

Diabetes in pregnancy:  
caring for the baby after birth  
Findings of a national enquiry



September 2007

England, Wales and Northern Ireland

## CEMACH Mission statement

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Our aim is to improve the health of mothers, babies and children by carrying out confidential enquiries on a nationwide basis and by widely disseminating our findings and recommendations.

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The recommendations contained in this report represent the views of CEMACH, and were arrived at after careful consideration of the available evidence. It does not override healthcare professionals' individual responsibility to make appropriate decisions in the circumstances of the individual patient, in consultation with the patient and/or guardian or carer.

### Note

Following further data analysis, there are minor differences between some of the numerical data in this report and the summary neonatal care chapter within the main CEMACH diabetes report published in February 2007 (*Diabetes in pregnancy: are we providing the best care? Findings of a national enquiry*). This has not resulted in any change in the key findings and recommendations of the report.

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## Glossary and abbreviations

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<b>ANNP</b>	Advanced Neonatal Nurse Practitioner
<b>Antenatal</b>	The period of time in pregnancy preceding birth
<b>Apgar score</b>	A system of assessing the general physical condition of a newborn infant based on a rating of 0, 1, or 2 for five criteria: heart rate, respiration, muscle tone, skin colour, and response to stimuli. The five scores are added together, with a perfect score being 10
<b>Baby Friendly Initiative</b>	The Baby Friendly Initiative is a global programme of UNICEF and the World Health Organization, which was established in the UK in 1994. It works with health services to ensure a high standard of care for pregnancy women, breastfeeding mothers and babies
<b>Blood glucose</b>	Blood sugar level
<b>BM</b>	A blood glucose testing strip originally made by the pharmaceutical company Boehringer Mannheim (now Roche). 'BM' is often used to describe any non-laboratory blood glucose test
<b>Caesarean section</b>	Surgical abdominal delivery of the baby
<b>Cardio-respiratory resuscitation</b>	Direct cardiac massage and artificial ventilation
<b>CEMACH</b>	Confidential Enquiry into Maternal and Child Health
<b>Convulsions (neonatal)</b>	Seizures manifesting as involuntary muscular contractions or autonomic changes due to abnormal electrical discharges in the baby's brain
<b>Cord pH</b>	Assessment of the baby acid-base balance in the arterial or venous blood of the umbilical cord
<b>Cup feeding</b>	Artificial method of feeding babies with a little cup until they are strong enough to be fully breast-fed and without interfering with the natural sucking process
<b>Donor milk</b>	Breast milk from mothers who have donated their excess to a milk bank responsible for storing, processing and screening donated breast milk. It can be prescribed when a baby's own mother's milk is not available
<b>Enteral feed</b>	Feeding given via the alimentary canal as opposed to parenteral feeding given through a vein
<b>Fetal distress</b>	Possible fetal compromise before or during labour
<b>Gestation</b>	The time from conception to birth. The duration of gestation is measured from the first day of the last normal menstrual period
<b>Glucose electrode</b>	Blood glucose measurement using electrochemical biosensors
<b>Group B streptococcus</b>	Bacterium that can cause infection such as pneumonia in newborns

