Obstetric emergencies in primary midwifery care In The Netherlands

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Chapter 1

General Introduction

JUSTIFICATION

During my years of studying midwifery in Amsterdam (1995-1999), a book called 'Midwives' by Chris Bohjalian was a bestselling novel. [1] It tells the story of an experienced midwife who performs a perimortem caesarean section. When the woman appears to have died during labour after eclampsia, the midwife saves the baby's life by removing the child from the womb with a kitchen knife. Autopsy of the body, however, reveals that the mother was actually alive at the time of surgery. The court drama which follows, aims to answer the question whether the midwife is a killer or a life-saver. The end of this story will be unrevealed here, but the thin line on which health care workers, like midwives, nurses and doctors, operate is well illustrated in this book.

The physiological process of birth can be interrupted by unexpected complications, and within minutes or even seconds, both mother and child can be in mortal danger. Fortunately, the risk of encountering the situation as described above is extremely small. In the Netherlands, 55 perimortem caesarean sections were performed in a 15 year period in which 2.929.289 births were registered (1 per 53.260 births). [2] Other complications at birth, such as shoulderdystocia where the foetal shoulder is stuck behind the symphysis pubis and profuse haemorrhage after birth are less rare (0.2-0.3 percent and 6 percent respectively). [3,4] Chance of survival for both mother and child is reasonably high when these emergencies occur, but adequate measures must be taken immediately by care providers. [5,6]

Health care in general is greatly dependant on risk selection. If high risk is recognised, protocols and guidelines supply care providers with a 'guide for optimal care', such as the Dutch 'Obstetric Indication List'. [7] Also, in low risk pregnancies unexpected complications can occur and health care workers then must be able to make clear and swift decisions. For this, the health care system must be appropriately equipped to provide the appropriate care at any time.

When pregnancy is uneventful and considered to be low risk, women in the Netherlands have the opportunity to give birth in primary care at home, a birthing clinic or hospital. In 2012, 28.8% of Dutch women gave birth in primary care of whom 53% at home and 47% in a birthing clinic or hospital. Most births in primary care are supervised by midwives (97.9%) and only 2.1% by general practitioners. [4] If no complications occur, no other assistance besides guidance and support is needed. A study in 2001-2003 showed that in approximately 40% of births commencing in primary care, referral to secondary care was needed. Of all these referrals, only 3.6% was on an urgency basis (mostly foetal distress or profuse bleeding after birth). If urgent referral is indicated, however, perinatal outcome is still satisfactory in the Netherlands. [8] Several studies suggest that women with low risk pregnancies, who choose to give birth

at home, have a lower rate of severe acute maternal morbidity, postpartum haemorrhage (PPH), and manual removal of placenta than those with low risk pregnancies who choose to give birth in hospital. [9-13] In addition, there is no evidence that planned home birth as compared to planned hospital birth leads to an increased risk of severe adverse maternal outcome in a maternity care system with both well-trained midwives and a good referral and transportation system. [14]

