.82 ± 535.86	<0.0001	2,555
2018	191	3,725.15 ± 429.36	2,284	3,300.59 ± 527.41	<0.0001	2,475
Total	1,077	3,754.10 ± 460.73	14,973	3,319.78 ± 531.37	<0.0001	16,050
* Mean ± Standard deviation						
** Level of significance was determined by independent samples t-test.						

6.3 Summary

This chapter presented the retrospective data analysis which examined the incidence and trend of SD in the past six years at one hospital in Sydney. Findings showed an increase in the rate of SD, suggesting that a growing number of midwives are experiencing and diagnosing SD and are dealing with its potential consequences. Accurate diagnosis of SD is important as it can affect clinical decision-making for future births for women with a history of SD. The main risk factors for SD included post-term pregnancy (OR: 1.36, 95% CI: 1.29-1.44), maternal pre-existing diabetes/ Gestational Diabetes Mellitus (GDM) (OR: 1.57, 95% CI: 1.05-1.27), labour induction/ augmentation (OR: 1.63, 95% CI: 1.40-1.90) and duration of second stage of labour (more than two hours) (OR: 2.80, 95% CI: 2.40-3.27). Along with the trend of SD, the trend of some risk factors increased over these years; these risk factors included maternal gestational diabetes, use of analgesia and augmentation of labour. The next chapter presents the discussion of the results of both phases of the study.

Chapter Seven: Discussion

This study was a sequential mixed methods study to explore midwives' experiences about births complicated by shoulder dystocia (SD) and to determine the rate of SD at one large hospital in Australia. In this chapter I synthesise my findings with the literature and place them within the context of midwifery training, professional development and practice in Australia.

The findings of the qualitative descriptive study (phase one) revealed that midwives described SD as a “horrendous” and a “dreadful” experience. The duration of SD births was described as lasting only a few minutes. However, the experience appeared to stay in the midwives' memory for several years and even decades. As a traumatic birth experience, SD impacted midwives' emotions, perceptions of normal birth and the way they practised in subsequent birth(s). Two overarching themes were identified as the main pathways that midwives went through following their traumatic experience: 1) professional growth or 2) catastrophic thinking.

In the professional growth pathway, midwives viewed the traumatic experience through the lens of learning, growing and optimism, and used this untoward experience as an opportunity to develop new skills. Findings surrounding this pathway were presented in chapter five. Professional growth after trauma was an ideal outcome which, however, was not expressed by all midwives. The alternative outcome of SD for midwives was catastrophic thinking. Catastrophic thinking or catastrophising describes a situation where midwives became overwhelmed by constant fear and anxiety. Negative thoughts and rumination about their experience had an impact on their risk perception and led them to consider the worst-case scenario in similar births. Catastrophic thinking was associated with hypervigilant behaviours. This pathway was explained in chapter four. A number of factors in both pathways were identified which could either improve the feelings of the midwives towards their traumatic birth experience and facilitate the recovery process or add to their distress after the event. These factors are explained in detail in chapters four and five and are further synthesised in this chapter together with the findings of phase two.

The retrospective cohort study (phase two) was prompted by the first phase findings. This study, conducted in one large Australian maternity hospital, revealed that the overall incidence of SD was 0.05 in 2013, which increased to 0.07 in 2018. Based on the degree of severity, the incidence of moderate and severe SD did not significantly increase, whereas the rate of mild

SD increased from 0.04 to 0.06 over that time. The increase in mild SD showed that during this time period, an increasing rate of births required manoeuvres to free the impacted shoulders. The McRoberts manoeuvre and/or suprapubic pressure were the manoeuvres used for extracting the babies' shoulders in mild SD. Use of these manoeuvres had an increasing trend over 2013-2018. The main risk factors for SD included post-term pregnancy (OR: 1.36, 95% CI: 1.29-1.44), maternal pre-existing diabetes/ Gestational Diabetes Mellitus (GDM) (OR: 1.57, 95% CI: 1.05-1.27), labour induction/ augmentation (OR: 1.63, 95% CI: 1.40-1.90) and duration of second stage of labour (more than two hours) (OR: 2.80, 95% CI: 2.40-3.27). The main maternal and neonatal adverse outcomes associated with SD were higher rate of postpartum haemorrhage (p-value <0.0001), APGAR score < 7 at the 1st and 5th minute (p-value <0.0001), and higher rates of neonatal resuscitation and admission to Neonatal Intensive Care Unit (NICU) (p-value <0.0001).

In this chapter, the results and the main concepts identified of phase one, the qualitative study, are discussed together with the relevant literature. These include midwives' descriptions of SD, the types of response they experienced following SD, the main contributors to professional growth and the role of a supportive workplace culture. Following that, the results of the second phase of the study are discussed, including the incidence, trend, risk factors and outcomes of SD in a tertiary hospital in NSW. This thesis was a mixed methods study, in which data were collected sequentially and analysed separately. The point of integration of the two phases of the study was at the stage of data interpretation, the results of which are presented in this chapter.

7.1 Diagnosis and reporting of shoulder dystocia

As described in chapter one, diagnosis of SD largely relies on the assessment of the accoucheur. The definitions and signs such as "failure to birth the shoulders with a gentle traction on the neck", "turtle sign" or "HBDI time more than 60 seconds" are all clinical guides that can be used to assess the situation. However, in many cases a subjective diagnosis by the accoucheur, and on the basis of her/his previous experiences, may be inevitable. The most common algorithm to manage SD is the HELPER (H-call for Help, E-consider Episiotomy, Legs-McRobert's maneuver, Pressure-Suprapubic pressure, Enter-Enter the vagina using internal pressure to reduce impacted shoulder, R-Remove the posterior arm and R-Rotate the patient to her hands and knees) (RCOG 2012). Other algorithms are also available but are used less frequently, for example, The Hernandez & Wendel algorithm or the ALARMER algorithm (A-Ask for help, L-Lift/ hyperflex legs, A- Anterior shoulder disimpaction, R-Rotation of the

posterior shoulder, M-Manual removal of posterior arm, E-Episiotomy and R-Roll woman onto “all-fours” (Bothou et al. 2021). Although they are generally accepted as effective tools, there are debates regarding the order of the manoeuvres and technique of use (Ansell et al. 2012; Ansell et al. 2019). In practice, midwives may use their own go-to manoeuvre, as described by some participants in this study (chapter five). Inconsistencies in algorithms necessitate developing an updated, and more flexible version of these tools (flexible in terms of the sequence of manoeuvres).

Differences in practice regarding diagnosis/ management and subsequently, reporting of SD may be explained partly by the differences in guidelines, but also may reflect the differences between local educational programs. As the association between education/ training and diagnosis/ management of SD was not the focus of this study, no conclusion can be made in this regard. However, evidence confirms that training programs have the potential to change the order of the manoeuvres that staff use when SD occurs. Dahlberg et al. (2018) reported that after 10 years of simulation-based SD training program, the dominant manoeuvre to release shoulders changed from posterior arm extraction to internal rotation of the anterior shoulder. Further research is warranted to explore the impact of incorporating midwives’ experiences into local (hospital-based) training programs on SD outcomes.

7.2 Traumatic birth experiences add to the emotional work of midwifery

Midwives described SD as an emotionally charged birth. They described moments of high pressure, anxiety and responsibility which in some cases left them with a permanent fear. Distressing events are an inseparable part of the profession of midwifery. In a survey among Swedish midwives, Wahlberg et al. (2017) found that, of a total 706 midwives, more than 70% experienced at least one severe obstetric event with detrimental outcomes for the mother or the baby at any time during their career (Wahlberg, Sachs, et al. 2017). Chapter one discussed the concept of the second victim where health professionals who are involved in an adverse event are personally and/or professionally affected (Wu 2000). The feeling of being a second victim is a concern among obstetric staff including doctors, midwives, nurses and even non-clinical healthcare workers (Rivera-Chiauzzi et al. 2021). In a survey, obstetric and gynaecology nurses from the United States of America (US) were asked if they had felt like a second victim at any time in their career (Finney et al. 2021). They defined second victim as *"a health care provider*

involved in an unanticipated adverse patient event, medical error and/or a patient-related injury who becomes traumatized by the event" (Finney et al. 2021, Survey instrument-Appendix S1). About half of the 115 respondents reported feeling like a second victim in their career, with around one-fifth having experienced that feeling in the past 12 months. The feeling of being a second victim is subjective as in this US study; more than 70% of the obstetric nurses had not heard about the term 'second victim' (Finney et al. 2021). It is likely that a considerable proportion of midwives or nurse-midwives who experience negative emotions may not be aware that they are also victims of traumatic experiences.

Midwifery involves emotional work (Hunter 2001), which is defined as modifying the expression of emotions through enhancing, faking or suppressing them (Grandey 2000). Working in a birth unit requires constant management of emotions such as happiness, sadness, stress, fear and anxiety. In the majority of these situations, midwives and nurses perceive that they are expected to suppress their emotions (Lartey et al. 2020). The midwives in the first phase of the current study used terms such as "*poker face*" or "*inside panic but [on the] outside I always remained calm*". These terms indicated the midwives' effort to look professional by suppressing their emotions. The participants reported that they pretended to be calm but internally they were not feeling the same; this is called surface acting (Grandey 2000). Studies among healthcare providers confirm the association between surface acting and burnout, reduced organisational commitment and leaving the job (Theodosius et al. 2021; Yang & Chang 2008). In the long term, surface acting affects the mental health and well-being of healthcare workers and increases the risk of depressive symptoms (Suh & Punnett 2021).

In and of itself, midwifery is an emotionally laden profession (Pezaro et al. 2016); however, exposures to birth emergencies such as SD increase the emotional pressure on midwives. A classic scenario of severe SD, described below, provides a snapshot of the distress that midwives may bear during SD:

"The hairy scalp slides out with reluctance. Fat cheeks eventually emerge. A double chin has to be hooked over the posterior vulval commissure, to which it remains tightly opposed. Restitution seldom occurs spontaneously, for the head seems incapable of movement as a result of friction with the girdle of contact of the vulva.

Time passes. The child's head becomes suffused. It endeavours unsuccessfully to breathe. Abdominal efforts by the mother or by her attendants produce no advance; gentle head traction is equally unavailing.

Usually equanimity forsakes the attendants. They push, they pull. Alarm increases. Eventually by greater strength of muscle or by some internal juggle the difficulty appears to be overcome, and the shoulders and trunk of a goodly child are delivered. The pallor of its body contrasts with the plum-coloured cyanosis of the face, and the small quantity of freshly expelled meconium about the buttocks. It dawns upon the attendants that their anxiety was not ill-founded, the baby lies limp and voiceless, and too often remains so despite all efforts at resuscitation" (Morris 1995, p.305).

Midwives in this study recalled the SD births long after the events. Events involving extreme emotions (such as fear, rage, joy, panic, grief) are associated with the secretion of noradrenaline which helps enhance the formation of memory (Tully & Bolshakov 2010). Dysregulation of noradrenaline is important in development of post-traumatic stress disorder (PTSD) symptoms such as anxiety (Krystal & Neumeister 2009). Response to trauma may be exhibited in a variety of immediate or delayed reactions; these are classified into five categories (Centre for Substance Abuse Treatment 2014). The examples of these responses which were described by midwives in this study are mentioned in brackets: (a) Emotional response (fear, anxiety, helplessness, sadness, anger, guilt, fear of trauma recurrence); (b) Physical response (pain in hands, numbness, shaking hands, adrenaline rush, elevated heartbeat); (c) Cognitive response (rumination and replaying the event over and over again, generalisation of signs to other cases, difficulty in making decisions); (d) Behavioural response (avoiding event reminders, changing workplace and avoiding working in birth suite); and (e) Existential response (redefining meaning of birth, actualisation of potential skill sets, renewed faith [in ones' power in saving life]).

7.3 Same event, different responses: Bouncing back, backward, or forward

In this study, not all midwives expressed similar pathways or ways of thinking after experiencing SD. In chapters four and five, I presented the 'snowball (catastrophising)' and 'growth' models as the main outcomes for midwives following traumatic birth experiences. Response to birth trauma is a dynamic trajectory in which the affected midwife may not follow

exactly every stage of this process from the beginning to the end. Grief, fear and growth may be experienced alone or consecutively. Midwives who underwent a growth path may have already gone through catastrophic thinking before.

For some midwives in this study, the experience of SD was associated with learning, flourishing, and gaining a better understanding of critical situations. These midwives viewed SD as a unique experience that contributed to their feeling of satisfaction and empowerment. They not only bounced back to the pre-trauma situation but bounced forward. Their experience helped them to find their '*go-to practice*', and to internalise their emergency skills. Successful management of SD was reassuring, boosted the self-confidence of midwives and improved their optimism about their skill sets. Shoulder dystocia enabled midwives to use skills which they had never, or rarely, used before. Previous studies have shown that distressing births can help midwives, nurses, and obstetricians to become better clinicians, in terms of improving their skill sets as well as their deep understanding of their profession and life (Beck, Eaton & Gable 2016; Schröder et al. 2016; Walker et al. 2020). As a result of the increased self-confidence, some midwives in this study considered sharing their knowledge and skills to empower other midwives. Applying knowledge in practice is reassuring for midwives and gives them a sense of usefulness (Sabzevari & Rad 2019). This feeling of satisfaction and reassurance may be of greater importance in settings which are medically dominated, because in these settings, midwives describe an inability to fully use their knowledge and skills, and express a feeling of disengagement from their workplace (Catling & Rossiter 2020).

In chapter five, I discussed post-traumatic growth (PTG) after SD. Although there is controversy about the relationship between resilience and PTG (Levine et al. 2009), from one perspective, PTG has been viewed as a way of developing resilience. A continuum has been proposed for resilience which ranges from bouncing back to the pre-trauma situation to thriving and growing post trauma (Carver 1998). Thriving and PTG are at the top of this continuum since the affected person not only recovers from the incident but progresses to a higher level of personal or professional accomplishment compared to the pre-trauma level (Carver 1998).

A prerequisite for the growth pathway is possessing a growth mindset. The concept of growth mindset originates from the studies of Dweck and her colleagues, and is defined as embracing challenges and viewing them as an opportunity for learning (Dweck 2008). The opposite of a

growth mindset is the fixed mindset in which one believes that her/his abilities are fixed and cannot be improved (Dweck 2008). An early, significant study by Dweck and Leggett (1988) investigated the responses of students to difficulties, and found that some students demonstrated a “helpless” response, whereas some others showed a “mastery-oriented” response (Dweck & Leggett 1988). Students with a helpless orientation viewed their challenges as failures, but mastery-oriented students viewed their difficulties as a challenge to be solved through effort. Mastery-oriented students had optimism about the outcome of their efforts and believed in their capacities. Recent studies have also confirmed that a growth mindset increases the level of wellbeing and better performance of students in school (Ortiz Alvarado, Rodríguez Ontiveros & Ayala Gaytán 2019; Yeager et al. 2019). Other studies have shown that having a growth mindset leads to embracing challenges and focusing on learning and hard work, whereas people with a fixed mindset avoid challenges and focus on their inherent talents (Dweck 2008, 2013; Wolcott et al. 2021). Not only the mindset of the students, but also the mindsets of their instructors, may affect the outcomes, motivations and achievements of students (Canning et al. 2019).

Strategies to promote a growth mindset can improve resilience, perseverance and confidence in healthcare professionals (Wolcott et al. 2021). There is a lack of evidence in the midwifery literature regarding the existence of a growth mindset among students, registered midwives or midwifery managers. When this theory is applied to midwifery, it is possible that not only the mindset of the midwives, but their managers as well, influence how midwives perceive and deal with challenging births. Midwifery students learn essential skills by observing and emulating the practice of their supervising midwives who role model practice (Bluff & Holloway 2008). They learn from their mentors how to deal with difficult births (Coldridge & Davies 2017). Similarly, students may learn from their mentors and senior colleagues how to develop a growth mindset when exposed to traumatic events. Exploring the impact of mentors’ mindsets on students warrants further studies.

Having said that, encouraging midwives to see the growth and positivity in challenging births does not counteract acknowledging their feelings of fear, anxiety, sadness and guilt. A growth mindset is about believing that difficult births can boost professional confidence and expertise

but does not indicate persuading* midwives or obstetricians to see every traumatic birth as a positive experience.