<b>HaemoCue</b>	Cot side blood sugar monitoring using a glucose photometer (Hemo-Cue AB, Angelholm, Sweden)
<b>High dependency care</b>	Criteria for receipt of high-dependency care are: <ul style="list-style-type: none"><li>• receiving NCPAP for any part of the day but not fulfilling any of the criteria for intensive care</li><li>• below 1000 g current weight and not fulfilling any of the criteria for intensive care</li><li>• receiving parenteral nutrition</li><li>• having convulsions</li><li>• receiving oxygen therapy and below 1500 g current weight</li><li>• requiring treatment for neonatal abstinence syndrome</li><li>• requiring specified procedures that do not fulfil any criteria for intensive care:<ul style="list-style-type: none"><li>– care of an intra-arterial catheter or chest drain</li><li>– partial exchange transfusion</li><li>– tracheostomy care until supervised by a parent</li><li>– requiring frequent stimulation for severe apnoea</li></ul></li></ul> (British Association of Perinatal Medicine, 2001)
<b>Hypoketonaemic hypoglycaemia</b>	Low blood plasma sugar level with no formation of ketone bodies (substances produced by the body during starvation bringing energy by breaking down fats)
<b>Hypothermia</b>	Abnormally low body temperature
<b>Infant formula</b>	An industrially produced milk product based on cow or soy milk, which aims to duplicate the nutrient content of natural human breast milk
<b>Intensive care</b>	Criteria for receipt of intensive care are: <ul style="list-style-type: none"><li>• receiving any respiratory support via a tracheal tube and in the first 24 hours after its withdrawal</li><li>• receiving NCPAP for any part of the day and less than five days old</li><li>• below 1000 g current weight and receiving NCPAP for any part of the day and for 24 hours after withdrawal</li><li>• less than 29 weeks gestational age and less than 48 hours old</li><li>• requiring major emergency surgery, for the preoperative period and postoperatively for 24 hours</li><li>• requiring complex clinical procedures:<ul style="list-style-type: none"><li>– full exchange transfusion</li><li>– peritoneal dialysis</li><li>– infusion of an inotrope, pulmonary vasodilator or prostaglandin and for 24 hours afterwards</li></ul></li><li>• any other very unstable baby considered by the nurse-in charge to need 1 :1 nursing</li><li>• a baby on the day of death</li></ul> (British Association of Perinatal Medicine, 2001)
<b>Interquartile range</b>	The spread of a set of values between which 25% (25th centile) and 75% (75th centile) of these values lie



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<b>Intrapartum care</b>	Care during labour
<b>Intra-uterine growth restriction</b>	A baby that is smaller than usual during pregnancy – these babies normally have a lower weight at birth
<b>IPPV</b>	Intermittent Positive Pressure Ventilation
<b>Jaundice</b>	Marked by high concentrations of bilirubin in the blood, causing the infant's skin and eyeballs to look yellow
<b>Lactation</b>	The secretion of milk from the mammary glands
<b>Macrosomia</b>	Oversized baby as seen for example as a consequence of the effect of diabetes during pregnancy. Defined as having a birth weight above the 90th centile for gestation or a birth weight of 4000g or more
<b>Mean</b>	Sum of all the values in a set of data divided by the number of values
<b>Meconium</b>	The first stool from an infant
<b>Median</b>	The value of the middle item of a series when the items are arranged in numerical order
<b>Nasogastric feeding</b>	Feeding of milk using a little tube passed through the nose into the stomach of a baby not strong enough to breast or bottle feed
<b>Neonatal Hypoglycaemia</b>	Low blood glucose concentration in a baby
<b>Neonatal unit</b>	A unit which provides additional care for babies over and above that which can be offered on a postnatal ward or transitional care unit. There are different levels of complexity of care which can be offered: intensive care, high dependency care and special care (see definitions)
<b>NICE</b>	National Institute for Health and Clinical Excellence
<b>O<sub>2</sub> monitoring</b>	The process of monitoring the amount of oxygen in a baby's blood using a medical device
<b>Odds ratio</b>	A measure of the excess risk or degree of protection given by exposure to a certain factor. An odds ratio of greater than one shows an increased risk and less than one shows a protective effect
<b>Oxytocin</b>	A hormone produced by the brain that causes contractions of the uterus during childbirth and of the mammary glands in the breast during lactation
<b>Postnatal ward</b>	Maternity ward where mother and baby are cared for after birth
<b>Range</b>	The difference or interval between the smallest and largest values in a frequency distribution
<b>Reagent strip testing</b>	Strip of paper with a blood test-pad that was initially developed for monitoring blood glucose concentration in diabetes and not intended for detection of neonatal hypoglycaemia