Although outcomes of birth in primary care have been studied in relation to severe maternal morbidity, some (more rare) complications in case of *a priori* low-risk pregnancies and births in the Netherlands have not been studied. The Dutch Perinatal Registry (PRN, www.perinatreg.nl) collects data relating to events such as postpartum haemorrhage (PPH) and retained placenta. However, not all obstetric emergencies are currently included in the dataset. For example, umbilical cord prolapse (UCP) has no code in the data form and the prevalence of eclampsia, shoulderdystocia and resuscitation of the newborn are likely to be under-reported because of facultative and non-user-friendly registration procedures of these incidents. Besides uncertainty of the actual prevalence of obstetric emergencies in primary care, little research has been performed evaluating the management of obstetric emergencies occurring in primary care. Additionally, the prevalence of neonatal resuscitation in community-based midwifery care in the Netherlands is largely unknown. The Perinatal Registry shows that approximately 0.9% of all infants born have an assessed Apgar score of < 7 at five minutes after birth. [15] It is safe to assume that a substantial number of these infants required some form of support and/or resuscitation. After birth, placental oxygenation ceases, neonatal lungs expand and blood oxygenation is primarily provided by breathing. If this transition proceeds normally, neonatal organs are oxygenated and this subsequently leads to high oxygen saturation (the percentage of haemoglobin binding sites in the bloodstream occupied by oxygen). Immediately after birth, an infant's condition is assessed by observation of breathing, heart rate, skin colour, muscle tone and reflexes (irritability), also known as the Apgar score. [16] It seems plausible that if a high Apgar score is assessed, it means that the oxygen saturation is also high. Studies have shown, however, that judging oxygen saturation based on the infant's colour can be very inaccurate. [17] Also, the heart rate is often underestimated (lower than the actual heart rate) by auscultation or palpation. [18] Pulse oximetry (PO) offers objective and accurate values of oxygen saturation and heart rate. Also when using PO, interventions such as assisted ventilation do not need to be interrupted by manual auscultation. [17,18] As such, it could be a valuable tool to evaluate the need for, and response to resuscitation. Both the Dutch Association of Paediatricians (NVK) and the Royal Dutch Organization of Midwives (KNOV) recommend the use of PO when resuscitation is indicated. [15,19] Currently however, PO has not yet been implemented in midwifery practice.

If complications arise during or after birth, care providers need the necessary skills to adequately manage the situation and attend to both mother and (unborn) child. In an outer hospital setting, collaboration with birth-assistants ('kraamverzorgende'), ambulance personnel and obstetricians must be impeccable. Initial schooling for midwives, physicians and birth assistants, provides theoretical and practical training in order to adequately diagnose and treat obstetric emergencies. As the prevalence of obstetrical emergencies is generally low, midwives have to regularly train and update their knowledge and skills. In the last decade, the importance of such emergency training has been of increasing interest to all professionals working in obstetric care. Dutch and English colleagues have shown the positive effect of obstetric emergency training as it enhances cooperation, knowledge, skills and perinatal outcome. [20-23]

Since 2004, the Managing Obstetric Emergencies and Trauma (MOET) course for obstetricians and anaesthetists was successfully introduced in the Netherlands. In 2012 the Pre-hospital Obstetric Emergency Training (POET, www.ALSG.nl) for midwives in primary care was introduced. Before POET was started, most Dutch midwives (>90%) participated in the CAVE course ('Cursus Acute Verloskunde', real life simulation Primary Care Obstetric Emergency Course, www.medsim.nl). This postgraduate pre-hospital obstetric emergency course was specifically developed for community-based midwives in the Netherlands. The course focuses on the identification of obstetric emergencies and their management, including timely and adequate referral to hospital. [24]

In the last decade, audit has increasingly been applied as a tool to evaluate obstetric care. The Dutch Perinatal Audit (PAN) on perinatal mortality and the Dutch LEMMoN study (Nationwide study into Ethnic of Severe maternal morbidity in the Netherlands) on severe maternal morbidity have shown that audit can determine the presence of substandard care factors and provide recommendations concerning optimal care. [25,26] Cases discussed in these studies sometimes originate in primary midwifery care. [25,27,28] However, these only include cases in which severe maternal morbidity and/or perinatal death occur, and do not supply us with data on the management of other more 'common' obstetric complications, such as shoulderdystocia or PPH. So far, the prevalence and management of obstetric emergencies in Dutch primary care in the Netherlands has not been structurally evaluated.