In contrast to the growth mindset, catastrophising (the snowball model) was the other major response to SD. “From passion to caution” was one of the identified themes that suggested a gradual shift from joy and excitement about birth, towards defensiveness. The “passion” that midwives talked about is critical to help them survive the “rough days” in their career (Bloxsome et al. 2019), and which may be compromised by exposures to adverse incidents at birth. Midwives expressed that SD made them reflect on their attitude towards normal birth. Fear from previous incidents caused some midwives to overthink SD risk, to pre-empt it happening, and to identify low-risk births as high-risk. In some cases, preoccupation with the possibility of the repetition of SD shifted midwives towards over-diagnosis of SD and the use of more ‘just-in-case’ prophylactic interventions such as McRoberts manoeuvre. In such cases, the documented SD could have been due to the midwife’s anxiety that influenced the decision rather than because of an actual delay in the birth of the shoulders.

As discussed in chapter four, the main body of literature about catastrophising is about the development and exaggeration of medical conditions such as depression and physical pain (Miller, Meints & Hirsh 2018; Moore et al. 2018). Evidence is limited about a catastrophising mentality amongst healthcare professionals. Further research is needed to address how common catastrophic thinking is among midwives, and what interventions may assist and support midwives to overcome it. The current study identified some contributors to professional growth which improved the traumatic experience and counteracted the process of catastrophising. These factors were explained in chapters four and five, and are summarised in Diagram 1. In the following sections, I briefly discuss three of these factors that were more frequently mentioned throughout the interviews, and then I focus on the role of workplace support as one of the topics most emphasised by midwives.

* I appreciate an anonymous reviewer for one of our papers that was published in *Midwifery* who commented that “One cannot force someone to “have a positive outlook” and often growth mindsets take time”.

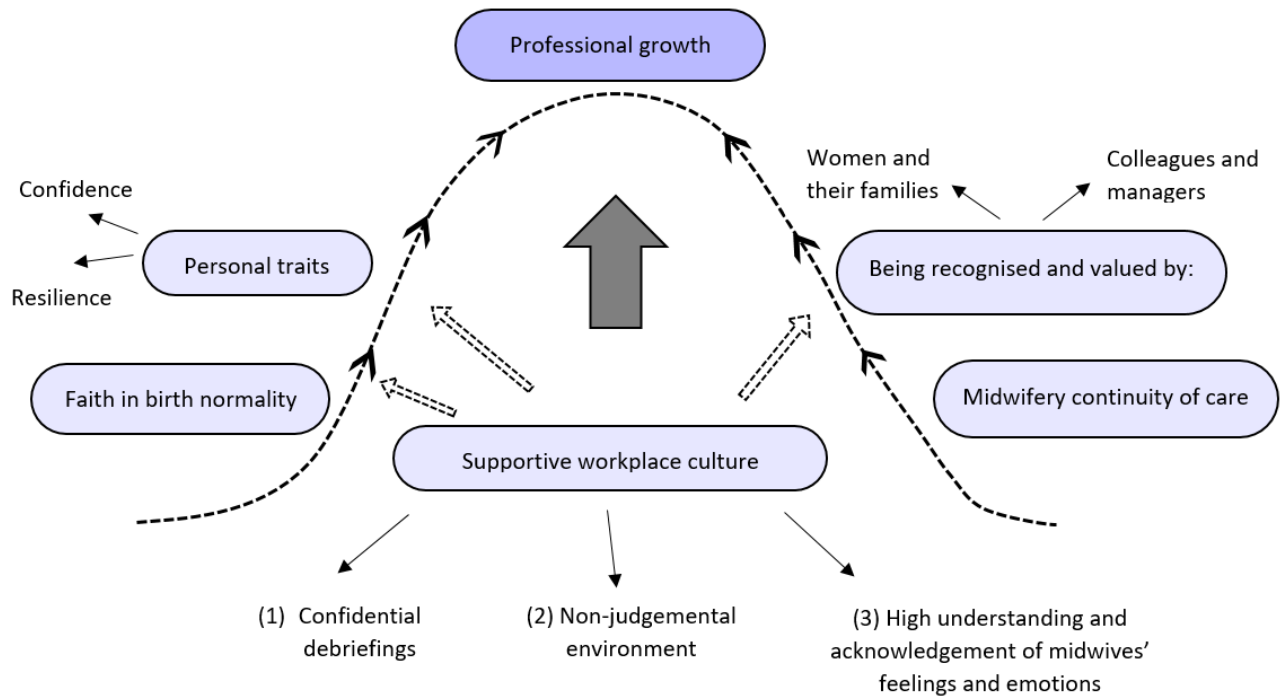


Diagram 1. Contributors to professional growth after traumatic birth experiences (specifically after shoulder dystocia, in this study)

7.4 Contributors to professional growth

7.4.1 Midwifery continuity of care model

Midwives who were working in midwifery continuity of care models, often called caseload, made positive references towards having the opportunity to debrief with the woman and her family after SD. They described having this opportunity as a privilege that helped them to better deal with the outcomes of the birth trauma. Studies have supported the positive effects of midwifery continuity of care on both women and midwives. Midwifery continuity of care reduces the rate of obstetric interventions for women and increases their level of satisfaction with the care they receive (Sandall et al. 2016). Caseload midwives report high levels of satisfaction from working in midwifery continuity of care models and lower rates of burnout (Dawson et al. 2018; Fenwick, Lubomski, et al. 2018; Newton et al. 2014). Similar findings have been reported for new graduate midwives (Cummins, Denney-Wilson & Homer 2015). While the rate of burnout and job dissatisfaction is high, in particular among early career midwives (Cull et al. 2020), working in midwifery continuity of care models has potential to improve confidence and professional development (Evans et al. 2020), reduce anxiety and depression in midwives (Fenwick, Sidebotham, et al. 2018), and enable a positive attitude towards their work (Dawson et al. 2018). However, for some midwives, having an existing

relationship with the mother may make the traumatic experience more difficult to handle (Sheen, Spiby & Slade 2016). Therefore, being a caseload midwife has its own challenges which highlight the need for post-trauma support for all midwives irrespective of the model of care in which they work.

7.4.2 Sense of being valued and appreciated

Midwives felt reassured when women or their managers expressed gratitude to them. Conversely, when their commitment was undervalued by the mother or colleagues, they felt dissatisfied with their performance. Midwives value appreciation from their senior colleagues especially after having a difficult shift or an emergency (Cull et al. 2020). Feelings of being undervalued and lack of recognition for their role and responsibilities are a source of distress and dissatisfaction for midwives, and a reason for considering leaving the profession (Harvie, Sidebotham & Fenwick 2019).

In a scoping review, Aparacio et al (2019) discussed that expression of gratitude by patients and their families generates positive personal and professional feelings for healthcare workers: feelings such as pride, satisfaction, sense of wellbeing and motivation to continue caring for others (Aparicio et al. 2019). Gratitude from those cared for by oncology nurses has been associated with reduced levels of burnout, (Converso et al. 2015). Starkey et al. (2019) investigated the role of gratitude on physical health outcomes of acute care nurses (Starkey et al. 2019). Gratitude could be received from the patient, patient's family, charge nurse, physician, or a co-worker. They found that gratitude was associated with nurses' satisfaction with the care they provided, improved sleep quality and sleep adequacy, reduced headaches and healthy eating attempts (Aparicio et al. 2019). Similar evidence is limited among midwives. It needs further exploration to determine whether gratitude helps midwives to regain their professional confidence, emotional wellbeing and motivation to continue caring for women after experiencing traumatic births.

7.4.3 Confidence and resilience

Midwives also spoke about confidence and resilience as contributors to recovery and growth after SD, regardless of the birth outcome. Feeling confident and competent contributes to midwives feeling safe and secure in their job (Bäck et al. 2017). Building professional

confidence and competence is a process which develops over years, meaning that having more hands-on experience contributes to feeling more confident (Bäck et al. 2017). Younger and less experienced midwives are more vulnerable to work-related stress (Suleiman-Martos et al. 2020), which could be due to their lower level of professional confidence. Similarly, resilience is a process that is developed following exposure to adversity (Lutha & Cicchetti 2000). The midwives in this study described confidence and resilience as factors for professional growth. Recovery after trauma needs confidence and resilience. However, the exposure to SD itself, as a birth adversity, may benefit midwives through improving and building their confidence and resilience. Although midwives described confidence and resilience as factors for professional growth, they also spoke about the experience as an event which boosted their midwifery skills.

Challenging situations may trigger resilience in midwives. Evidence is strong on the benefits of enhancing resilience and educating coping strategies in healthcare professionals to improve their well-being and facilitate professional growth (Grant and Kinman 2015). Resilience can be learned or developed, and there is an increasing amount of literature to support the role of educators in improving resilient behaviours in midwifery students (Clohessy et al. 2019). Resilience, together with reflective thinking, are recognised strategies to enable students to move forward after exposure to adversity (Clohessy et al. 2019). Resilience and hardiness may even be associated with slightly improved academic performance among midwifery students (McGowan et al. 2016). One of the main attributes of resilience in midwifery which helps developing and sustaining resilience is social support (Clohessy et al. 2019), either through the social environment within (e.g. colleagues) or beyond (e.g. family and friends) the workplace (Hunter and Warren 2014). Midwives, in this study, emphasized the role of their social and collegial network in recovering after trauma. The emerging concept of sustainability in midwifery can well be related to this context. While, undoubtedly, fostering personal resilience is of great benefit to midwives and women, working environments also need to be sustainable to support resilience in midwives. Crowther et al. (2016, p.40) explored the concepts of sustainability and resilience, and whether they are useful concepts in midwifery workforce development. They compared the UK resilience study (Hunter and Warren 2014) with the New Zealand sustainability study (McAra-Couper et al., 2014), and identified four common themes including “self-determination, ability to self-care, cultivation of relationships both professionally and with women/families, and a passion, joy and love for midwifery”. Crowther et al. (2016, p.47) described midwifery as “a living system requiring a whole systems approach.

A focus on the wholeness or ecology of maternity services and how midwifery is politically organised affects the experience of the midwifery workforce”. Midwives who are equipped with coping strategies are indeed an important asset of a sustainable system. However, broader practices and policies and leader-led changes may be required to develop a resilient and sustainable midwifery workforce, rather than expecting individual midwives to “*Toughen up*” (Crowther et al. 2016, p. 40).

Besides the factors described, to cope with adversity and to thrive afterwards, it is crucial to have a supportive network (McDonald et al. 2016). The next section presents the views of midwives about their relationships with their colleagues and seniors and the role of collegial support in facilitating professional growth post-trauma.

7.5 Supportive Workplace and Collegial Support

One of the concepts most frequently mentioned by participants in this study was the value of collegial support for both preventing negative thoughts and facilitating the growth pathway. Provision of meaningful and sustained peer support is crucial for midwives who work in labour wards (Schrøder et al. 2019). Similar to the findings of this study, a US survey found that peer support was the most desired form of support among nurses in obstetrics and gynaecology (Finney et al. 2021). A supportive workplace is a broad concept, and its importance is well-established. Thumm and Flynn (2018) reviewed the literature and reported five main attributes of a supportive midwifery climate; these included “effective leadership; adequate resources; collaboration control of one’s work, and support of the midwifery model of care” (Thumm & Flynn 2018, p.91). Many support programs have been developed to minimise the suffering of clinicians or at least help them not to suffer in silence (Busch et al. 2021; Edrees et al. 2016; Finney et al. 2021). Programs may differ in terms of the support provider (e.g. internal peers or external professionals), time (immediately or shortly after the event), focus and goal of support and type of support (one-on-one or group support) (Busch et al. 2021). However, they have common goals which are to reduce the emotional distress of healthcare providers, to foster their coping strategies and to promote their resilience (Busch et al. 2021).

Literature shows that supportive workplaces not only contribute to higher engagement at work and job satisfaction in midwives but also improve the quality of care and women's satisfaction while reducing the occurrence of adverse incidents (Thumm & Flynn 2018). In the quantitative phase of this study, I found increasing trends of shoulder dystocia which led to higher rates of adverse maternal outcomes such as postpartum haemorrhage and neonatal admission to intensive care. These events have long lasting effects on midwives (Elmir et al. 2017). However, as I found, a supportive work environment has the effect of reducing the negative feelings associated with these birth outcomes. Similarly, the ongoing WHELM (Work, Health and Emotional Lives of Midwives) study, described in the introduction chapter, also reported comparable results regarding the role of collegial support in alleviating midwives' stress (Cull et al. 2020). In their recent survey among UK midwives, researchers investigated the satisfaction and dissatisfaction factors at work for early career midwives. Midwives described having strong relationships with colleagues as a protective factor against work-related stress (Cull et al. 2020).

The findings in the current study demonstrate some midwives were anxious about criticism from their colleagues about their clinical competence. Especially those midwives who were involved in a SD that resulted in maternal complications, expressed that they were worried about the judgement of colleagues and or the reaction from the woman's family regarding their competence in handling the SD births. To prevent future complicated births, midwives may perform interventions or manoeuvres prophylactically, as revealed by some midwives in this study. In the second phase of the study, I found a higher rate of using the McRoberts manoeuvre in recent years. A potential explanation for an increase in interventions may be the pressure of criticisms that midwives receive after a traumatic birth. It is therefore critical to maintain a trusting and blame-free culture for midwives, especially after traumatic events, as the culture of mistrust may affect how midwives perform in subsequent birth(s).

Being scrutinised by colleagues can disrupt effective communication, and is a reason for job dissatisfaction (Harvie, Sidebotham & Fenwick 2019), whereas being in a respectful and friendly work environment increases the ability of midwives to remain in the profession (Bloxsome, Bayes & Ireson 2020). The culture of blame not only prevents healthcare providers from reporting adverse events (Hitchen 2007), but reduces their inclination to seek help after

an adverse event (Edrees & Wu 2021). Previous reports have shown that nurses (and probably also midwives) seek help and advice from experts whom they perceive as experienced, accessible and trustworthy (Hofmann, Lei & Grant 2009). Catling and Rossiter (2020) investigated the perception of Australian midwives about the culture of their workplace through a national survey (Catling & Rossiter 2020). Less than a third of the total 322 participants rated their workplace culture as positive. In their study, some of the main aspects of the negative workplace culture included poor communication, being bullied by managers and colleagues, and feeling unrecognised.

Employees are encouraged to express their positive feelings at work, but those who express their distress are more likely to be viewed as less competent professionals compared to those who do not (Wolf et al. 2016). In this study, some midwives reported that despite a high understanding by managers for post-trauma support, there were situations where midwives' request for a debriefing session was declined by the manager. Debriefing, especially for early career midwives, has been described as a way to eliminate "the build-up of deleterious effects of the midwifery role" (Sheehy et al. 2021). The lack of an immediate supervisor's support for talking about challenging situations may lead midwives to become reluctant to share their future experiences. This may then result in a negative cycle of trauma and silence. When midwives perceive low levels of managerial support, their likelihood of suffering from anxiety, stress, depression and burnout increases (Hunter et al. 2017). A recent study by Wahlberg et al (2020) revealed that Swedish midwives and obstetricians feel lonely and insecure regarding their managers and colleagues, after experiencing an adverse event during childbirth (Wahlberg, Högberg & Emmelin 2020). Having a manager or a senior colleague who acknowledges the experiences of second victims and encourages them to discuss their vulnerabilities can foster a culture of support.

Different aspects of a supportive workplace described by midwives in this study, pertain to the role of clinical supervision as a professional support mechanism for the midwifery workforce. In a joint position statement, the Australian College of Nursing, the Australian College of Mental Health Nurses and the Australian College of Midwives defined clinical supervision as a formal meeting between a supervisor and a supervisee that provides critical reflection on work issues raised by the supervisee (Australian College of Mental Health Nurses, Australian College of Midwives, and Australian College of Nursing 2019). Clinical supervision is a

structured professional arrangement that is recommended for all nurses and midwives, and is not only associated with improved care (Snowden et al. 2017) and patient safety (Snowden et al. 2016), but with lower burnout and greater staff retention (Martin et al. 2021). It positively affects midwives' work, interpersonal skills, situational responses and career goals as well as increasing sustainability in midwifery workforce (Love et al. 2017). The concerns, and in some parts the demands, that midwives spoke about in this thesis are in accordance with the core elements of clinical supervision as stated in the position statement, some of which include: opportunity to talk about challenges, being attentively heard and understood, having effective, confidential communication and developing knowledge and confidence.