<b>Respiratory difficulty</b>	Difficulty breathing
<b>Sepsis</b>	Condition in which the body is fighting a severe infection
<b>SHO</b>	Senior House Officer
<b>SIGN</b>	The Scottish Intercollegiate Guidelines Network (SIGN) develops and disseminates national clinical guidelines containing recommendations for effective practice, based on current evidence
<b>Skin-to-skin contact</b>	Very close direct physical contact between mother and baby that can help to promote breastfeeding
<b>Special care</b>	Care provided for all babies not receiving intensive or high dependency care (see definitions) but whose carers could not reasonably be expected to look after them in hospital or at home (British Association of Perinatal Medicine, 2001)
<b>Supplemental feeding</b>	Any type of bottle feeding
<b>Term infant</b>	A baby born between the 37th completed week and the 42nd completed week of gestation
<b>Tone</b>	The normal state of tension or contraction in resting muscle. Abnormal tone is an important clinical feature of neonatal cerebral dysfunction as seen for example in severe neonatal hypoglycaemia
<b>Transitional care unit</b>	A unit providing care of term or near-term babies not needing high-dependency or intensive care, which can be safely delivered without babies being separated from their mothers
<b>Tube feeding</b>	See nasogastric feeding
<b>Type 1 diabetes</b>	There is an absolute deficiency of insulin production, due to autoimmune destruction of the insulin-producing beta cells in the islets of Langerhans in the pancreas. It accounts for 5 – 15% of all people with diabetes
<b>Type 2 diabetes</b>	There is a relative deficiency of insulin production, and/or the insulin produced is not effective (insulin resistance). It accounts for 85% - 95% of all people with diabetes
<b>95% Confidence Interval</b>	A range of values for which there is a 95% chance that it includes the true value

## Foreword

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I welcome this important study conducted by CEMACH and in particular their findings relating to the babies of women with diabetes. This work confirms what many have suspected, namely that the babies of women with diabetes are being admitted needlessly to neonatal units. Not only is there unnecessary separation from the mother, but also this inevitably has a negative impact on the success of breastfeeding. These two findings are against all the principles of child-friendly hospitals which we are trying to endorse and implement, and I hope that as a result of this report we can encourage more babies to remain with their mothers and also achieve a higher success rate for breastfeeding.

There is also concern regarding the sub-standard neonatal management of hypoglycaemia, as well as early feeding. Medical staff have been making estimates of blood glucose concentrations in babies too early and intervening unnecessarily at a time when the baby's metabolism has not yet adjusted to extra-uterine life, and a "low" blood glucose concentration may well be physiologically normal. We hope that as a result of this report this practice will be improved.

CEMACH are to be congratulated on this careful piece of work which will have practical implications for the betterment of the health of mothers and their babies.

A handwritten signature in cursive script that reads "Patricia Hamilton".

**Patricia Hamilton**

*President, Royal College of Paediatrics and Child Health*



## 1 Key findings

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- Over half of all neonatal admissions were assessed by panels to be avoidable, mainly due to no specific medical indication for admission and also suboptimal thermal care on the labour ward.
- Several barriers to breastfeeding were reported:
  - Lack of early feeding on the labour ward
  - Low rate of documented skin-to-skin contact in the first hour after birth
  - Infant formula often given as first feed
  - Infant formula given to all babies admitted to a neonatal unit, even when the maternal intention was to breastfeed
  - Infant formula feeding on the postnatal ward often determined by maternal choice.
- The first blood glucose measurement was often performed too early, with inappropriate methods of testing used and poor documentation of management.

## 2 Summary of recommendations

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- All units delivering women with diabetes should have a written policy for the management of the baby. The policy should assume that babies will remain with their mothers in the absence of complications.
- Mothers with diabetes should be informed antenatally of the beneficial effects of breastfeeding on metabolic control for their babies.
- As with the general maternity population, mothers with diabetes should be offered an opportunity for skin-to-skin contact with their babies immediately after delivery. Breastfeeding within one hour of birth should be encouraged.
- Term babies of diabetic mothers who are otherwise well with no clinical signs of hypoglycaemia, should not be subjected to routine early blood glucose testing in the first two hours after birth. Any blood glucose measurements should be performed before a feed, using a reliable method (ward-based glucose electrode or laboratory analysis). The time a blood glucose measurement was performed, the method used, the result, and the action taken should be clearly documented.
- Staff should be trained in the management of babies of mothers with diabetes. This should include appreciation of the importance of early feeding, avoiding blood glucose testing within the first two hours after birth in a well baby, and formulation of a written plan agreed with the mother.
- Midwives should be aware that supporting early breastfeeding is especially important for women with diabetes, and that this aspect of care should be consistently documented.



### 3 Introduction

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CEMACH's survey of maternity units in 2002 showed that a high proportion (30%) of hospitals in England, Wales and Northern Ireland routinely admitted babies of women with diabetes to a neonatal unit <sup>1</sup>. In addition, the CEMACH descriptive study of 3808 pregnancies to women with type 1 and type 2 diabetes found evidence of suboptimal management with regard to neonatal hypoglycaemia and early feeding; a lower intention to breastfeed in mothers with diabetes at birth than in the general population; and a higher number than expected of admissions of term babies to a neonatal unit <sup>2</sup>. One quarter of these admissions appeared to be due to routine hospital policy <sup>2</sup>. This is concerning, as separation of mother and baby soon after birth may affect a number of important processes such as early establishment of breastfeeding, temperature control and emotional bonding. Also, from a health system perspective, unnecessary neonatal admissions are costly and may deprive other infants of care.