AIM OF THIS THESIS AND RESEARCH QUESTIONS

Primary aim of the studies described in this thesis is to gain insight into management of obstetric emergencies occurring in primary midwifery care in the Netherlands. Data collected from the 'CAVE study' (as described below) is analysed. As referral to secondary care is usually indicated in case of an obstetric emergency, we also aim to gain insight into cooperation between care providers such as midwives, ambulance personnel and obstetricians. The secondary aim of this thesis is to develop preventative strategies and tools to optimise primary midwifery care.
The following research questions are addressed in this thesis: how do midwives manage obstetric emergencies occurring in primary care, how is cooperation between care providers such as ambulance personnel and obstetricians, and which tools can optimise midwifery care?

THE 'CAVE STUDY'

For this thesis, 198 cases of obstetric emergencies occurring in primary midwifery care were collected (Table 1). From April 2008 to April 2010, 548 midwives (337 participants and 211 scheduled to participate) reported all obstetric emergencies encountered during their work. Upon inclusion, during twelve consecutive months, participants received a monthly e-mail linked to a password-protected internet site. When reporting an obstetric emergency, the midwife was asked to fill out a detailed case registration form containing information on received care during pregnancy and birth and maternal and neonatal outcome. Anonymous medical files, ambulance report forms (if applicable), discharge letters and laboratory results were requested.

Table 1. Collected cases in the 'CAVE study' by all participants (548 midwives)

	Reported Cases (n=198) (%)
PPH	**98 (50)**
Shoulderdystocia	**55 (28)**
Neonatal resuscitation	**25 (12)**
Umbilical cord prolapse	**8 (4)**
Unexpected breech birth	**9 (5)**
Hemorrhage after miscarriage, eclampsia and ruptured spleen.	**3 (1)**
Total	**198 (100)**

OUTLINE OF THIS THESIS

In the first part of this thesis, studies on PPH in primary midwifery care are presented. We present the results of an audit on PPH after home birth and a case study on ambulance referral after PPH. We report on a national survey on management of the third stage of labour and describe the process of development of quality indicators for management and prevention of PPH. In the second part, we present a case study of umbilical cord prolapses, and two further chapters concern the use of pulse oximetry in new-born infants in primary care. A summary of collected cases of shoulderdystocia and neonatal resuscitation is described at the end of this chapter (Table 2 and Table 3) .

Chapter 1 This chapter contains the justification of this thesis and describes the study objectives, as well as the context in which the studies took place.

Chapter 2 and Chapter 3 provide the results of an audit meeting on PPH after home birth. After one year of data collection, 67 cases had been collected, of which 7 were audited. Substandard care factors were determined, differentiated into incidental, minor and major substandard care factors and recommendations for practice were made.

Chapter 4 provides an insight into ambulance referral in case of postpartum haemorrhage after home birth. After applying selection criteria on 98 reported cases, fifty four cases of PPH are analysed with respect to time management, maternal condition during ambulance care and maternal outcomes.

Chapter 5 describes a survey of prophylactic use of uterotonics in the third stage of labour in the Netherlands. As a similar survey was performed in 1995, changes in management of the third stage of labour in the Netherlands can be analysed.

Chapter 6 describes the development of quality indicators for prevention and management of PPH in primary midwifery care through a RAND modified Delphi procedure.

In Chapter 7 we assess the performance of the quality indicators as described in Chapter 6 for prevention and management of PPH in primary care in the Netherlands.

Chapter 8 is a descriptive study of eight cases of umbilical cord prolapse. We provide the reader with an insight into risk factors of UCP, procedures to alleviate cord compression, timing of ambulance transfer and perinatal outcomes.

Chapter 9 describes the results of a feasibility study of the use of pulse oximetry in primary midwifery care.

In Chapter 10 we assess whether defined reference ranges of oxygen saturation (SpO_2) and heart rate (HR) of term infants after birth also apply for infants born after midwifery supervised uncomplicated vaginal birth where delayed cord clamping (DCC) and immediate skin to skin contact (ISSC) is routine management.

A summary and general discussion and recommendations to improve primary midwifery care are formulated in **Chapter 11**.