A lack of shared understanding about the purpose and meaning of clinical supervision is a barrier to an effective engagement of supervisees in clinical supervision (Love et al. 2017; Rothwell et al. 2021). Midwives may be familiar with the concept of "reflection on practice" (Love 2017 et al. p. 278), but may not have a clear understanding of the meaning of clinical supervision. In this thesis, midwives spoke about the importance of getting their confidence back and feeling a sense of value after traumatic birth experiences. Love et al. (2017) reported that a benefit of clinical supervision is its potentiality in increasing confidence and sense of value in midwives. Exposure to stressful birth experiences can reduce job satisfaction and contribute to workforce attrition (Rouleau et al. 2012). Clinical supervision, besides the benefits described above, is known as a motivating factor that increases workforce retention (Love et al. 2017).

When maternity ward managers proactively plan for the management of critical incidents, then they will be able to provide midwives with the support and learning they need (Christoffersen, Teigen & Rønningstad 2020). Since, speaking up about experiencing traumatic births and seeking emotional support still may appear unprofessional in many workplaces, it is important that managers offer support proactively, rather than reactively (Christoffersen, Teigen & Rønningstad 2020). Not feeling supported by the workplace is a risk factor which increases fear and uncertainty in midwives (Bäck et al. 2017). Midwifery managers have the power to either build staff confidence or contribute to them losing their confidence, in particular in early career midwives (Sheehy et al. 2021). When midwives are engaged at work and feel supported, their likelihood of providing quality care increases (Freney & Fellenz 2013).

As discussed in the section on catastrophic thinking, the experience of SD has the potential to influence midwives' diagnoses and interventions in the next birth(s). This may affect the incidence of SD. The next section discusses the findings from phase two of the study which examined the trend, risk factors and outcomes of SD in a women's specialist hospital. Findings of this phase were presented in chapter six.

7.6 Incidence and trend of Shoulder Dystocia

Phase one of this study found that SD has lasting effects on the emotions and clinical practice of midwives, and that this can lead to future over-diagnosis. Fear and anxiety developed from previous traumatic birth experiences could increase the susceptibility of midwives to hyper-vigilant practice, which in turn could result in more interventions such as McRoberts manoeuvre. When a manoeuvre is documented, the birth is reported as SD, although it may only have been implemented as a response to an over-diagnosis. Results from the qualitative phase prompted me to conduct a study which could provide epidemiological information on SD. For the second phase, I conducted a retrospective cohort study to examine the incidence using the medical records of women and babies at one tertiary hospital in Sydney. The selected hospital is one of Australia's main specialist hospitals for women and babies with an annual rate of 4,200 births. Importantly this hospital is the only women's hospital in New South Wales (NSW). The high annual birth rate provided sufficient and generalisable data for this thesis.

Results of the second phase of the study showed a significant increase in the diagnosis of SD over 2013-2018 (p-value <0.0001). The overall incidence of 5% in 2013 increased to 7% in 2018. Global data report a wide incidence range of 0.2%- 3% (Grobman 2013). There is limited national or state data on the incidence of SD. Findings from a similar Australian study, conducted in a tertiary obstetric hospital in Queensland, reported an incidence of 5.3% over 2007-2015 (Michelotti, Flatley & Kumar 2018). Due to the subjectivity of the diagnosis, the incidence is affected by different factors such as the diagnostic criteria, the population studied and the consistency of reporting and documentation (Gherman et al. 2006).

The rise observed in the overall trend of SD in this study is consistent with findings from studies conducted in the UK, USA, Finland and Norway (Dandolu et al. 2005; Heinonen et al. 2021; MacKenzie et al. 2007; Øverland, Vatten & Eskild 2014). MacKenzie et al. (2007) reported that in an observational study of a single maternity unit in the UK, the use of the McRoberts'

manoeuvre increased dramatically from 3% (for five out of 163 SD births) during 1991-1995 to 91% (for 193 out of 211 SD births) during 2001-2005. However, their small sample size of SD births may limit the generalisability of their findings to any other settings. In a US cohort, Dandolu et al (2005) reported an incidence rate of 1.29% with a tenfold increase from 0.2% in 1979 to 2.11% in 2003. Another retrospective US study reported an incidence rate of 1.8% between the years 1976 and 2001, with a higher rate of 2.6% among African American women (Cheng, Norwitz & Caughey 2006). In addition, a comparable US study showed a higher incidence rate of 3.3% in a cohort of 637 births in 1997 (Bofill et al. 1997). In Finland, a recent study by Heinonen et al. (2021) reported an increasing trend from 0.1% to 0.3% during 2004-2017. In a Norwegian cohort, Øverland, Vatten & Eskild (2014) reported a rate of 0.7%, with a rising trend from 0.2% in 1967-76 to 1.1% in 1997-2009. Comparable incidence rates have been reported in some other European countries such as Sweden (0.1%) (Christoffersson & Rydhstroem 2002) and Denmark (0.7%) (Hedegaard et al. 2015). With the exception of the UK study (MacKenzie et al. 2007), all other European studies reported a much lower rate of SD than the current study.

The literature confirmed a wide variation in the incidence rates across studies. Further, the findings of this study and the majority of reports from the international literature (Heinonen et al. 2021; Øverland, Vatten & Eskild 2014) report increasing rates over time. Only a few studies have reported a steady rate or a decrease in the incidence of SD over years (Cheng, Norwitz & Caughey 2006; Grossman et al. 2020). For example, a retrospective US study did not find any increase or decrease in the rate of SD over 1976-2001 (Cheng, Norwitz & Caughey 2006). Also, a nested-case control study conducted in Israel, observed a decreasing trend from 0.3% to 0.1% between 1988 and 2014 (Grossman et al. 2020).

Differences between the findings of this study and other reports may be explained, firstly by differences in the criteria that are used to define SD. Defining SD based on the type of manoeuvres that are used makes a huge difference in the reported rates. Second, the setting in which the study is conducted is important. In this study, the setting was a tertiary referral hospital. Tertiary hospitals provide specialised consultative care and have specialized staff and technical equipment. Referral hospitals “provide complex clinical care to patients referred from lower levels” (Hensher, Price & Adomakoh 2006, p.1231). Women at high risk of SD, due to

GDM and/or fetal macrosomia, may be referred to tertiary referral hospitals, which may increase the rate of calculated incidence compared with primary/secondary non-referral hospitals.

In addition, differences in the incidence rates across studies may be explained by racial and ethnic differences (Cheng, Norwitz & Caughey 2006; Hefele et al. 2018). Maternal anthropometric parameters such as height have also been reported as risk factors for SD (Gupta et al. 2010; Mazouni et al. 2006), which are different among different populations. For example, SD is reported to be higher among Hispanic women compared to Caucasian women (Berggren et al. 2012). Hefele et al (2018) reported that even the risk factors associated with SD occurrence may differ among different racial/ethnic groups. They found that post-term birth and use of epidural anaesthesia were the main risk factors for occurrence of SD in white non-Hispanic women; whereas, for black non-Hispanic women, having GDM and use of epidural anaesthesia were the main risk factors.

As described, the overall incidence of SD in the current study was 5% over the years 2013-2018. The data were analysed based on the degree of SD (mild, moderate and severe), and the analysis found that the rate of mild SD significantly increased from 4% to 6% during this time period (p-value <0.0001). Mild SD is defined as the use of first line manoeuvres including McRoberts and/or suprapubic pressure (Royal College of Obstetricians and Gynaecologists (RCOG) 2012). An increase in rates of mild SD suggests that the number of births which received McRoberts manoeuvre and/or suprapubic pressure has risen. Moderate SD occurs when internal manoeuvres are used such as Rubin, Wood's screw, and/or posterior shoulder removal. These are known as the second-line manoeuvres (American College of Obstetricians and Gynaecologists 2017; RCOG 2012). The overall rate for moderate SD was lower than mild SD and remained stable (1%) during this time period. Severe SD is defined when so-called 'heroic' manoeuvres are required to birth the baby such as clavicular fracture, symphysiotomy and Zavanelli manoeuvre (RCOG 2012). The rate of severe SD in the current study could not be calculated, due to the low rate of cases.

The incidence rate of 5% estimated in this study lies above the upper range reported in international studies. This rate includes mild, moderate and severe SDs. Increase in mild SD

can be due to both the actual need to do McRoberts/ suprapubic pressure, as well as the prophylactic use of these manoeuvres. Therefore, the more accurate way of interpreting the incidence of mild SD is to say that there was an increase in the use of McRoberts and/or suprapubic pressure, since some manoeuvres might have been performed prophylactically. The rate of moderate SD (1%) was closer to the global reports. Moderate SD may serve as a more accurate indicator of incidence, since it shows the number of births that required internal manoeuvres when a true SD occurs.

As shown in phase one, traumatic births may leave midwives with long-lasting feelings of fear and anxiety. The fear could increase their susceptibility to hyper-vigilant practice (as shown in chapter four, the snowball effect model). Shoulder dystocia is a multifactorial maternity emergency. The increasing use of manoeuvres for mild SD may not be necessarily attributed to midwives' fear of SD. However, traumatic experiences can potentially lead midwives to use prophylactic interventions and perhaps an overuse of manoeuvres such as McRoberts which disturb the natural process of birth.

Determining whether previous traumatic birth experiences from SD instigate the overuse of manoeuvres was beyond the scope of this study. In phase one of this study, participants included 25 midwives from across Australia who had experienced SD in different settings and in different time periods. In phase two, the results represent the performance of different cohort of midwives in a single hospital in NSW during 2013-2018. To address whether the experience of a traumatic SD (phase one) affects the diagnosis of midwives and the increase incidence of manoeuvres (phase two), would require a longitudinal study in a single hospital that follows the same cohort of midwives. Such a study would determine if, over time, there is a significant change in the practice of those midwives who experienced a SD-complicated birth as traumatic.

7.7 Risk factors and outcomes of SD

Changing trends of SD are dependent on the underlying risk factors as well as the diagnosis and documentation of incidents by the accoucheurs (Menticoglou 2018). The factors which increased the risk of SD in this cohort included post-term pregnancy (OR: 1.36, 95% CI: 1.29-1.44), maternal pre-existing diabetes and/ or GDM (OR: 1.57, 95% CI: 1.05-1.27), induction

and/or augmentation of labour (OR: 1.63, 95% CI: 1.40-1.90) and longer duration of the second stage of labour (more than two hours) (OR: 2.80, 95% CI: 2.40-3.27). These risk factors are in accordance with the findings of previous studies (Hill & Cohen 2016; Kim, Vogel & Das 2017; Santos et al. 2018).

One explanation for an increase in the trend for SD in this study could be the rising trend of GDM from 7.52% to 10.7% during 2013-2018. Prevalence of GDM has wide variation across studies depending on the diagnostic criteria used (Behboudi-Gandevani et al. 2019). The prevalence and trend of GDM in this study are comparable to the results of the studies conducted in the US (6.29%) (Jovanovič et al. 2015) and Eastern and South-eastern Asian countries (10.1%) (Nguyen et al. 2018), but higher than the rates reported in European countries (2-5%) (Eades, Cameron & Evans 2017; Ovesen et al. 2018). The latest reports from the Australian Institute of Health and Welfare (AIHW) indicate that in 2017 nearly half of all mothers were overweight or obese (AIHW 2018). The AIHW also reports a tripled rate of GDM from 5% in 2000-1 to 15% in 2016-17, with a steep increase from 2012-2013 onwards (AIHW 2019). Mean birthweight of babies with SD was significantly higher than babies without SD ($3,754.10 \pm 460.73$ vs. $3,319.78 \pm 531.37$, p -value <0.0001). In addition, the risk of SD increased in women with post-term pregnancies compared to term pregnancies. These three risk factors (GDM, birthweight and post-term pregnancy) are proven risk factors and have been confirmed in previous studies (Grossman et al. 2020; Heinonen et al. 2021).

This study also revealed that postpartum haemorrhage was significantly higher in births with SD. The difference was significant in all three categories (i.e., blood loss $\geq 500 < 1000$, $\geq 1000 \leq 1500$, and > 1500 ml). Overall, 36.2% of women with SD complicated births, and 16.8% of women without SD had blood loss of greater than 500 ml. Most cases of SD were resolved through using a combination of manoeuvres. Previous studies have shown that using internal rotational manoeuvres and delivery of the posterior arm increase the likelihood of neonatal injury such as brachial plexus injuries and fractures (Michelotti, Flatley & Kumar 2018) as well as postpartum haemorrhage (Gherman et al. 1997). The number of manoeuvres also correlate with the risk of neonatal injury, in particular after using the fourth manoeuvre (Hoffman et al. 2011). However, it was not possible to, for example, assess the association between a specific type of internal manoeuvre and a maternal or neonatal outcome. Further, because only two

cases of severe SD were reported, data were not sufficient to analyse the association between the number and types of manoeuvres and severe neonatal injuries or maternal complications.

In this cohort, analgesia (including epidural), was used for 13,360 (83.2%) of the 16,050 births during the first stage of labour. An increasing trend of analgesia was observed during 2013-2018 time period. However, analgesia was not associated with an increase in SD. Similarly, the AIHW report (2018) also showed an increasing trend of analgesia in Australia, and in particular in New South Wales the most populated state of Australia. Over the past decade, approximately 4 in 5 women (80%) in Australia received pain relief during labour (AIHW 2018). The effect of epidural analgesia on increasing the risk of SD is not clear; while some studies confirm this effect (Øverland, Vatten & Eskild 2014; Santos et al. 2018), others have not found any association between epidural analgesia and SD (Parantainen et al. 2014; Revicky et al. 2012). Based on the literature, it is unclear whether analgesia is an independent or a confounding risk factor for SD

In this study, a logistic regression model showed that induction/ augmentation of labour (OR: 1.63, 95% CI: 1.40-1.90) and duration of second stage of labour (longer than two hours) (OR: 2.80, 95% CI: 2.40-3.27) significantly increased the risk of SD. The majority of previous studies have reported comparable results regarding the higher rate of induction of labour and longer duration of the second stage of labour in SD-complicated births (Baskett & Allen 1995; McFarland et al. 1995; Mehta et al. 2004). Similarly, Mehta et al (2004) found that 22% of women with SD had a second stage of labour greater than two hours, compared with 3% of women without SD (p-value < .05) (Mehta et al. 2004). Lurie et al. (1995) reported that prolonged second stage of labour was not significantly different between SD and non-SD births, and as such it may not be a risk factor for SD. Inconsistency across studies may be due to the presence of confounders (i.e., other SD risk factors) which have not been analysed in logistic models. Based on the available literature, it is not clear whether induction of labour and longer duration of the second stage of labour are independent risk factors for SD (Dandolu et al. 2005; Hedegaard et al. 2015; Revicky et al. 2012).

This study also found that the mean birthweight for babies in SD group was significantly higher than babies in non-SD group ($3,754.09 \pm 459.9$ versus $3,320.54 \pm 531.63$, p-value <0.0001).

However, in the regression model, birthweight was not found as an independent risk factor for SD. Babies born in the SD group, had approximately 300 grams higher birth weight compared to the non-SD group. Despite significant difference in birthweight, maternal BMI was not significantly different between the two groups, with both groups having a BMI within the normal range (23.42 ± 4.17 vs. 22.82 ± 4.03 , p -value= 0.6). However, GDM, which is a known risk factor for SD, was higher in SD births. In other words, the rate of SD was higher when women had GDM, but not necessarily a high BMI. Literature refers to this phenomenon as diabetes in lean individuals (people with normal BMI). The phenomenon can be explained through the mechanisms of insulin resistance and impaired pancreas beta-cell function (George et al. 2015; Inoue et al. 2020). Clinically, it is an important point, as many pregnant women with GDM, despite having normal BMI, may be at risk of SD.