The aims of this neonatal enquiry were:

- To gain an understanding of the current care that term infants of mothers with diabetes receive, including management of body temperature, feeding and hypoglycaemia.
- To elucidate why these babies are frequently admitted to a neonatal unit and identify the clinical pathway by which they get there.
- To make recommendations for a national policy regarding care during the early neonatal period for babies of women with type 1 and type 2 diabetes.

## 4 Methods

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### 4.1 Composition and location of enquiry panels

Enquiry panel meetings were held in five CEMACH regions (East of England, London, North East, North West and South West) between January and April 2006. Each panel consisted of two representatives from each of the following disciplines drawn from district general hospitals and tertiary referral centres:

- Neonatologists
- Neonatal nurses
- Midwives

Panels were chaired by the Panel Chairs appointed for the enquiry or by the CEMACH Regional Manager of that region. Six cases were reviewed at each meeting. Cases reviewed were selected from a national pool excluding the region of the assessing panel, to ensure an independent assessment of the care provided. Each panel was provided with an antenatal summary, intrapartum medical records, neonatal records and charts pertaining to the first three days after delivery, discharge summaries, the postnatal maternity records, and any relevant correspondence or hospital protocols. All records were fully anonymised to remove any patient, unit or staff identifiers.

### 4.2 Enquiry pro forma

Clinical guidance for the neonatal enquiry was provided by a steering group of clinicians with specific clinical or research experience in neonatal care for babies of women with diabetes (Appendix A). A structured enquiry pro forma (Appendix B) was developed in consultation with members of the steering group. This pro forma was designed to be used by panels to assess neonatal care provided on the labour ward, the postnatal ward, the transitional care unit<sup>a</sup> or on the neonatal unit. The pro forma was developed to comprise a mixture of factual information and assessments of care from review of the medical records, after a round-table discussion and after panel consensus had been reached. The main focus of the pro forma was on clinical decision-making.

Panel assessors were asked to grade their opinion of the quality of care as 'optimal', 'adequate' or 'poor'. 'Optimal' indicated that there were no issues with care, while 'adequate' indicated that there were some issues of concern. 'Adequate' and 'poor' care were aggregated as 'suboptimal' care for the purpose of analysis.

### 4.3 Standards of care

Care was assessed against standards relating to the place of care, blood glucose monitoring, temperature management and feeding. The clinical standards for this enquiry were those used in the CEMACH Diabetes Programme (Appendix B), with some additional standards from the Baby Friendly Initiative<sup>3-5</sup>. These standards were documented on the pro forma and available to every panel prior to the review of cases.

### 4.4 Enquiry sample

The diabetes neonatal enquiry study population originated from the control group (n=220) of the main diabetes in pregnancy enquiry that used a case-control design to identify factors associated with stillbirth, neonatal death or congenital anomalies (Figure 1). This control group was randomly selected from all singleton pregnancies of diabetic women resulting in a normally formed baby surviving to 28 days of life. Babies born prematurely (< 37 weeks' gestation) and term babies admitted for intensive or high dependency care were then excluded. All 132 babies at term (37+0 weeks of gestation onwards) of

<sup>a</sup> defined as a unit where mothers and babies can be cared for together under the supervision of specialist staff if the baby needs non-intensive treatment and monitoring.

diabetic mothers, either admitted to a neonatal unit for special care or remaining with their mother, were selected for the neonatal enquiry. Neonatal medical records were not available for 13 cases, missing in two cases and the place of care not documented in five cases, leaving a total of 112 available case notes, which were then examined by multidisciplinary panels.