SUMMARY OF COLLECTED CASES OF SHOULDERDYSTOCIA AND NEONATAL RESUSCITATION

(Unpublished data)

Shoulderdystocia

Fifty-five cases of shoulderdystocia were reported. Basic characteristics can be found in Table 2. Prior to birth, risk factors for shoulderdystocia (macrosomia and maternal obesity) were identified by the midwife in 2/55 cases. Procedures applied to resolve the shoulderdystocia varied, but all midwives applied at least one procedure: sacral movement of head in 29 (53%), Mc Roberts' manoeuvre was applied in 38 cases (69%), supra pubic impression in 20 (36%), 'all fours manoeuvre' (Gaskin manoeuvre) in 37 (67%), delivery of posterior arm and shoulder in 39 (71%), and rotation manoeuvres in 13 out of 55 (24%). An episiotomy was performed in 3 cases (5%). Head to body interval ranged from one to six minutes with a median of two minutes. After birth, two infants were resuscitated through mask and bag ventilation (4%), supplemental oxygen was supplied to 21 infants (38%). In 49/55 (89%) infants, no morbidity as a result of shoulderdystocia was reported. One infant suffered Erb's palsy and in 2 cases a fractured clavicle or humerus was reported.

All infants suffering from shoulderdystocia fully recovered. No perinatal mortality was reported.

Table 2. Reported cases of shoulderdystocia (n=55)

Parity	
Primipara *n (%)*	4 (8)
Multipara *n (%)*	51 (92)
Gestational Age	
median (range, weeks + days)	40^{+2} (38^{+1} – 42^{+0})
Place of birth	
n (%)	
Home	41 (75)
Hospital*	14 (25)
Apgar scores (AS)	
Median (range)	
AS 1 minute	8 (1-10)
AS 5 minute	9 (6-10)
AS 10 minute	10 (6-10)
Birth Weight	
median (range) grams	4160 (3500 – 5600)

* Hospital birth supervised by the primary care midwife

Neonatal resuscitation

Twenty-five cases of neonatal resuscitation were reported (Table 3). In 14 (56%) cases, suboptimal condition was found (abnormal foetal heart rate was auscultated during birth).

The median duration of dilatation was 4 hours (ranging from one to 12 hours). The second stage had a median duration of 13 minutes (range three to 110 minutes).

In 8 cases (40%), meconium stained liquor was present at second stage, the umbilical cord was wrapped on the neck/shoulders of the infant in 12/25 cases (48%). In two cases, a shoulderdystocia occurred. After birth, all infants were dried and stimulated. Of eleven infants (44%) the umbilical cord was clamped because of suboptimal condition and in 24 infants (96%) bag and mask ventilation was performed. In two cases chest compressions were also applied.

The paediatrician was consulted in all but 5 cases, 5 infants were intubated and eleven were ventilated on the neonatal intensive care unit. 17 new-borns were admitted to the neonatology ward for a median of 1 day (range 1-7 days).

Twenty-two infants fully recovered from birth. One infant deceased due to severe asphyxia. In this case, the duration of first stage was 5 hours, second stage lasted 90 minutes. The amniotic fluid was clear; the umbilical cord was tightly wrapped around the neck. Absent foetal heartbeat was found a few minutes before birth.

One infant was diagnosed with a diaphragmatic hernia and one infant was diagnosed with a metabolic disease.

Table 3. Reported cases of neonatal resuscitation (n=25)

Parity	
Primipara *n (%)*	5 (20)
Multipara *n (%)*	20 (80)
Gestational Age	
median (range, weeks + days)	40^{+4} (37^{+4} – 42 $^{+0}$)
Place of birth	
n (%)	
Home	16 (64)
Hospital*	9 (36)
Apgar scores (AS)	
Median (range)	
AS 1 minute	3 (0-9)
AS 5 minute	6 (0-10)
AS 10 minute	8 (0-10)
Birth Weight	
median (range) grams	3455 (3100 – 4270)

* Hospital birth supervised by the primary care midwife

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