The current study found that there was a significant association between SD and postpartum haemorrhage (p -value <0.0001), APGAR score < 7 at the 1st and 5th minute (p -value <0.0001), high rate of neonatal resuscitation and admission to NICU (p -value <0.0001). Postpartum haemorrhage following a SD-complicated birth may occur as a result of uterine atony due to fetal macrosomia (Wormer, Jamil & Bryant 2021), and/or as a result of perineal/ vaginal/ cervical tears and/or uterine rupture (Dajani & Magann 2014). Also, the rate of maternal perineal/ anorectal tears (both third- and fourth-degree tears) was higher in the SD group compared with the non-SD group; however, the difference was not significant (p -value: 0.07) (chapter six, Table 5).

Similar to the findings of this study, Michelotti et al (2017) reported that neonates born after SD-complicated births are more likely to have a very low Apgar score (≤ 3) at five minutes (OR 5.25, 95% CI 3.23- 8.56, $P < 0.001$) and significant acidosis (OR 3.10, 95% CI 2.76- 3.50, $P < 0.001$), compared to neonates born without the complication of SD. They also reported a higher rate of NICU admission among SD-born neonates (OR 3.17, 95% CI 2.80–3.58) (Michelotti, Flatley & Kumar 2018). It is important to note that different degrees of SD (mild/moderate/severe) are associated with different outcomes. As many previous studies did not differentiate the outcomes based on the degree of SD, there may be differences in the reported outcomes across the studies. In moderate and severe SD, different types and higher number of manoeuvres are needed to release the shoulders. When the number and type of

manoeuvres increases, the rate of serious maternal/neonatal outcomes also increases (Gherman et al. 1997; McFarland et al. 1996; Michelotti, Flatley & Kumar 2018).

The ripple effects of SD outcomes may go beyond the birth. Maternal postpartum haemorrhage significantly increases the length of hospital stay and inpatient mortality rates (Marshall et al. 2017). Neonatal admission to NICU increases the rate of nosocomial infections and the length of neonatal hospital stay (Jeong, Jeong & Choi 2006). Both maternal and neonatal hospitalisation may be a trigger for the cascade of other adverse outcomes. Mothers who are separated from their newborns during their first week of life due to NICU hospitalisation, have reported feelings of despair, powerlessness, lack of control and guilt (Nyström & Axelsson 2002). Separation of the mother and baby may have negative effects on their emotional ties and dyadic mutuality and reciprocity even at one year after birth (Bystrova et al. 2009). Postpartum depression and high anxiety levels are prevalent among mothers whose newborns are admitted to NICU (Mizrak, Deniz & Acikgoz 2015; Vasa et al. 2014).

Postpartum depression is associated with problems in bonding, exclusive breastfeeding and child cognitive development (Bernard-Bonnin et al. 2004; Sha et al. 2019). Even fathers of the hospitalised newborns are at risk of developing postpartum stress disorders (Lefkowitz, Baxt & Evans 2010). Stress, anxiety and parent-infant separation affect parenting behaviours and transition to parenthood (Lean et al. 2018). There is evidence that maternal depression post-NICU admission may even affect mother-child interactions at age five (Gerstein et al. 2019). Women who experience SD, regardless of the hospitalisation depression, need postpartum emotional support (Beck 2013). The support may need to be intensified if women or their newborns are hospitalised. To provide support, postpartum screenings are required after traumatic births to detect women who suffer from depression or are at risk of developing postnatal depression or other mental health disorders. Currently, there are family-based interventions available for parents of hospitalised newborns which aim to address psychosocial needs of parents and facilitate their transition to parenthood (Lean et al. 2018; Waddington et al. 2021). Tailoring family-centred interventions based on the birth experience of the mother (in this case, SD) improves the outcomes for the parents and the baby.

Postgraduate education for health professionals may play an important role in preventing or minimising adverse SD outcomes. An example is the PROMPT (PRactical Obstetric Multi-

Professional Training) course, a training package specifically for maternity emergencies, that has been implemented in countries such as UK, Australia and USA (Practical Obstetric Multi-Professional Training (PROMPT) 2021). Kumar et al. (2018) investigated the clinical outcomes of PROMPT among Australian medical and midwifery staff and found that after the implementation of the course, lower incidences of brachial plexus injury, clavicle fractures, low Apgar scores and nursery admissions were reported. A similar study in Australia reported significant improvements in neonatal and perinatal outcomes after the implementation of PROMPT (Shoushtarian et al. 2014).

Continuous education and simulation-based training improve clinical skills of midwives in managing outcomes of SD (Crofts et al. 2006, 2007; Deering, Weeks & Benedetti 2011), and have the potential to prevent subsequent psychological problems for midwives and families involved. Shoulder dystocia is not a common obstetric emergency. Midwives and midwifery students may not frequently experience real cases of SD during their training or practice. Simulation-based education plays an important role in teaching essential skills to students. Dahlberg et al. (2018) assessed a 10- year simulation-based SD training program on clinical outcomes, staff confidence and management of SD in a university hospital in Sweden. The training program, called Practical obstetric team-training (PROBE), included a team session of simulation scenarios and practical skills training station. Data were collected through a maternity registration system, video-recordings and debriefing sessions with the staff. The study showed promising neonatal outcomes; the rate of brachial plexus injuries due to SD reduced significantly from 73% in pre-PROBE to 17% in post PROBE groups. After introducing the training program, staff reported higher confidence in handling SD. Benefits of such training is reflected through both the staff feeling safer and more confident and the reduced numbers of adverse neonatal outcomes. No difference was observed in maternal complications before and after the training. Simulation-based training provides an opportunity for repeated practice which is not possible in real emergencies. Continuous staff training in the format of simulation-based training has other benefits as well. A retrospective study by Van den Ven et al. (2016) showed that simulation team training facilitated implementation of some effective manoeuvres that staff had never used before, such as the all-fours technique. The training also contributed to proper documentation of the manoeuvres used. Apart from its clinical benefits, simulation training has been associated with higher student satisfaction rate

compared to image-based lectures when teaching management of normal delivery and shoulder dystocia (Reynolds et al. 2010).

7.8 Strengths and Limitations

Strengths and limitations of the first phase of the study have been explained in detail in the discussion sections of chapters four and five. To avoid repetition, some further strengths and limitations regarding the whole study are presented in the following section.

7.8.1 Strengths

This is the first study exploring the experiences of midwives specifically of shoulder dystocia (SD) complicated births and its impact on the way they practise after the event. Midwives participated from different settings and states in Australia to maximise coverage of a range of experiences. Phase two of the study addressed a need to determine the rates of SD-complicated births, using a large sample size to ensure enough power for the calculation of the incidence rate.

7.8.2 Limitations

Midwives who experienced traumatic SD were invited to participate in this study, regardless when they experienced the event. The interval time ranged from some weeks to several years (with the majority who experienced SD more than three years earlier). It is possible that there may have been more severe outcomes, had I recruited midwives with shorter interval time between the traumatic birth exposure and the interview time. Also, different themes could have been identified, if more newly graduated midwives were interviewed. However, it is important to note that the recovery after a birth trauma is subjective, individualised and occurs over time. Even if we aim to, for example, explore the impact of SD after a certain period of time, different midwives may still be in different phases of their recovery process. This is because their personality traits, number of exposures, types of support they receive, and many other underlying factors are different, affecting how they respond to trauma.

Regarding the second phase of the study, due to the limitations of my PhD timeline, I included data only from one hospital and for the duration of 2013-2018. In terms of the included variables, there were some coding inconsistencies between the two databases of ObstetriX and eMaternity. For these variables, separate analysis based on the available data was conducted

(e.g. admission to NICU or SCN, as shown in table 5 in chapter six). Also, data were analysed in a retrospective study. A concern for retrospective data analysis is the accuracy and reliability of data. There is the possibility of error in the process of collection and entry of data. However, as explained in chapter three (data source section), regular data quality checks are part of the surveillance process for NSW electronic Perinatal Data, which ensures the reliability of data, in particular when the data are collected in a tertiary hospital. Regarding the generalisability of the second phase of the study, the results present a snapshot of SD in a tertiary referral hospital. Different incidence rates might have been generated had data been used from a primary or a secondary care hospital, or had data been used at state/ or national level, or if longer time periods had been studied.

7.9 Summary

The main findings from this study in relation to midwives' experiences after SD included professional growth and catastrophic thinking. Midwives' responses to the experience of shoulder dystocia as birth trauma were dynamic. Fear from previous traumatic experience was found to be influential in subsequent diagnoses and interventions of midwives in relation to SD. An outcome of this influence could be the increasing trend of using McRoberts manoeuvre found in phase two of this study. However, this finding needs to be interpreted by considering other SD-related risk factors. Having a supportive workplace was the main factor in midwives' survival and growth after an experience of birth trauma. Other factors for growth and resilience after SD were working within a midwifery continuity of care model, collegial support and managers' recognition of midwives' efforts. Through improving the contributors to professional growth, midwives may be enabled to not just overcome catastrophising, but transition to building/ improving resilience and actualising their potential skills. Acknowledging midwives' traumatic experiences and empowering them to recover after trauma can support midwives' feelings of well-being. Supportive environments help midwives to gain their professional confidence after trauma and help them in developing a growth mindset. Support, especially from managers, prevents catastrophic thinking and overuse of prophylactic manoeuvres at birth. This will ensure accurate documentation and reporting of true cases of SD and help midwives to provide quality care to women. Enabling midwives to maintain their perspective towards normal birth, even after traumatic experiences, will also reduce workforce attrition, and help in having emotionally healthy midwives.

The conclusion of the study is presented in the next chapter, along with my reflections as a researcher. That chapter also details the implications of and recommendations for midwifery practice and future research of this study.

Chapter Eight: Conclusion

This sequential mixed methods study provided insights into midwives' experiences of births complicated by shoulder dystocia (SD), and the increasing trend in the number of women diagnosed with mild shoulder dystocia in one tertiary referral hospital in Australia. The thesis began by reviewing the literature about birth trauma in general, because evidence specific to SD was limited. This lack of evidence led to the scoping review which sought to identify and review any research in relation to midwives' emotions and practice after traumatic birth events. The results of that review, presented in chapter two, showed that past traumatic birth experiences have the potential to affect the future practice of midwives through influencing their professional confidence and risk perception. However, most of the included studies assessed the impact of non-emergency traumatic birth events which are different from emergency births such as SD. Studies focused on birth trauma, emotions and PTSD, and few evaluated the impact on midwives' daily practice. The underlying factors which could determine the response after trauma were not well addressed in general.

To address these gaps, I undertook the first phase of this study to explore the experiences of Australian midwives about SD. Results showed that SD-complicated births affect midwives' mental health and well-being, their clinical practice and the way they think about normal physiological birth after the event. Personal and professional growth or catastrophising birth were the two main pathways that emerged after the traumatic experience. One single birth may not be powerful enough to change the pathway of thinking; however, midwifery is emotional work and throughout their career, midwives are exposed to multiple traumatic events which may have cumulative effects. I asked midwives specifically about their experiences of SD. However, it is likely that their description of SD was an accumulation of different events over many years. Their perception of SD might have unavoidably been shaped or intensified by other traumatic births. Results of phase two of the study highlighted an increasing trend in the rate of SD over recent years. This increase suggests more exposures to SD, and further potential for the development of fear, anxiety and adverse mental outcomes for midwives. Although, catastrophic thinking was not the only reason for the increasing trend of SD, it could affect how midwives diagnose SD.

8.1 Reflections

At the beginning of this study, my aims were to investigate the definition of SD through 1) measuring the head-body delivery interval (HBDI) in low-risk vaginal births, and 2) exploring the perspectives of birth attendants regarding the diagnostic criteria of SD. Through addressing these two aims, I aimed to provide information on both the objective and subjective definitions of SD. A protocol for this study was written (Appendix 1), and a systematic review was conducted. The review indicated the HBDI > 60 seconds as a cut-off for the definition of SD. However, the threshold at which prolonged HBDI progresses to adverse neonatal outcomes was not clear in the literature. Measuring HBDI could provide information on the association between adverse maternal and neonatal outcomes. However, its measurement at birth was associated with ethical and feasibility challenges. Therefore, the topic shifted towards the experiences of midwives. I excluded the first part of the research question, and focused on midwives' experiences and perceptions about SD.

My initial assumption regarding midwives' experiences of SD was shaped, based on my clinical experiences in a completely different setting. Before conducting this study, I felt that the main outcome of SD for midwives would be fear and negative rumination. In this study, I interviewed midwives who were educated in Australia or the UK and were working in Australia. The type of training, resources, working conditions and access to support services in high-income countries are different to that of low- and middle-income countries (LMIC) (Bogren et al. 2020; Filby, McConville & Portela 2016; Muliira & Ssendikadiwa 2016; Nursing and Midwifery Board 2020). These factors may influence mental health, distress and burnout in midwives, and how they make sense of their professional growth.

In conducting this study, I gained insight about developing and maintaining a growth mindset at work. As a midwife who had experienced many SD-complicated births, I was inspired by how positively some midwives in this study viewed their traumatic experience. Similar to many other traumatic events, once SD occurs, things cannot go backwards, time cannot be reversed, and trauma cannot be deleted from the memory of midwives. Therefore, it is important to have emotional awareness to overcome negative feelings. Traumatic birth

emergencies may inevitably occur. Some previous studies have focussed on the interventions that help reduce stress after trauma. Those studies are important. However, equipping midwives with emotional first aid skills in advance; preparing them for emotional work; and educating midwifery students in a growth mindset before they experience traumatic incidents may be other approaches which prevent catastrophising.

8.2 Future Research Directions

Recognising and valuing midwives' work is a contributor to recovery and growth after birth trauma. Midwives who are involved in such births may be invited to share and present their experience with other colleagues. Future research could examine the effects of such sharing on the recovery process, confidence and competence of the second victim midwives. There is evidence that shows midwives not only benefit from collegial support in building resilience, but benefit from providing emotional support to their colleagues (Hunter & Warren 2014), another aspect which would benefit from additional research. In particular, studies of how supporting other second victim midwives can improve the feeling of competence in midwives involved in traumatic births, may benefit the profession as a whole.

Working in midwifery continuity of care models and connecting with women were therapeutic for midwives who experienced SD. Additional research to evaluate and compare the impact of different models of care on response to birth trauma in second victim midwives will add to the evidence regarding the impact of different models of care on midwives' recovery, PTSD symptoms and pathway of thinking following traumatic births.

Research is growing around the role of gratitude on the mental health, physical well-being and job satisfaction of healthcare professionals (Aparicio et al. 2019; Cheng, Tsui & Lam 2015; Starkey et al. 2019; Stegen & Wankier 2018). Currently, there is no study on the role of gratitude in boosting midwives' confidence and feeling of competence after adverse birth events. It is worthy to explore the impact of women/ colleagues/ managers' recognition on midwives' recovery post trauma.

This study found that in the growth pathway, midwives learn, grow and actualise their potential skills. However, the association between growth mindset and risk-averse practice is still unclear. Resilience coaching interventions for healthcare professionals and students improves self-awareness and conflict resolution skills as well as increasing knowledge and confidence about adverse occupational events (Johnson et al. 2020; McDonald et al. 2012). Additional studies might explore the effect of developing a growth mindset and building resilience on reducing risk-aversion in midwives.

There appears to be limited research to inform the benefits of post-trauma workshops on professional growth in improving midwives' mental well-being. Clinical supervisors may play an important role in designing and assessing the efficiency of these workshops. Educating a growth mindset will help midwives to utilise their post-trauma stress to optimise clinical performance. The content of such workshops may include psychology of growth mindset, how growth (or conversely, stress mindset) can transform future experiences, mechanisms to enhance resilience, the words/ language we use to describe a traumatic experience (e.g., leveraging/ or utilising post-trauma stress rather than coping or managing it) and even inspiring experiences of midwives who have managed difficult births.

Finally, the impact of worries and rumination on the physical health of midwives was beyond the scope of this thesis. There is clear evidence of the association between negative emotions and risk of physical health problems (Suls & Bunde 2005). Future research may investigate how physical health problems after traumatic events may lead to midwifery workforce absenteeism/ attrition.

8.3 Implications for Midwives

8.3.1 Continuing education in the risks and management of SD

There is an ongoing need for improving SD management training for midwifery students and staff. As discussed earlier, although SD used to be a rare maternity emergency in the past, it may no longer be an uncommon event in future. Findings of this thesis and many

similar reports worldwide have shown an increasing trend in risk factors of SD, in particular gestational diabetes. Sedentary lifestyle and physical inactivity, as well as nutritional behaviour changes can exponentially exacerbate the risk of developing diabetes in the near future. Increases in these risk factors will inevitably lead to an increase in the incidence of SD. This necessitates continuous training programs for midwives. Simulation-based training is effective in learning the practical skills, such as the manoeuvre(s) to choose, the techniques required to effectively perform the manoeuvres and the time to move to the next manoeuvre.