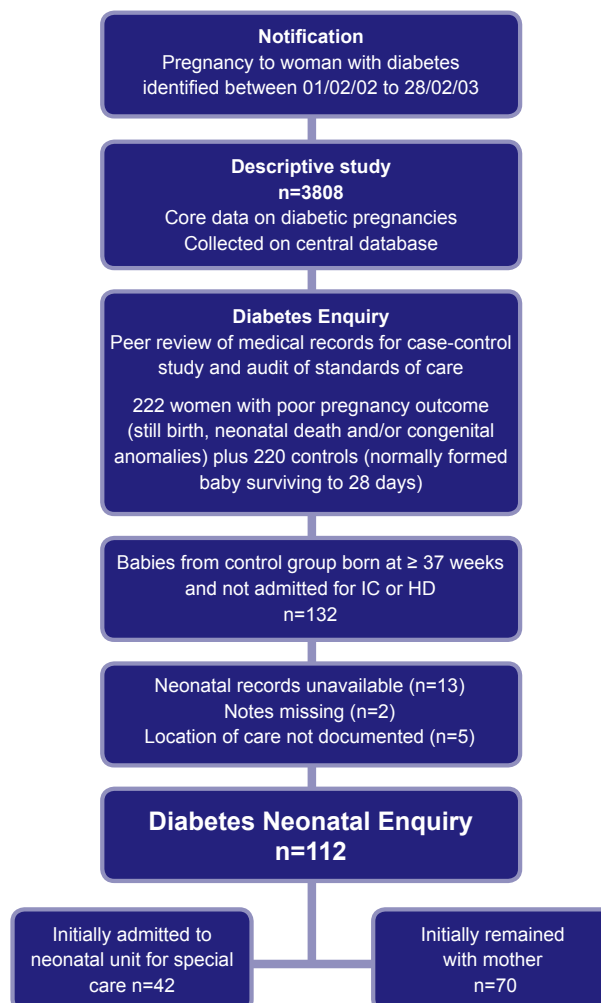
Babies in the diabetes enquiry were divided into two groups for further descriptive comparative analysis:

- a) Babies who stayed with their mothers, either on the postnatal ward, transitional care unit, labour ward or maternal high dependency unit
- b) Babies who were initially admitted to a neonatal unit.

#### 4.5 Data analysis

This was a case-control design nested in a cohort study: the controls were babies who remained with their mother on the postnatal ward, transitional care unit, labour ward or maternal high dependency unit; the cases were babies who were admitted from the labour ward directly to a neonatal unit for special care. Free-text comments made by panels were categorised into thematic headings by a neonatologist (DA) to allow further exploration of the data.

**Figure 1:** Flow diagram of babies identified for the Diabetes Neonatal Enquiry.





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## 4.6 Limitations

All data collected during this enquiry were derived from review of the medical records. Findings of this report are therefore retrospective and based on documentation in the medical records of clinical care, and are not based on direct questioning of clinicians or women. In some cases it was not possible to complete all questions on the pro forma with reference to the medical notes provided. Throughout the report, numbers are reported with reference to the total number of records where information was recorded i.e. excluding all missing data.

A potential limitation to the panel enquiry approach is variation of assessments between different regional panels. Panel guidance notes were provided in order to minimise variation, and the Panel Chairs and Regional Managers had an important role to play in directing the discussion and ensuring that all factors were taken into consideration during assessments.

Panel assessors were not blinded to outcome i.e. they were aware of whether the baby had been admitted to a neonatal unit or not. It is recognised that this may have introduced an element of bias to assessments of care.