8.3.2 Continuing self-reflection to increase emotional awareness

A key message for midwives from this thesis is the need for emotional awareness and continuous self-reflection. Accepting ones' emotions is the first step in emotional awareness (Greenberg & Pascual-Leone 2006). In empathy-related professions, repeated exposures to trauma make the workers desensitised to trauma (Rauvola, Vega & Lavigne 2019). Birth trauma may unconsciously affect midwives. Therefore, ongoing reflection on emotions and on clinical outcomes of trauma may minimise interventions in midwives' practice.

Courses such as “emotion management post-trauma” need to be incorporated into midwifery education. Midwifery education provides knowledge and skill development in managing complicated births or maternity emergencies. However, students may not be prepared for dealing with the potential distress after trauma. Midwifery students need to be aware that adverse events inevitably happen at birth, and that they may experience some sort of birth trauma in their career. They also need to become aware that while midwifery will involve experiencing uplifting moments, there may be difficult situations as well. Emotional management training is of particular importance for early career midwives who may be surprised by what they experience in the birth unit upon transition into midwifery (Sheehy et al. 2021). At first glance, it may appear discouraging or daunting for students. However, it may instead mentally prepare them, and help them to accept traumatic births as part of their job.

Midwifery education and professional development programs need to be enhanced with courses on managing occupational stress and developing resilience. Building and developing

resilience not only helps midwives to recover after adverse situations, but to bounce forward and continue stronger than before. Resilience and emotional management skills are as important as all the other midwifery skills. The content of courses may include the psychology of having a growth mindset after trauma. Upon entrance to an emotionally engaged profession such as midwifery, students are not evaluated or selected based on their degree of resilience, coping skills or vulnerability to traumatic events. Such skills remain unknown until midwives experience adversity. Therefore, emotional preparation is needed in advance.

8.3.3 Responsibilities of maternity managers to care for their staff

It is important to recognise that midwives will benefit from regular follow-up after traumatic births. Midwives may be checked on by close colleagues, mentors or their counsellors immediately after the event. However, the recovery process may take months for some midwives, therefore, long term follow-up may benefit those midwives who may not have recovered soon after the event. This requires managers' awareness and understanding regarding midwives' mental health needs following traumatic births. To improve awareness among midwifery managers, mental health training regarding birth trauma is recommended.

Midwifery managers and policy makers may be guided by the factors identified in this thesis, to ensure the mental health and well-being of second victim midwives and thereby minimise their attrition. This study found that acknowledgement of midwives' traumatic experiences, recognition of their efforts and building/ enhancing resilience and confidence in midwives were important contributors to midwives' recovery and professional growth post trauma. Working in a midwifery continuity of care model was identified as another protective factor against the adverse consequences of traumatic births which necessitates improving midwives' access to this model of care. The findings of this research add to the emerging body of knowledge regarding the factors which need to be strengthened to help midwives remain and grow in the profession.

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Appendix

Appendix 1

Publications related to this thesis

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Shoulder dystocia: A panic station or an opportunity for post-traumatic growth?



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ABSTRACT

Background: Traumatic births are considered as challenging events in the professional life of midwives. Negative emotional and psychological consequences of these births on midwives are well-established. However, evidence suggests that in the aftermath of challenging events, such as birth traumas, positive outcomes may emerge as well. Based on the literature, shoulder dystocia (SD) is known as one of the most traumatic birth experiences for midwives. In this study we aimed to explore the impact of experiencing SD complicated births on clinical practice of midwives.

Methods: A qualitative descriptive study was undertaken. Midwives who had an experience of at least one case of SD were invited to the study through the Australian College of Midwives. In-depth interviews were conducted with 25 midwives. Data were analysed using an inductive thematic approach.

Results: Three themes were identified 1) Putting on a brave face 2) Towards the growth zone 3) I am resilient enough to recover, because of ... Experience of SD was described as a dreadful event in midwives' career. However, on reflection, this experience was considered as a benefit which developed midwives' clinical expertise and contributed to their professional empowerment. Having faith in birth normality, support from workplace, seniority/ years of experience and self-confidence were among the factors which helped midwives in overcoming the stress after SD.

Conclusion: There needs to be greater awareness about the consequences of traumatic births such as SD for midwives. Collegial support has a critical role in helping midwives to have a positive outlook on their traumatic experience and to ease their pathway of professional growth.



Catastrophic thinking: Is it the legacy of traumatic births? Midwives' experiences of shoulder dystocia complicated births

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ABSTRACT

Background: Shoulder dystocia (SD) is considered one of the most traumatic birth experiences not only for women, but for clinicians involved as well. Adverse effects of birth trauma on the emotions and psyche of midwives have been well established.

Aim: To explore the impact of SD, as a birth trauma, on midwives' orientation towards normal births and on their clinical practice and the factors which may deteriorate or improve the experience of SD.

Methods: In a qualitative descriptive study design, 25 in-depth interviews were undertaken with Australian midwives who had experienced at least one case of SD. Data were analysed thematically.

Findings: A total of four themes emerged: 1) an unforgettable birth; a wake-up call, 2) from passion to caution, 3) factors worsening the experience, and 4) factors soothing the experience. Fear, anxiety and doubt about their professional competence were the most common feelings experienced by midwives after SD. For many, the first exposure to SD left them contemplating their previous attitude towards normal birth. Disturbed orientation of normal birth shifted midwives towards hypervigilance in practice. Not having effective relationships with women and receiving poor support from colleagues were perceived to worsen the traumatic experience, whereas working in a midwifery continuity of care model and the sense of being appreciated improved midwives' experience after the trauma.

Conclusion: Shoulder dystocia is a birth emergency that midwives will inevitably experience. Involvement in such births can potentially direct midwives towards a 'worst case scenario' mentality and affect the way they provide care for women in future.

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Scoping review of the impact of birth trauma on clinical decisions of midwives

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Abstract

Objective: The psychological and emotional impact of a traumatic birth experience on clinicians is well-established. It is also known that emotions can generally influence decisions. However, it is not clear whether experiencing a birth trauma can affect the professional behaviour and decision-making of clinicians. This study explores the impact of birth trauma on clinical decision-making of midwives.

Data Sources: Four databases (Medline, Scopus, CINAHL and ProQuest) were searched to identify English language studies published from 1990 to 2018. Due to the lack of studies with specific focus on clinical decision-making after birth trauma, we defined two main domains for our literature search. To be included, studies had to focus on either traumatic birth experience or clinical decision-making in midwifery. The findings of the two domains were then integrated.

Study Selection: Of a total 2104 studies identified, 70 received full-text screening with 40 included in the review. Twenty-two articles were about traumatic birth events and 18 examined decision-making in midwifery.

Data Extraction: Information were extracted on each article's purpose, study design, data collection, participants, definitions of birth trauma and the context in which clinical decisions were made.

Results: Thematic analysis was conducted. The impact of birth trauma on midwives could be categorized into the following themes: psychological issues; professional concerns; changes in practice and positive impact. Review of literature indicated that clinical decision-making could be influenced through all these themes.

Conclusion: Decision-making can be impacted by the midwife's affective state related to previous experience of birth trauma. The continuum of impact may vary from increased defensiveness to increased personal and professional growth. Being aware of this impact can help midwives to better manage their emotions while making decision after traumatic birth experiences.



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Full length article

Shoulder dystocia and range of head-body delivery interval (HBDI): The association between prolonged HBDI and neonatal outcomes: Protocol for a systematic review



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ABSTRACT

Objective: Shoulder dystocia (SD) is an obstetric emergency which if not carefully diagnosed and managed, can contribute to lifelong neonatal morbidities. Despite current guidelines on the definition of SD (impaction of the fetal shoulder behind the maternal symphysis pubis and need for ancillary manoeuvres or head-body delivery interval (HBDI) >60 s) its accurate diagnosis requires clinical expertise as well as overall consideration of fetomaternal condition. Based on the literature available, our study aims to determine (1) the range of HBDI as an indicator of SD and (2) the neonatal complications occurring following prolonged HBDI in normal or SD-complicated births.

Study design: A comprehensive literature search will be conducted in the following databases MEDLINE, CINAHL and Scopus (Elsevier) as well as international obstetric guidelines to find English language published data since 1970 that evaluate HBDI, prolonged HBDI and associated neonatal outcomes. Retrospective/prospective observational studies and randomized controlled trials will be recruited. As heterogeneity in definitions of SD among studies is expected, we will categorize our results according to the following two definitions: 1-Bony obstruction of fetal shoulder behind the maternal symphysis pubis or less commonly, posterior shoulder on sacral promontory and need for ancillary manoeuvres or 2-Head-body delivery interval (HBDI) > 60 s). Two reviewers will independently identify eligible studies, assess risk of bias and extract data based on predefined checklists. Outcomes of interest will be the HBDI in normal and SD-complicated births and associated neonatal consequences.

Discussion: Findings of this systematic review will provide reliable information regarding (1) the interval between birth of the head and birth of the shoulders and (2) neonatal outcomes attributed to either true SD or prolonged HBDI. Our findings will add to the knowledge of whether prolonged HBDI is an appropriate definition for SD and whether/what level of prolongation of HBDI results in adverse neonatal outcomes. This increased understanding will better inform the clinical practice of midwives and obstetricians.


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*The protocol of the systematic review for the initial design of the study is presented below. The protocol was published, however, as described at the beginning of chapter two, the topic and design of the study was later shifted to a different topic and study design.

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 **Shoulder dystocia and range of head-body delivery interval (HBDI): The association between prolonged HBDI and neonatal outcomes: Protocol for a systematic review**
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Title: Shoulder dystocia and range of head-body delivery interval (HBDI); the association between prolonged HBDI and neonatal outcomes: protocol for a systematic review

Abstract

Objective: Shoulder dystocia (SD) is an obstetric emergency which if not carefully diagnosed and managed, can contribute to lifelong neonatal morbidities. Despite current guidelines on the definition of SD (impaction of the fetal shoulder behind the maternal symphysis pubis and need for ancillary manoeuvres or head-body delivery interval (HBDI) > 60 seconds) its accurate diagnosis requires clinical expertise as well as overall consideration of fetomaternal condition. Based on the literature available, our study aims to determine (1) the range of HBDI as an indicator of SD and (2) the neonatal complications occurring following prolonged HBDI in normal or SD-complicated births.

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among studies is expected, we will categorize our results according to the following two definitions: 1-Bony obstruction of fetal shoulder behind the maternal symphysis pubis or less commonly, posterior shoulder on sacral promontory and need for ancillary manoeuvres or 2-Head-body delivery interval (HBDI)> 60 seconds). Two reviewers will independently identify eligible studies, assess risk of bias and extract data based on predefined checklists. Outcomes of interest will be the HBDI in normal and SD-complicated births and associated neonatal consequences.

Discussion: Findings of this systematic review will provide reliable information regarding (1) the interval between birth of the head and birth of the shoulders and (2) neonatal outcomes attributed to either true SD or prolonged HBDI. Our findings will add to the knowledge of whether prolonged HBDI is an appropriate definition for SD and whether/what level of prolongation of HBDI results in adverse neonatal outcomes. This increased understanding will better inform the clinical practice of midwives and obstetricians.

Registration: PROSPERO, as a registry of prospective systematic reviews protocols (CRD42018092652)

(at http://www.crd.york.ac.uk/PROSPERO/display_record.php?ID=CRD42018092652)

Key words: shoulder dystocia, head-body delivery interval, neonatal outcome

Introduction

In a normal cephalic-presentation birth, the fetal cardinal movements result in external rotation of the head, internal rotation of the shoulders and body expulsion (Cunningham et al. 2014). Restitution of the head and external rotation indicate that the fetal bisacromial diameter has rotated into the anterior-posterior diameter of the pelvis (Cunningham et al. 2014), facilitating the birth of the shoulders (Marshall & Raynor 2014). The current Guide from the World Health Organization advocates waiting for the spontaneous rotation of the shoulders within 1-2 minutes after the head is born (World Health Organization, United Nations Population Fund, World Bank & United Nations Children's Fund (UNICEF) 2015); if delayed, and only after ensuring that restitution has occurred (Marshall & Raynor 2014), the accoucheur can apply gentle pressure to deliver the anterior shoulder (World Health

Organization, United Nations Population Fund, World Bank & United Nations Children's Fund (UNICEF) 2015).

Despite comparable recommendations by a range of obstetric/midwifery textbooks on the expectant approach towards the birth of the shoulders (Macdonald & Johnson 2017; Marshall & Raynor 2014; Pairman et al. 2015), in practice, variations may exist between clinicians and institutions on the management of this stage. According to a study by Mortimore and McNabb (Mortimore & McNabb 1998), prior to 1930, the common method of birth of the shoulders was the expectant approach in which accoucheurs avoided applying traction to the neck once the head was born; instead, they waited for the spontaneous emergence of the shoulders (Edgar 1916; Galabin 1886; Mortimore & McNabb 1998) (the so-called two-step method) (Zhang et al. 2016). Nonetheless, due to concerns about the association between birth prolongation and neonatal acidosis (Wood et al. 1973), and risk of impacted shoulders (Welch 1997), some clinicians follow the active approach (Mortimore & McNabb 1998), in which the birth is expedited by manually restituting the head to shoulders alignment, and then by a gentle downward traction (the so-called one-step method) (Welch 1997).

Regardless of the approach toward birth of the shoulders, in certain cases such as fetal trunk mal-rotations, large bisacromial diameter or macrosomia (Gherman et al. 2006), this normal process can be impeded by obstruction of the fetal anterior shoulder behind the maternal symphysis pubis or, rarely, the posterior shoulder on the sacral promontory, which requires further assistance to be dislodged (RCOG 2012). This impaction is referred to as shoulder dystocia (SD), defined as the need for additional obstetric manoeuvres, more than a gentle downward traction after birth of the fetal head (ACOG 2017). Based on this definition, the diagnosis of SD will mainly rely on the clinician's subjective judgment, and as such, there is marked variation regarding its reported incidence, which ranges from 0.2 to 3% (Gherman et al. 2006).

To add an objective component to the definition, Spong et al. (1995) attempted to re-define SD by measuring intervals of different phases of the second stage of labour from crowning of the head to completion of the birth. They observed 250 women with cephalic term babies and categorized them after birth into three groups (those who needed obstetric manoeuvres, those with prolonged HBDI and those with normal/spontaneous birth). Prolonged HBDI was

defined as the interval exceeding the mean plus two standard deviations of the non-manoeuvre group (60 seconds).

In this context, a recent randomised trial compared the effect of labour induction and expectant management on incidence of SD and neonatal outcomes (Boulvain et al. 2015). Findings of this study, where SD was defined as either clinical difficulty with delivery of shoulders or $\text{HBDI} \geq 60$ seconds, demonstrated that induction of labour for suspected macrosomia lowers the risk of SD. However, the beneficial effect did not change by excluding the component of $\text{HBDI} \geq 60$ seconds from the definition (RR: 0.34, 95%CI: 0.14-0.78).

Once SD occurs, the most significant concern is the maximum time that can elapse without exposing the neonate to the risk of asphyxia and also, the minimum time that can be given to wait for the shoulders to be born spontaneously (or with gentle traction) to avoid iatrogenic birth trauma including fracturing the clavicle, breaking the humerus or neurological damage (Gottlieb & Galan 2007; Politi et al. 2010). Therefore, generalising the HBDI of >60 seconds as a discriminator between all normal and SD-complicated births, without considering individual fetomaternal circumstances needs further investigation (Kotaska & Campbell 2014). Despite its low incidence, SD is associated with high rates of severe maternal and neonatal morbidities as well as related litigation (RCOG 2012); it is therefore critical to make a clear distinction between prolonged HBDI in normal births and SD-complicated births.