## 5 Place of care

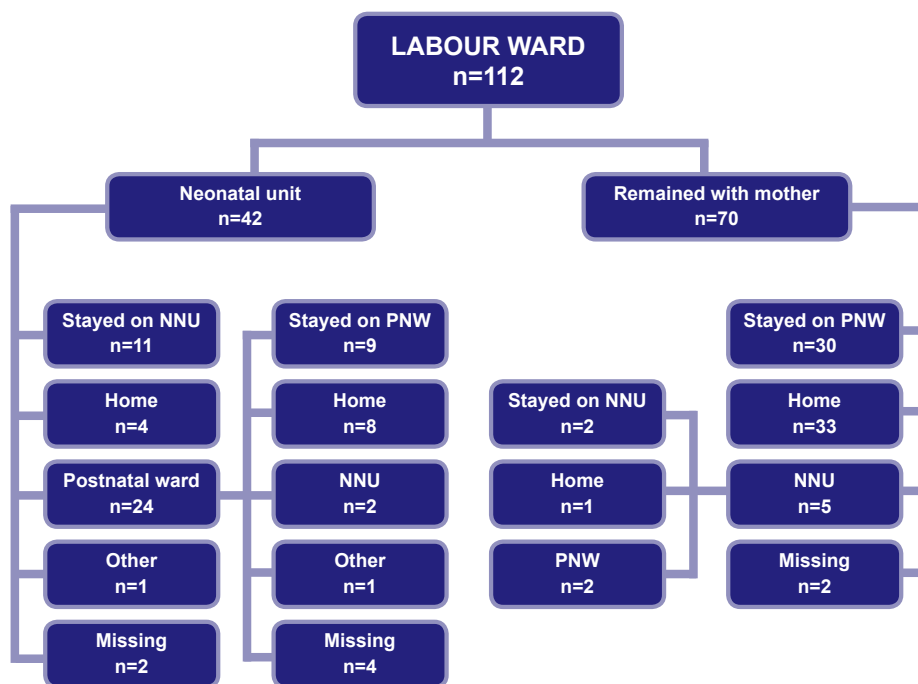
Panels were asked to report where babies were cared for after delivery: postnatal ward (PNW), transitional care (TC), neonatal unit (NNU) or “other destination”. Figure 2 gives an overview of where the 112 babies in the neonatal enquiry were cared for in the first three days of life.

Seventy babies were nursed initially with their mothers (61 on the postnatal ward, five in a transitional care unit and four on the labour ward or maternal high dependency unit). By day three, nearly half of these 70 babies had been discharged from hospital. Five of the babies, who were initially nursed with their mother, were later admitted to a neonatal unit and are described separately.

Forty-two babies were admitted directly to a neonatal unit after delivery. Within the first three days, one-third of these 42 babies were still on the unit and two-thirds had returned to be with their mothers on the postnatal ward. By day three, half of the babies on the postnatal ward were discharged home with their mothers.

Two of the babies discharged from the neonatal unit were readmitted by day three.

**Figure 2:** Place of care of term babies of mothers with type 1 and type 2 diabetes, up to day three after delivery.



### Learning points

- A number of potential barriers to breastfeeding were identified:
  - Only 29% of babies had documented evidence of early skin-to-skin contact
  - Only 28% of mothers had documented evidence of breastfeeding support in the first hour after birth
  - 23% of babies did not have their first feed on the labour ward
  - 63% of babies had infant formula as their first feed.
- The decision to admit was assessed to be inappropriate for 53% of babies admitted to neonatal unit from labour ward.
- A quarter of babies who were cared for on the postnatal ward with their mothers did not have a written management plan in the medical records.
- 60% of babies were assessed by panels to have aspects of suboptimal care on the labour ward, with the main areas noted being blood glucose monitoring, early feeding and temperature control.

### 6.1 Perinatal risk factors

Panels were asked to identify any antenatal maternal or fetal factors (other than diabetes) from a summary of the maternity notes, which they considered were relevant to subsequent management of the baby. There were 53 babies for whom this information was available (Table 1). The two most frequent antenatal risk factor categories were pre-existing maternal disease (this included a wide range of conditions e.g. hypothyroidism, thrombocytopenia, severe asthma, cholestasis, cardiac condition, epilepsy, depression) and hypertensive disorder noted during pregnancy.

**Table 1**

Antenatal risk factors (other than diabetes) in pregnancies to mothers with type 1 and type 2 diabetes who had term babies

Antenatal risk factors	Frequency
Pre-existing maternal disease	22
Hypertensive disorder noted during pregnancy	14
Group B streptococcus	8
Diabetic complication	3
Macrosomia	3
Other obstetric problem	2
Intra-uterine growth restriction (IUGR)	1

Panels also documented any intrapartum problems (other than maternal diabetes) which may have been relevant to the subsequent management of the baby. Intrapartum complications were present in nearly half (47/111) of the babies, with the two most frequent being fetal distress and failure to progress in labour (Table 2).

**Table 2**  
Intrapartum complications in term babies of mothers with type 1 and type 2 diabetes

Intrapartum complication	Frequency
Fetal distress	24
Failure to progress	9
Complication of diabetes complication	4
Shoulder dystocia	3
Group B streptococcus	2
Other obstetric complication	4
Missing	1

Overall, an antenatal risk factor or intrapartum complication was present in around half of the babies in the neonatal enquiry. It is important to note that this study was not designed to look at the incidence of antenatal or intrapartum risk factors in this population of babies in comparison to babies in the general maternity population, but rather to determine if the presence of antenatal and/or intrapartum risk factors may have influenced subsequent location of care.