Furthermore, apart from the precise diagnosis of range of HBDI , its association with neonatal outcomes is still unclear. While several studies have so far supported a correlation between longer HBDI and neonatal complications such as low umbilical artery PH, low 5-minute Apgar score or hypoxic ischaemic brain injury (Allen et al. 2002; Leung et al. 2011b; Wood et al. 1973), others have not found any significant relationship between the length of time the fetal head is on the perineum and subsequent adverse outcomes (Kotaska & Campbell 2014; Leung et al. 2011b; Stallings, Edwards & Johnson 2001). As a result of those studies which indicate a positive correlation between prolonged HBDI and acidosis, birth attendants are advised to precipitate the birth as soon as they observe signs of impacted shoulder to reduce fetal asphyxia (Wood et al. 1973).

Rationale and objectives of the study

Given the contradictory reports concerning the range of HBDI and the potential consequences associated with its prolongation, it is essential to accurately detect true SD to avoid lifelong neonatal complications and also, to safely manage it to avoid unintended harm (RCOG 2012). Despite the existing literature, the evidence is insufficient to put forth a clinical recommendation for frontline practitioners. To the best of our knowledge, to date, no systematic review has investigated normal HBDI definition and its neonatal aspects; the only available Cochrane review on SD (2006), investigated the prophylactic manoeuvres in preventing SD (Athukorala, Middleton & Crowther 2006).

More importantly, it appears that current practice is mostly influenced by the findings of some dated studies (Beall et al. 1998; Spong et al. 1995; Wood et al. 1973) which need to be interpreted with caution due to their small sample size and inability to adjust for different confounders. Also, at the present time, the increased prevalence of influencing factors such as maternal obesity, gestational diabetes mellitus and sedentary lifestyle during pregnancy (Huda, Brodie & Sattar 2010) might have reinforced the need for re-evaluation of previous measurements.

Taking this into consideration, based on the literature available, we aim to address the following questions; 1. What is the range of HBDI (in seconds) and accordingly, what is the definition of prolonged HBDI? 2. Is prolonged HBDI equivalent to the diagnosis of SD? 3. To what extent does HBDI prolongation affect neonatal outcomes? (by quantitatively comparing the interval time between normal uncomplicated vaginal births and those complicated by SD) 4. Does the severity of outcomes increase per increase in HBDI time, or remain stable after a certain interval?

Methods

This protocol has been registered with PROSPERO CRD42018092652, and will be developed based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses for Protocols (PRISMA-P) (Moher et al. 2015).

Eligibility Criteria

Based on the purposes of this review, we will conduct two searches. The first is to investigate the normal duration of HBDI and therefore to identify prolonged HBDI (search 1) and the second to evaluate the adverse consequences of this prolongation on neonatal outcomes (either in normal or SD-complicated births) (search 2). This search will be limited to English language and human subjects. No geographical restriction will be applied. Eligible studies will include retrospective/prospective observational studies and randomized controlled trials (RCTs) that examine HBDI (prolongation) in association with neonatal outcomes during vaginal birth.

Inclusion/ Exclusion Criteria

Initial decision to include or exclude a study will be made based on the title and abstract of studies; in case of uncertainty, the full-text article will be assessed. To meet the objectives of this review, we will assess studies that have recruited women with singleton, cephalic presentation at term (>36 weeks of gestation) pregnancies. Studies will be excluded if assessing neonatal outcomes without presenting HBDI duration.

Outcome Measurements

Primary and secondary outcomes will be HBDI range and neonatal outcomes due to HBDI prolongation, respectively. As heterogeneity in definitions among studies is expected, we will stratify our findings according to the results obtained (we attempt to present an interval range). Neonatal outcomes will include 5-minute Apgar score; umbilical artery parameters (PH, Po₂ and Pco₂ and lactates values); hypoxic ischaemic encephalopathy (HIE); newborn birth injuries (bone and neurological traumas); caesarean section, admission to neonatal intensive care unit and neonatal death. Also, the impact of the method of delivery (expectant or active approaches) on neonatal outcomes will be explored.

Search Strategy

Databases including MEDLINE (OVID), CINAHL (Cumulative Index to Nursing and Allied Health Literature) (EBSCO) and Scopus (Elsevier) will be searched separately. Searches will also be carried out in relevant grey literature databases including POPLINE (Population

Information Online; collection of population and reproductive resources) and guidelines published by Royal College of Midwifery (RCM), American College of Obstetricians and Gynaecologists (ACOG), Royal College of Obstetricians and Gynaecologists (RCOG), Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG), World Health Organization (WHO) and National Institute for Health and Care Excellence (NICE).

Our search strategy will consist of a combination of indexed (MeSH subject headings) and free-text terms relevant to timing of delivery/birth or specific neonatal complications, such as head to body delivery interval; birth prolongation; umbilical blood PH; brachial plexus/clavicle injury; shoulder dystocia and obstetric manoeuvres, combined by Boolean operators AND and OR (Table 1; search strategy).

Data selection

To capture both dated and recent studies, eligible studies will be included from inception (1970) to 30 April 2018. The duplicate articles will be removed; titles and abstracts of eligible studies will be screened by two independent reviewers for full-text retrieval. A manual search on reference lists of retrieved papers will be conducted to prevent missing studies.

Data Extraction

Reviewers will independently extract data from the full-text papers using a detailed data abstraction form (supplementary file 1; data abstraction form). Results will be compared between the reviewers, and any disagreement will be noted and solved by consensus or by arbitration of a third reviewer. In the case of missing or unclear data, the corresponding author of that study will be contacted by email and requested for clarification. To organize data, Endnote (version X8, Thomson Reuters, New York, NY), Excel (version 2016, Microsoft Corporation) and Review Manager (version 5.3) programs will be recruited.

Data Extraction Items

(1) Study identifiers: first author, setting, country, date and journal of publication and language (if not English)

(2) Study characteristics: study objectives and design, sample size, measurement tools, inclusion and exclusion criteria

(3) Study subject: age, parity, gestational age, maternal BMI and gestational weight gain, history of gestational diabetes mellitus

(4) Study outcomes: methods used for evaluating outcomes, birth weight, neonatal Outcomes

(5) Adjusted confounders: gestational age (term/post-term pregnancy), history of previous macrosomia, labour induction/ augmentation, use of anaesthesia, labour arrest, precipitate labour, birth position, birth attendant classifications, episiotomy, instrumental delivery (forceps or vacuum), use of ancillary manoeuvres

Quality and risk of bias Assessment

Quality and risk of bias assessment for observational and randomized studies will be done by each reviewer independently using the National Institutes of Health Quality Assessment tool for Observational Cohort and Cross Sectional Studies and the Cochrane risk of bias tool, respectively (Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies; Cochrane Training 2021). Provided the number of included studies exceed 10, we will assess publication bias through visual inspection of the funnel plot (Higgins 2011), and Egger's test (significance level < 0.05) (Egger et al. 1997).

Statistical analysis plan

To perform meta-analysis, studies with homogenous characteristics will be quantitatively analysed through Review Manager (version 5.3) using fixed or random effects model. The Mantel-Haenszel method will be used to estimate the pooled effect size (95% confidence interval [CI]). χ^2 (alpha= 0.1) or I^2 ($\geq 50\%$) tests will be used to identify heterogeneity among studies (Higgins JPT & S 2011). Homogenous data (in terms of population, outcome measures and interventions) will be quantitatively pooled in meta-analysis. Summary estimates for continuous and dichotomous outcomes will be presented using pooled mean differences and risk ratio, respectively. In case of significant clinical/statistical heterogeneity, data will be synthesised narratively. We attempt to answer our third research question through quantitative analysis by comparing the neonatal outcomes between normal births and SD-

complicated births or between births with HBDI > 60 and births with HBDI ≤ 60 seconds or between neonates delivered by active delivery method and those delivered by expectant method. To determine the robustness of our results and to reduce the weight of outlier studies, we will perform sensitivity analysis by excluding studies with high/unclear risk of bias. Provided we have sufficient data, we will conduct subgroup analyses on co-variables including parity, maternal gestational diabetes, types of labour (spontaneous or induced), interventions during labour, different birth positions, operative delivery, birthweight or NICU admission.

Ethics approval and consent to participate

Not applicable.

Reporting and dissemination of results

Included and excluded studies will be reported using the PRISMA-P flow chart and final results will be presented according to the PRISMA-P checklist (Moher et al. 2015). Currently, the study is in the stage of extracting and analysing data. The findings of this systematic review will be disseminated by publishing in peer-reviewed journals.

Discussion

Whether to precipitate the birth of the baby after the head is born or to adopt a “wait and see” approach, requires clinicians to consider several clinical parameters. First, it still continues to be a matter of debate whether adverse neonatal outcomes are attributable to HBDI prolongation alone or compromised intrauterine fetal condition prior to birth or other unknown factors (Leung et al. 2011b). Second, when interpreting previous studies, variations in definitions of outcomes should also be taken into account such as timing, type and procedure of sampling (Armstrong & Stenson 2007). Umbilical cord blood gas analysis and PH measurement involve several influencing factors which may differ among different studies and as a result, heterogeneous laboratory values may be obtained. These parameters include, but are not limited to, the time at which the cord is clamped (early or delayed clamping), type of sampling (from double clamped cord or from a cord with ongoing placental flow), potential mixture of arterial and venous blood and even the presence of nuchal cord (Armstrong & Stenson 2007; Tong et al. 2002). Third, birth attendants need to

be cautious when analysing previous reports on neonatal acid-base status. Statistically significant low PH values may not necessarily represent clinical importance (Locatelli et al. 2011), but should draw attention to this issue. Evidence supports a slow decrease in umbilical artery PH in SD-complicated births (Stallings, Edwards & Johnson 2001), and unless severe, newborns may well tolerate mild to moderate acidosis (Leuthner & Das 2004).

Our proposed systematic review will examine the time between birth of the head and birth of the, the so-called head to body delivery interval and its prolongation that is described as shoulder dystocia. We also aim to investigate the potential adverse consequences attributed to SD, by taking into account various confounders. This will contribute to the gap in the literature regarding accurate diagnosis and management of SD and will provide a better understanding of its neonatal outcomes.

Strengths and Limitations

This will be the first systematic review, to date, investigating the duration between birth of head and shoulders, and to assess potential sequelae of delayed shoulder delivery on neonates. However, our review may be subject to limitations; firstly, because SD has two definitions, it may have been defined differently in the literature. Secondly, due to the diversity of laboratory measurements, there may be divergent techniques and thresholds used for PH, P_{O_2} and P_{CO_2} values which can complicate the comparison of results.

Author's contributions

SM and MF conceived and designed the protocol. SM, AC and MF wrote and drafted the protocol. All authors read, revised and approved the final manuscript.

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Competing Interests

None.

Table 1. Search Strategy

Database	Search strategy	Date	Hits
Medline (Ovid)	<ol style="list-style-type: none"> 1. head-to-body delivery interval.mp. 2. umbilical blood PH.mp. 3. head-to-body interval.mp. 4. 'Two-step' head-to-body delivery.mp. 5. neonatal depression.mp. 6. fetal distress.mp. or Fetal Distress/ 7. apgar score.mp. or Apgar Score/ 8. birth injuries.mp. or Birth Injuries/ 9. Dystocia/ or brachial plexus injuries.mp. 10. clavicle injuries.mp. 11. shoulder dystocia.mp. 12. delivery of shoulders.mp. 13. 1 or 3 or 4 or 12 14. 2 or 5 or 6 or 7 or 8 or 9 or 10 15. 13 and 14 16. 11 or 15 17. manoeuver.mp. 18. obstetric manoeuver.mp. 19. manoeuvres.mp. 20. manœuvre.mp. 21. maneuver.mp. 22. McRoberts' manoeuvre.mp. 23. Rubin.mp. 24. posterior arm.mp. 25. McRoberts.mp. 26. Wood's corkscrew.mp. 27. rubin's maneuver.mp. 28. 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 29. 11 or 13 30. 28 and 29 	1970- 31 April 2018	1009 observations and 42 intervention studies

	<p>31. 16 or 30</p> <p>32. limit 31 to (english language and humans and yr="1970 - 2018")</p> <p>33. randomized controlled trial.mp. or Randomized Controlled Trial/</p> <p>34. 29 and 33</p>		
<p>Scopus (Elsevier)</p>	<p>(((TITLE-ABS-KEY (shoulder AND dystocia)) OR (((TITLE-ABS-KEY (head-to-body AND delivery AND interval)) OR (TITLE-ABS-KEY (head-to-body AND interval)) OR (TITLE-ABS-KEY ('two-step' AND head-to-body AND delivery)) OR (TITLE-ABS-KEY (delivery AND of AND shoulders))) AND ((TITLE-ABS-KEY (umbilical AND blood AND ph)) OR (TITLE-ABS-KEY (neonatal AND depression)) OR (TITLE-ABS-KEY (fetal AND distress)) OR (TITLE-ABS-KEY (apgar AND score)) OR (TITLE-ABS-KEY (birth AND injuries)) OR (TITLE-ABS-KEY (brachial AND plexus AND injuries)) OR (TITLE-ABS-KEY (clavicle AND injuries))))) OR ((((TITLE-ABS-KEY (rubin's AND maneuver)) OR (TITLE-ABS-KEY (wood's AND corkscrew)) OR (TITLE-ABS-KEY (mcroberts)) OR (TITLE-ABS-KEY (posterior AND arm)) OR (TITLE-ABS-KEY (rubin)) OR (TITLE-ABS-KEY (mcroberts' AND manoeuvre)) OR (TITLE-ABS-KEY (maneuver))) OR ((TITLE-ABS-KEY (maneuver)) OR (TITLE-ABS-KEY (manoeuvre)) OR (TITLE-ABS-KEY (obstetric AND manoeuvre)) OR (TITLE-ABS-KEY (manoeuvre))))) AND ((TITLE-ABS-KEY (shoulder AND dystocia)) OR ((TITLE-ABS-KEY (head-to-body AND delivery AND interval)) OR (TITLE-ABS-KEY (head-to-body AND interval)) OR (TITLE-ABS-KEY ('two-step' AND head-to-body AND delivery)) OR (TITLE-ABS-KEY (delivery AND of AND shoulders))))))) AND (TITLE-ABS-KEY (randomized AND controlled AND trial)) AND (EXCLUDE (PUBYEAR , 1969) OR EXCLUDE (PUBYEAR , 1968) OR EXCLUDE (PUBYEAR , 1967) OR EXCLUDE (PUBYEAR , 1966) OR EXCLUDE (PUBYEAR , 1965) OR EXCLUDE (PUBYEAR , 1964) OR EXCLUDE (PUBYEAR , 1963) OR EXCLUDE (PUBYEAR , 1962) OR EXCLUDE (PUBYEAR , 1961) OR EXCLUDE (PUBYEAR , 1960) OR EXCLUDE (PUBYEAR , 1959) OR EXCLUD</p>	<p>1970- 31 April 2018</p>	<p>1318 observational and 163 intervention studies</p>

	E (PUBYEAR , 1958) OR EXCLUDE (PUBYEAR , 1956) OR EXCLUDE (PUBYEAR , 1954) OR EXCLUDE (PUBYEAR , 1953) OR EXCLUDE (PUBYEAR , 1952) OR EXCLUDE (PUBYEAR , 1951) OR EXCLUDE (PUBYEAR , 1949) OR EXCLUDE (PUBYEAR , 1948) OR EXCLUDE (PUBYEAR , 1946) OR EXCLUDE (PUBYEAR , 1945) OR EXCLUDE (PUBYEAR , 1943) OR EXCLUDE (PUBYEAR , 1933)) AND (EXCLUDE (DOCTYPE , "re") OR EXCLUDE (DOCTYPE , "le") OR EXCLUDE (DOCTYPE , "no") OR EXCLUDE (DOCTYPE , "cp") OR EXCLUDE (DOCTYPE , "ed") OR EXCLUDE (DOCTYPE , "ch") OR EXCLUDE (DOCTYPE , "bk")) AND (EXCLUDE (SRCTYPE , "b") OR EXCLUDE (SRCTYPE , "p") OR EXCLUDE (SRCTYPE , "k")) AND (LIMITTO (LANGUAGE , "English"))		
CINAHL	<p>S1. "head-to-body delivery interval"</p> <p>S2. "umbilical blood PH"</p> <p>S3. "head-to-body interval"</p> <p>S4. "'Two-step' head-to-body delivery"</p> <p>S5. "neonatal depression"</p> <p>S6. (MH "Fetal Distress") OR "fetal distress"</p> <p>S7. (MH "Apgar Score") OR "apgar score"</p> <p>S8. (MH "Brachial Plexus Birth Injuries") OR "birth injuries"</p> <p>S9. (MH "Shoulder Dystocia") OR (MH "Dystocia") OR "Dystocia"</p> <p>S10. "clavicle injuries"</p> <p>S11. (MH "Shoulder Dystocia")</p> <p>S12. S1 OR S3 OR S4</p> <p>S13. S2 OR S5 OR S6 OR S7 OR S8 OR S10</p> <p>S14. S12 AND S13</p> <p>S15. S9 OR S11 OR S14</p> <p>S16. S9 OR S11 OR S14</p> <p>S17. "manoeuvre"</p> <p>S18. "manoeuvres"</p> <p>S19. "manoeuvre"</p> <p>S20. "maneuver"</p> <p>S21. "McRoberts' manoeuvre"</p> <p>S22. "Rubin"</p> <p>S23. "posterior arm"</p> <p>S24. "McRoberts"</p> <p>S25. "rubin's maneuver"</p> <p>S26. S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25</p> <p>S27. S11 OR S12</p> <p>S28. S26 AND S27</p> <p>S29. S16 OR S28</p> <p>S30. (MH "Randomized Controlled Trials") OR "randomized controlled trial"</p> <p>S31. S28 AND S30</p> <p>S32. "randomized"</p> <p>S33. S27 AND S32</p>	1987- 31 April 2018	996 observational and 8 intervention studies

Supplementary file 1. Data Abstraction Form

Reviewer	#1:	#2:
-----------------	-----	-----

Article ID
Reference number:
Title:
Journal:
First author:
Year:

Study Overview	
1.	Study objectives:
2.	Outcome measures:
3.	Study overall conclusion:

Study Setting		
1.	Country, region:	
2.	What types of care providers assisted the birth of the baby?	
3.	Who recorded the information?	
4.	Where was the information recorded?	