The presence of antenatal risk factors or intrapartum complications additional to maternal diabetes was not associated with the decision to admit babies to a neonatal unit (Table 3).

**Table 3**  
Proportion of term babies of mothers with type 1 and type 2 diabetes, with antenatal risk factors or intrapartum complications, admitted to a neonatal unit

	Babies remaining with mother	Babies admitted to NNU	OR [95%CI] (admission to NNU vs remaining with mother)
Antenatal risk factors	31/70	22/42	1.4 [0.6, 3.0]
Intrapartum complications	29/69	18/42	1.0 [0.5, 2.3]

## 6.2 Clinical condition at birth

Apgar scores at one and five minutes, and cord pH in those babies for which this information was available, were not different between babies who remained with their mothers or were admitted to a neonatal unit (Table 4). Nine babies who remained with their mother and six babies who were admitted to a neonatal unit were documented to have received IPPV via mask. There were no babies documented to have received IPPV via intubation or chest compression.

**Table 4**

Apgar scores, cord pH and cardio-respiratory resuscitation at delivery in term babies of mothers with type 1 and type 2 diabetes

	Babies remaining with mother (N=70)	Babies admitted to NNU (N=42)	p - value
Median Apgar at 1 minute [IQR]	9 [8,9] (n=68)	9 [8,9] (n=42)	1
Median Apgar at 5 minutes [IQR]	9 [9,10] (n=67)	10 [9,10] (n=42)	0.5
Median Arterial cord pH [IQR]	7.28 [7.22, 7.33] (n=31)	7.24 [7.22, 7.27] (n=19)	0.2
Median Venous cord pH [IQR]	7.33 [7.26, 7.35] (n=29)	7.30 [7.23, 7.34] (n=19)	0.3

### 6.3 Staff present at delivery

A paediatric presence is not routinely required at the delivery of a baby of a woman with type 1 and type 2 diabetes, and midwives have appropriate skills to provide initial care. Midwives were recorded as being present at delivery for the majority (92/112, 82%) of babies in the neonatal enquiry. Middle grade or senior paediatric staff were documented to be in attendance at delivery for seven babies, with a junior paediatrician (senior house officer, SHO) being present at delivery for 34% (38/112) of babies. No advanced neonatal nurse practitioner (ANNP) was recorded as being present for any of the deliveries. When additional personnel were recorded to be present at delivery, they were usually anaesthetists.

### 6.4 Written plan of care for management of the baby

Staff in attendance at birth for babies of women with type 1 and type 2 diabetes should take the opportunity to write up an early and clear management plan. Written plans should include all aspects of care.

There was evidence of a clear written care plan for 73% of 70 babies remaining with their mother and 59% of 41 babies referred to a neonatal unit (Table 5). The care plan included advice about blood glucose monitoring and feeding (in over three quarters of cases) more consistently than for other areas of care. When a written plan was identified, the recommended location of care was documented for a third (35%, 18/51) of babies remaining with their mothers and two-thirds of babies (67%, 16/24) admitted to a neonatal unit ( $p=0.01$ ).

The care plan was written by the paediatric SHO for 57% (43/75) of babies and by the midwife for 15% (11/75) of babies. In 23% of cases, there was insufficient information in the notes to determine who had written the care plan.

The care plan was not fully followed in 34% of 73 babies, with no difference between babies who remained with their mother or were admitted to a neonatal unit. Panels made 36 comments on where management diverged from the written plan: ten comments related to blood glucose management, six related to management of feeding and seven to temperature control. Deviation from the original care plan may have been justified by subsequent events: in four cases, management different to that in the written plan was said to be due to change in mother's or baby's clinical condition or lack of nursing staff. In the remaining nine cases, a lack of documentation did not allow assessment by panels.

**Table 5**  
Aspects included in care plan for term babies of mothers with type 1 and type 2 diabetes

	Babies remaining with mother (N=70)		Babies admitted to NNU (N=42)		p-value
	n	%*	n	%*	
<b>Evidence of a written care plan</b>	51	73	24	59	0.1
<b>Plan includes reference to:</b>					
Recommended place of care	18	35	16	67	0.01
Blood glucose monitoring	47	90	19	83	0.3
Temperature management	24	46	7	30	0.2
Feeding	43	83	16	70	0.2
<b>Care plan followed:</b>					
Fully	33	65	15	68	0.8
Partially	14	27	1	5	
No	4	8	6	27	
Missing	19		20		

\*Percentages are calculated after excluding missing data.