Study Design			
1.	From what years were the data collected?		
2.	What was the source of data?		
3.	Was this prospective data collection?	Yes	No
	Was this retrospective data collection?	Yes	No
4.	Sample size:		
5.	What are the eligibility criteria for recruitment of subjects?		
6.	Are the eligibility criteria clearly defined?	Yes	No

Definitions	
1.	How was "head-body delivery interval (HBDI)" defined?
2.	How was "shoulder dystocia (SD)" defined?
3.	How was "low 5-minute Apgar score" defined?
4.	How was "umbilical artery acidosis" defined?
5.	How was "instrumental vaginal birth" defined?
6.	How was "birth injury" defined?
7.	How was "admission to neonatal intensive care unit" defined?

Maternal Characteristics	
1.	Age:
2.	Ethnicity:
3.	Gravidity:
4.	Parity:

5.	Gestational age:		
6.	BMI:		
7.	Gestational excessive weight gain:	Yes	No
8.	Current gestational diabetes mellitus (GDM) or type 2 diabetes (T2DM):	Yes	No
9.	If multiparous, history of GDM:	Yes	No
10.	If multiparous, history of macrosomic fetus:	Yes	No
11.	If multiparous, history of shoulder dystocia;	Yes	No
12.	Labour induction:	Yes	No
	If yes, duration of induction:		
13.	Labour augmentation:	Yes	No
	If yes, duration of augmentation:		
14.	Use of analgesia:	Yes	No
	If yes, type of analgesia:		
15.	Average length of second stage (min): <ul style="list-style-type: none"> - Length of second stage for primigravidae: - Length of second stage for multiparous: 		
16.	Birthing posture/position:		
17.	Use of episiotomy:	Yes	No
18.	Occurrence of perineal tears:	Yes	No
	If yes, what was the degree of tear?	First degree Second degree Third degree Fourth degree	

Neonatal Outcomes			
1.	Time on perineum (crowning duration) (min):		
2.	Total HBD time (sec):		
3.	Need for therapeutic manoeuvres:	Yes	No

	If needed, which manoeuvres were performed?	<ul style="list-style-type: none"> - McRobert's - Suprapubic pressure - Wood's or Rubin's - Posterior arm - Zavanelli - Fundal pressure - Suprapubic and/or McRobert's only - Other (e.g., extension of episiotomy) 	
4.	Need for operative vaginal delivery:	Yes	No
	If needed,	Vacuum	Forceps
5.	Birth weight:		
6.	Sex:		
7.	1-min Apgar score:		
8.	5-min Apgar score:		
9.	Brachial plexus injury (Erb's palsy):	Yes	No
10.	Bone injury (clavicular/ humerus fracture):	Yes	No
11.	Need for resuscitation:	Yes	No
12.	Admission to neonatal intensive care unit:	Yes	No
13.	Occurrence of umbilical artery acidosis	Yes	No

Miscellaneous			
1.	Are results adjusted based on major influencing co-variates?	Yes	No
	If yes, list those co-variates:		
2.	Key conclusions		
3.	Miscellaneous comments from the authors of the study		
4.	Clarification required	Yes	No
	If yes, list items that require clarification:		

Appendix 2

Conference presentations related to this thesis

Virtual London Maternity and Midwifery Festival, London 2021- Oral presentation
Karen Stewart <karen.stewart@neilstewartassociates.co.uk>

Dear Sonia

I am writing to let you know that your paper, entitled ***Long-term consequences of traumatic birth experiences for midwives***, has been selected, by our programme curator, for presentation at the London Maternity and Midwifery Festival which takes place, online, on Wednesday 13 January 2021.

We are just finalising the order of play and timings and I will be back in touch with you later this week with the draft programme, but, at this stage, it would be good to know that you will be able to participate on 13 January since we will be announcing presentations very early next week.

If you can't present live, do let me know as there is the option to pre-record, if that fits in better with your diary.

Prior to the festival, we will organise a tech check where we run through the format and technical issues such as audio, lighting and screen sharing to make sure that all speakers are comfortable with the experience.

I would be most grateful, also, if you could send me through your biography and photo for the presenter profile webpage.

I do hope you'll be able to join us on Wednesday 13 January and look forward to confirmation at your very earliest convenience.

Kind regards

Karen
Karen Stewart
Programme Development Manager

Neil Stewart Associates
PO Box 67084, London, SW2 9JU
Tel: **020 7324 4330**
Mob: **07984 188166**

www.neilstewartassociates.co.uk

Forthcoming business conferences:

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**LONDON 2021
MATERNITY
& MIDWIFERY
FESTIVAL** 

Session 3c

*Long-term consequences of
traumatic birth experiences
for midwives*

Sonia Minoos

Midwife

University of Technology, Sydney



DATE

Wednesday 13
January 2021



TIME

13:30 - 14:00 GMT
15:30 - 16:00 CEST



@MidwiferyForum #LondonMMF2020



THE PRACTISING
MIDWIFE

Register for F

The 24th Annual Congress of the Perinatal Society of Australia and New Zealand (PSANZ) Bridging Gaps in Perinatal Care, Sydney 2020, Poster presentation

Dear Sonia,

We are delighted to advise that your abstract has been accepted for a **Poster** at the 2020 PSANZ Congress.

Poster displayed in poster showcase area in the exhibition area on either the Monday/Tuesday OR Tuesday/Wednesday sessions.

Please note:

- Authors must be available to be at their poster during poster showcase sessions for judging & discussions.
- Posters for showcase area must be a paper size 'AO Portrait'.

Please find below details of your accepted abstract:

Presentation Type: Poster

Title: Shoulder Dystocia: A Traumatic Birth Experience With Potential Positive Impacts on Clinical Practice of Midwives

ID#: PSANZ 2020 -236

Primary Author: Sonia Minoee

Please advise us immediately if you are not able to confirm your presentation/s.

If you have any questions, please contact PSANZ Congress Head Quarters:

PSANZ has appointed Professional Conference Organisers, Corporate Communique.

Ben Thompson is team-leading this event and can be contacted on 03 5977 0244 ben@corporatcommunqie.com.au

PSANZ 2020 conference abstract published in the Journal of Paediatrics and Child Health

Volume 56, Issue S1

onlinelibrary.wiley.com/doi/10.1111/jpc.14832

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Information

SHOULDER DYSTOCIA: A TRAUMATIC BIRTH EXPERIENCE WITH POTENTIAL POSITIVE IMPACTS ON CLINICAL PRACTICE OF MIDWIVES

Minooee Sonia^{1*}, Cummins Allison², Foureur Maralyn³, Travaglia Joanne⁴

¹Centre for Midwifery, Child and Family Health, Faculty of Health, University of Technology Sydney, Sydney, NSW, Australia, ²Centre for Midwifery, Child and Family Health, Faculty of Health, University of Technology Sydney, Sydney, NSW, Australia, ³Hunter New England Nursing and Midwifery Research Centre & University of Newcastle, Newcastle, NSW, Australia, ⁴Centre for Health Services Management, Faculty of Health, University of Technology Sydney, Sydney, NSW, Australia

***Corresponding author**

Centre for Midwifery, Child and Family Health, Faculty of Health, University of Technology Sydney, 235 Jones St., 15 Broadway, Ultimo 2007, Sydney, NSW, Australia

+61295144886, PO Box 123

Email: s.minooee@gmail.com

Background

Shoulder dystocia (SD) is among the top five most traumatic birth experiences for midwives. Birth trauma may have emotional and professional consequences for clinicians. This study explores the potential positive impacts of SD as a traumatic obstetric emergency on clinical practice of midwives.

Methods

A qualitative study was conducted. Participants were recruited through invitations to the membership of the Australian College of Midwives. One-to-one semi-structured interviews

Metrics

Altmetrics score 0

Details

© 2020 Paediatrics and Child Health Division (The Royal Australasian College of Physicians)

Publication History

Issue Online:
16 July 2020

Version of Record online:
16 July 2020

15th International Normal Labour and Birth Research Conference-India 2020

E-poster presentation

The certificate is displayed on a large tablet screen. At the top of the screen, there are logos for uclan, Fernandez Hospital Educational & Research Foundation, a training package logo, a globe logo, and UNICEF. To the right of the logos, the text reads: "THE 15TH INTERNATIONAL NORMAL LABOUR AND BIRTH RESEARCH CONFERENCE - INDIA" and "02-04 December 2020 Hyderabad, India".

Certificate of e-Poster Presentation

This is to certify that

Sonia Minoee

presented an e-Poster at the **15th International Normal Labour and Birth Research (Virtual) Conference** from 2nd to 4th December 2020

Title : *Towards professional growth or towards hypervigilance? Midwives' experiences of births complicated by shoulder dystocia*

Soo Downe
Prof. Soo Downe OBE
Professor of Midwifery Studies,
University of Central Lancashire

Luigi D'Aquino
Mr Luigi D'Aquino
Chief of Health,
UNICEF India Country Office

Evita Fernandez
Dr Evita Fernandez, FRCOG
Chairperson, Fernandez Hospital
Educational & Research Foundation

On the right side of the tablet, there is an illustration of a pregnant woman in a pink sari with a blue shawl, looking at her belly. The background of the entire graphic features a stylized cityscape with domes and minarets in shades of green and orange.

Appendix 3

ACM email to its members and invitation flyer

Hi *|FNAME|*,

Invitation to participate in an interview about your experiences of shoulder dystocia

Have you ever experienced shoulder dystocia as a registered midwife?

I am a PhD student undertaking a project at the University of Technology Sydney. The study aims to explore the experiences of midwives in relation to shoulder dystocia and the impacts these experiences have on midwives' future clinical practice.

So, if you have ever had a case of shoulder dystocia, please share your stories and experiences with me. I will conduct one-to-one telephone or Skype interviews (approximately one hour at a time convenient to you).

In appreciation of your time and participation in this study, you will be offered entry into a draw for an educational prize.

For more information and contact details, please see the flyer attached and the YouTube link below.

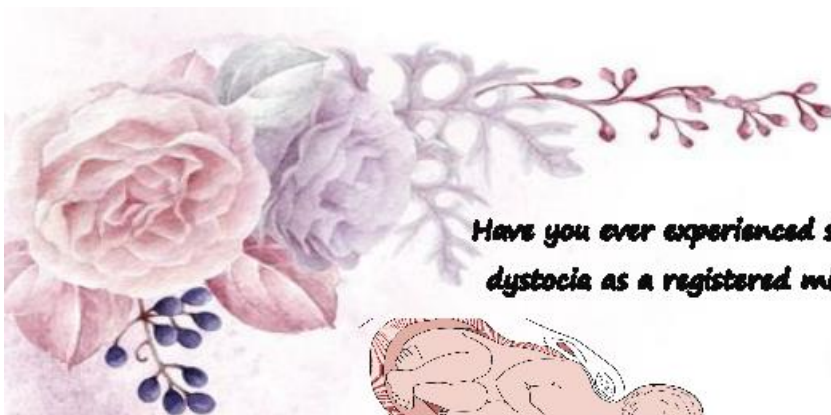
<https://youtu.be/SoejABPLryQ>

Many thanks

S.minooee@gmail.com



Kind regards,
Sonia Minoee



Have you ever experienced shoulder dystocia as a registered midwife?



I am a PhD student undertaking a project at the University of Technology Sydney. The study aims to explore the experiences of midwives in relation to shoulder dystocia and the impacts these experiences have on midwives' future clinical practice.

So, if you have ever had a case of shoulder dystocia which

- needed at least one manoeuvre to release the shoulders, or
- resulted in neonatal complications, or
- you just perceived it as a traumatic birth

Please share your stories and experiences with me at:

S.minooee@gmail.com

0490453997 (Sonia Minooee)

I will conduct one-to-one telephone or Skype interviews. They will take approximately one hour at a time convenient to you.

In appreciation of your time and participation in this study, you will be offered to enter into a draw for an educational package.
Thank you



UTS Centre for Midwifery, Child and Family Health
UTS Ethics Approval: HREC ETH18-3088

Appendix 4

Participant Information Sheet

Midwives Experiences of shoulder dystocia; diagnosis, management and the impacts on their subsequent practice (UTS HREC ETH18-3088)

WHO IS DOING THE RESEARCH?

My name is Sonia Minoee and I am a PhD student at UTS (Sonia.minoee@student.uts.edu.au). My supervisor is Professor Joanne Travaglia (joanne.travaglia@uts.edu.au).

WHAT IS THIS RESEARCH ABOUT?

This research is designed to examine the experiences of midwives relating to the diagnosis and management of shoulder dystocia, and how their clinical practice and decisions are influenced by this experience.

FUNDING

Faculty of Health, UTS.

WHY HAVE I BEEN ASKED?

You have been invited via the Australian College of Midwives to participate in this study because you are a registered midwife who is currently working in Australia and have experienced a case of shoulder dystocia while assisting in vaginal birth. The case could have occurred at any time in your working career. In this project, 'shoulder dystocia' is described as a case that:

- needed at least one manoeuvre to release the bony impaction of the shoulder following gentle traction on the neck, or
- you perceived it as a traumatic shoulder dystocia, even in the absence of applying manoeuvres, or
- resulted in neonatal complications (bone fractures, brachial plexus injury, hypoxic ischaemic encephalopathy)

IF I SAY YES, WHAT WILL THIS INVOLVE?

If you decide to participate, I will schedule a time with you to participate in a 45 minute interview. The interview will be conducted through Zoom/Skype or by telephone at a time that suits you and, with your permission, will be audio/video recorded, transcribed and analysed.

At the end of the interview, you will be offered to enter into a draw for an educational prize to show our appreciation for your participation in the research.

ARE THERE ANY RISKS/INCONVENIENCE?

In this study you will be asked about your experiences of assisting in vaginal births that involved shoulder dystocia. If you have perceived the event as traumatic, taking part in this

study might be a reminder of that trauma and might make you feel distressed. If you are currently experiencing a serious mental health issue (such as severe depression, panic, anxiety or bipolar disorders), we kindly ask you not to participate.

If you decide to take part, I will provide you with information at the beginning of the interview on the following counselling services should you feel distress at any time:

Lifeline: Phone: 13 11 14

Beyond Blue: 1300 22 4636 / <https://www.beyondblue.org.au/>

You can stop the interview at any time you need. If I perceive you are feeling discomfort or distress, I will offer to pause or discontinue the interview. If you need immediate support, I will ask you if you have someone at home/work or a counsellor that you could talk with and I will help you to contact them. I may recommend that you visit a counselling professional through your Employee Assistance Program (EAP) or to contact your GP for an immediate or ongoing support. If you do become distressed during the interview, I will call you following the interview to make sure you are okay.

DO I HAVE TO SAY YES?

Participation in this study is voluntary. It is completely up to you whether or not you decide to take part.

WHAT WILL HAPPEN IF I SAY NO?

If you decide not to participate, it will not affect your relationship with the researchers or the University of Technology Sydney. If you wish to withdraw from the study once it has started, you can do so at any time without having to give a reason, by contacting Sonia Minoeee (Sonia.minoeee@student.uts.edu.au) or Joanne Travaglia (joanne.travaglia@uts.edu.au)

If you withdraw from the study, your records will be erased and the transcripts will be destroyed.

CONFIDENTIALITY

By signing the consent form you consent to the research team collecting and using personal information about you for the research project. All this information will be treated confidentially and anonymised using pseudonyms. Data will be stored in a password-protected personal laptop, backed up in an external hard and saved in CloudStor. Only I and my academic supervisors will have access to the data. Data will be retained for a minimum of five years and then securely disposed. We would like to store your information for future use in research projects that are an extension of this research project. In all instances your information will be treated confidentially. For the purpose of research, we plan to publish the results in journal articles, conference presentations and a thesis. In any publication, information will be provided in such a way that you cannot be identified.

WHAT IF I HAVE CONCERNS OR A COMPLAINT?

If you have concerns about the research that you think I or my supervisor can help you with, please feel free to contact me on (Sonia.minoeee@student.uts.edu.au; [REDACTED]), or my

supervisor on (joanne.travaglia@uts.edu.au; [REDACTED]). You will be given a copy of this form to keep.

NOTE:

This study has been approved by the University of Technology Sydney Human Research Ethics Committee [UTS HREC]. If you have any concerns or complaints about any aspect of the conduct of this research, please contact the Ethics Secretariat on ph.: +61 2 9514 2478 or email: Research.Ethics@uts.edu.au], and quote the UTS HREC reference number. Any matter raised will be treated confidentially, investigated and you will be informed of the outcome.

Appendix 5

CONSENT FORM

**Midwives Experiences of shoulder dystocia; diagnosis, management and the impacts on their subsequent practice
(UTS HREC ETH18-3088)**

I _____ agree to participate in the research project “*Midwives Experiences of shoulder dystocia*” (UTS HREC ETH18-3088) being conducted by Sonia Minooe (Sonia.minooe@student.uts.edu.au, _____). I understand that funding for this research has been provided by the Faculty of Health, University of Technology Sydney.

I have read the Participant Information Sheet or someone has read it to me in a language that I understand.

I understand the purposes, procedures and risks of the research as described in the Participant Information Sheet.

I have had an opportunity to ask questions and I am satisfied with the answers I have received.

I freely agree to participate in this research project as described and understand that I am free to withdraw at any time without affecting my relationship with the researchers or the University of Technology Sydney.

I understand that I will be given a signed copy of this document to keep.

I agree for the interview to be audio or video recorded (depending on the method of interview; Skype/Zoom or telephone).

I agree that the research data gathered from this project may be published in a form that does not identify me in any way.

I agree that the research data gathered from this project may be used for future research purposes.

I am aware that I can contact Sonia Minooe or Professor Joanne Travaglia if I have any concerns about the research.

Name and Signature [participant]:

Date:

Sonia Minooe

Name and Signature [researcher or delegate]

Date:

Withdrawal of Consent

Midwives Experiences of shoulder dystocia; diagnosis, management and the impacts on their subsequent practice (UTS HREC ETH18-3088)

This form is to be completed when the person who is giving consent for the participation in the study, wishes to withdraw from the project.

I hereby wish to withdraw my consent to participate in the above research project and understand that such withdrawal will not jeopardise my relationship with the researchers or the University of Technology Sydney.

Name and Signature [participant]

___/___/___
Date

Name and Signature [researcher or delegate]

___/___/___
Date

Please email this form to Professor Joanne Travaglia (joanne.travaglia@uts.edu.au).

Appendix 6

Ethics Approvals (UTS)

Dear Applicant

Thank you for your response to the Committee's comments for your project titled, "Midwives' experiences of shoulder dystocia-complicated birth and the impacts on their subsequent clinical decision-making". The Committee agreed that this application now meets the requirements of the National Statement on Ethical Conduct in Human Research (2007) and has been approved on that basis. You are therefore authorised to commence activities as outlined in your application.

You are reminded that this letter constitutes ethics approval only. This research project must also be undertaken in accordance with all UTS policies and guidelines including the Research Management Policy (<http://www.gsu.uts.edu.au/policies/research-management-policy.html>).

Your approval number is UTS HREC REF NO. ETH18-3088.

Approval will be for a period of five (5) years from the date of this correspondence subject to the submission of annual progress reports.

The following standard conditions apply to your approval:

- Your approval number must be included in all participant material and advertisements. Any advertisements on Staff Connect without an approval number will be removed.
- The Principal Investigator will immediately report anything that might warrant review of ethical approval of the project to the Ethics Secretariat (Research.Ethics@uts.edu.au).
- The Principal Investigator will notify the UTS HREC of any event that requires a modification to the protocol or other project documents, and submit any required amendments prior to implementation. Instructions can be found at <https://staff.uts.edu.au/topichub/Pages/Researching/Research%20Ethics%20and%20Integrity/Human%20research%20ethics/Post-approval/post-approval.aspx#tab2>.
- The Principal Investigator will promptly report adverse events to the Ethics Secretariat (Research.Ethics@uts.edu.au). An adverse event is any event (anticipated or otherwise) that has a negative impact on participants, researchers or the reputation of the University. Adverse events can also include privacy breaches, loss of data and damage to property.
- The Principal Investigator will report to the UTS HREC annually and notify the HREC when the project is completed at all sites. The Principal Investigator will notify the UTS HREC of any plan to extend the duration of the project past the approval period listed above through the progress report.

- The Principal Investigator will obtain any additional approvals or authorisations as required (e.g. from other ethics committees, collaborating institutions, supporting organisations).
- The Principal Investigator will notify the UTS HREC of his or her inability to continue as Principal Investigator including the name of and contact information for a replacement.

I also refer you to the AVCC guidelines relating to the storage of data, which require that data be kept for a minimum of 5 years after publication of research. However, in NSW, longer retention requirements are required for research on human subjects with potential long-term effects, research with long-term environmental effects, or research considered of national or international significance, importance, or controversy. If the data from this research project falls into one of these categories, contact University Records for advice on long-term retention.

You should consider this your official letter of approval. If you require a hardcopy please contact Research.Ethics@uts.edu.au.

If you have any queries about your ethics approval, or require any amendments to your research in the future, please do not hesitate to contact Research.Ethics@uts.edu.au.

Yours sincerely,

A/Prof Beata Bajorek
Chairperson
UTS Human Research Ethics Committee
C/- Research & Innovation Office
University of Technology, Sydney
E: Research.Ethics@uts.edu.au

REF: E38

REGIS HREC Ethics

Dear Professor Travaglia

Thank you for submitting the following Human Research Ethics Application (HREA) for HREC review;

2019/ETH13438: Shoulder dystocia: Incidence, time trend, risk factors and outcomes across Hunter New England Local Health District over the period of 2008-2018

This project was considered by the **Hunter New England Human Research Ethics Committee** at its meeting held on **2/12/2019** and was determined to meet the requirements of the National Statement on Ethical Conduct in Human Research (2007).

This project has been Approved to be conducted at the following site/s:

- **John Hunter Hospital**

The following documentation was reviewed and is included in this approval:

- **HREA** (Version 3 created 25 November 2019)
- **Response to HNEHREC requirements** (undated)
- **Study Protocol** (Version 3 dated 28 November 2019)
- **Confirmation of Approval to access data by the Maternity Informatics Data Custodian** (dated 26 November 2019)

[Application Documents](#) - (Please note : Due to security reasons, this link will only be active for 14 days.)The Human Research Ethics Application reviewed by the HREC was:

It is noted that the Hunter New England Human Research Ethics Committee is constituted in accordance with the National Statement on Human Conduct in Research, 2007 (NHMRC). The approval is for a period of **5 years from the date of this e-mail (06 Dec 2019)** , on condition of the submission of Annual Reports.

We wish you all the best with the project and remind you that any changes to the application and safety reports will need to be submitted and reviewed by the approving HREC prior to implementation.

This email constitutes ethical and scientific approval only.

This project cannot proceed at any site until separate research governance authorisation has been obtained from the Institution under whose auspices the research will be conducted at that site.

This HREC is constituted and operates in accordance with the National Statement on Ethical Conduct in Human Research (2007). The processes used by this HREC to review multi-centre research proposals have been certified by the National Health and Medical Research Council.

Please contact us if you would like to discuss any aspects of this process further, as per the contact details below. We look forward to managing this application with you throughout the project lifecycle.

Kind regards

Debbie Madden

Ethics Administration Officer

Research Ethics & Governance Office

Hunter New England Local Health District

Ph: 02 [REDACTED]

Email: [REDACTED]

Appendix 7

Distress and safety protocol

Midwives' experiences of shoulder dystocia; diagnosis, management and the impact on their subsequent practice

Distress and safety protocol for the participant:

The following protocol will be put in place should a participant become distressed and require either additional or ongoing assistance. A range of services could be offered depending on his/her circumstances.

Prior to the commencement of any interview, information regarding the counselling available will be provided to all study participants. The researcher will provide sufficient information regarding the risks and benefits of the research so that individuals may freely accept or decline participation. This information will be made available to the participant prior to the initiation of interview. An additional notification of this information will also be given to those participants who may become distressed during the interview.

Strategies to assist those distressed during an interview:

Should a participant become uncomfortable or distressed during the interview, or in case the researcher perceives discomfort or distress in the interviewee (based on her facial expressions or voice), the following actions will be taken by the interviewer:

1. The researcher will suggest that it is appropriate that the interview be terminated;
2. If the participant wishes this to happen, the interview will be ceased;
3. Interviewees will be asked if they have someone at home/work in case they need immediate or further support, and whether they could provide the phone number of that person (or her/his psychologist/counsellor) to the researcher;
3. In the case where a counsellor is not readily accessible, the researcher will spend time with the participant and provide assistance, within the scope of her abilities, to discuss their concerns and support them;
4. After seeking advice from the Chief investigator (principal supervisor), a recommendation will be made that the participant visit a counselling professional to discuss her/his concerns;
 - Counsellors will be available for those working in health services through the Employee Assistance Program (EAP);
 - A recommendation will be made to the participant to access the EAP for on-going support;

- If the participant has a general practitioner (GP) involved in her/his care, it may be more appropriate to refer them to their GP who is already familiar with their history and would provide continuity of care;
5. The intended outcome of the activation of this protocol will be a comprehensive assessment and the presentation of options regarding ongoing counselling or other management as appropriate;
 6. A follow-up phone call will be made by the interviewer on the same/next day to ensure that the participant does not feel distressed any more.

Distress and safety protocol for the researcher (PhD student):

The following protocol will be put in place should a researcher become distressed. A range of services could be offered depending on her circumstances.

1. The researcher has regular contacts with her supervisors;
2. Should the researcher requires counselling, she will be referred to a professional to discuss her concerns;
3. The researcher will always carry a mobile phone while interviewing and will share the contact details and location of the interviews with the research team.

Below is the step by step guided protocol adapted from Draucker C B, Martsof D S and Poole C (2009) Developing Distress Protocols for research on Sensitive Topics. *Archives of Psychiatric Nursing* 23 (5) pp 343-350)

Participant's Safety & Distress Protocol:

Distress

- A participant indicates she/he is experiencing stress or emotional distress OR
- Exhibit behaviours suggestive that the interview is too stressful such as uncontrolled crying, shaking body or voice, etc.

Sterategy 1

- Stop the interview
- The researcher who is a health professional will offer immediate support
- Assess mental status: Tell me what thoughts you are having? Tell me what you are feeling right now? Do you feel you are able to go on about your day? Do you feel safe?

Evaluate

- If participant feels able to carry on; resume interview
- If GP or counsellor, colleague or a family member is not readily available
- If participant is unable to carry on, go to sterategy 2

Sterategy 2

- Encourage the participant to contact her/his GP or mental health provider OR
- Offer, with participant consent, for a member of the research team to do so OR
- With participant consent, contact a member of the health care team for further advice/support

Follow up




- Follow participant up with courtesy call (if participant consents) OR
- Encourage the participant to call either if she/he experiences increased distress in the hours/days following the interview

Researcher's Safety and Distress Protocol:



Appendix 8

Shoulder Dystocia Management Form- NSW

	FAMILY NAME	MRN
	GIVEN NAME	<input type="checkbox"/> MALE <input type="checkbox"/> FEMALE
Facility:	D.O.B. ____/____/____	M.O.
	ADDRESS	
MATERNITY RECORD OF LABOUR: SHOULDER DYSTOCIA RECORD	LOCATION / WARD	
	COMPLETE ALL DETAILS OR AFFIX PATIENT LABEL HERE	
	<p>This form is to be used to record all actions used to manage a Shoulder Dystocia.</p> <p>Fetal head birthed at: Date: ____/____/____ Time: ____ hrs</p> <p>Mode of birth of head (tick): <input type="checkbox"/> Spontaneous <input type="checkbox"/> Vacuum <input type="checkbox"/> Forceps (if instrumental complete form xxx)</p> <p>Fetal position (tick one): <input type="checkbox"/> Left fetal shoulder anterior <input checked="" type="checkbox"/>  <input type="checkbox"/> Right fetal shoulder anterior <input checked="" type="checkbox"/> </p> <p>Emergency situation explained to the woman and consent obtained for emergency actions: <input type="checkbox"/> Yes <input type="checkbox"/> No</p>	
H	HELP - ESCALATION (Obstetric and Neonatal) CERS/Emergency Response call at: Time: ____ hrs Neonatal Advanced Life Support clinician: <input type="checkbox"/> Already present <input type="checkbox"/> Called at: ____ hrs <input type="checkbox"/> Arrived at: ____ hrs Name: _____ Designation: _____ Attempt each of the manoeuvres for 30 seconds and move to another if unsuccessful.	
E	EVALUATE Episiotomy <input type="checkbox"/> Yes <input type="checkbox"/> No	By Whom: _____ Time: ____ hrs Details: <input type="checkbox"/> Internal manoeuvres not required – body birthed <input type="checkbox"/> Adequate access for manoeuvres <input type="checkbox"/> Tear present <input type="checkbox"/> Episiotomy prior to birth of head
L	LEGS - McRoberts <input type="checkbox"/> Yes <input type="checkbox"/> No	By Whom: _____ Time: ____ hrs Details:
P	PRESSURE – Suprapubic (Rubin's I) <input type="checkbox"/> Yes <input type="checkbox"/> No	By Whom: _____ Time: ____ hrs Details: From maternal (tick one): <input type="checkbox"/> Left <input type="checkbox"/> Right Type (tick all relevant): <input type="checkbox"/> Constant <input type="checkbox"/> Rocking (Rubin's I)
E	ENTER manoeuvres <input type="checkbox"/> Yes <input type="checkbox"/> No <i>Discourage pushing</i>	By Whom: _____ Time: ____ hrs Details: <input type="checkbox"/> Rubins II (single hand) <input type="checkbox"/> Woods' screw (double hand) <input type="checkbox"/> Reverse Woods' screw
R	REMOVE posterior arm <input type="checkbox"/> Yes <input type="checkbox"/> No <i>Discourage pushing</i>	By Whom: _____ Time: ____ hrs Details: (tick one): Fetal Arm: <input type="checkbox"/> Left <input type="checkbox"/> Right
R	ROLL all fours &/or position change <input type="checkbox"/> Yes <input type="checkbox"/> No	By Whom: _____ Time: ____ hrs Details:
	Other manoeuvres used	By Whom: _____ Time: ____ hrs Details:
Notes:		
_____ _____ _____		



Holes Punched as per AS2828.1: 2019
BINDING MARGIN - NO WRITING

NHT00560 170220

MATERNITY RECORD OF LABOUR:
SHOULDER DYSTOCIA RECORD

SMR060.851