These findings highlight some problems with documentation of care plans, with thermal management and place of care often not included. Staff present at delivery may be under pressure due to other high risk situations occurring concurrently, but should be aware of the importance of written plans which include all aspects of care.

### 6.5 Skin-to-skin contact

For the maternity population as a whole, systematic reviews have shown that early skin contact between mothers and babies is beneficial in relation to breastfeeding and infant crying<sup>6</sup>. A possible explanation is that skin contact stimulates maternal oxytocin release, which facilitates uterine contraction, milk ejection and mother-infant interaction<sup>7</sup>. There is also evidence in the literature that babies whose mothers keep them in close skin contact are warm, calm and reassured<sup>8,9</sup>.

In the diabetes neonatal enquiry, early skin-to-skin contact between mother and baby after birth (within 30 minutes of delivery, or as soon as the mother was able to respond following caesarean section) was documented to be achieved for only 29% (30/102) of babies, with no difference between babies remaining with their mothers and babies admitted to a neonatal unit. In eight further instances skin-to-skin contact was documented as not being possible, and panels made twelve comments about the reasons for this. Seven of the comments referred to skin-to-skin contact not being possible due to recovery from caesarean section or other surgery, and one comment noted that there was no skin-to-skin contact due to maternal request. Four comments related to babies being too unwell for skin-to-skin contact to be practicable.

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Lack of documentation of skin-to-skin contact does not necessarily mean that this aspect of care had not been provided. This is part of normal midwifery care and may not always be routinely recorded. However, it is important that all maternity staff recognise the importance of early skin-to-skin contact for all mothers and their babies, and enable this to occur if appropriate within the context of the clinical situation.

It has been shown that postnatal care programmes such as the Baby Friendly Initiative which help promote undisturbed mother-infant contact improve breastfeeding success<sup>3-5</sup>. These initiatives are likely to be of particular benefit to mothers with diabetes and their babies, who may be more vulnerable to the negative psychological impact of a high risk medical condition in pregnancy<sup>10</sup>.

## 6.6 Early feeding

Babies born to women with diabetes should be fed as soon as possible after birth and all should receive their first feed within four hours of birth, unless contraindicated for medical reasons.

[SIGN Guidelines No.9]

[Diabetes NSF – Intervention details;

[www.publications.doh.gov.uk/nsf/diabetes/ch2/interventions/pregnancy.htm](http://www.publications.doh.gov.uk/nsf/diabetes/ch2/interventions/pregnancy.htm)]

Early feeding of babies of mothers with diabetes is recommended to prevent neonatal hypoglycaemia and enhance lactation<sup>11,12</sup>. Seventy-seven per cent (75/97) of babies in the enquiry received their first feed while on the labour ward; ninety-five per cent of 59 babies remaining with their mothers compared to 50% of 38 babies admitted to a neonatal unit ( $p<0.001$ ). The location of the first feed was not documented for 13% of babies.

It is possible that the clinical condition of a proportion of babies admitted to the neonatal unit did not allow feeding and in particular breastfeeding; however, these findings suggest that at least half of the babies admitted to a neonatal unit were well enough to breastfeed.

## 6.7 Type of milk given at first feed

Breastfeeding is recommended, but all mothers should be supported in the feeding method of their choice.

[CEMACH Diabetes Multidisciplinary Resource Group – standard derived from SIGN Guideline No.9]

[Diabetes NSF – Intervention details;

[www.publications.doh.gov.uk/nsf/diabetes/ch2/interventions/pregnancy.htm](http://www.publications.doh.gov.uk/nsf/diabetes/ch2/interventions/pregnancy.htm)]

The establishment of early breastfeeding is especially important for babies of diabetic mothers, who may be hypoglycaemic at birth<sup>13</sup>. However, infant formula was the most frequently recorded first feed in the neonatal enquiry, being given to 63% (67/106) of babies; this was more common in babies who were admitted to a neonatal unit ( $p<0.01$ ) (Table 6). It is recognised that breastfeeding might be delayed if delivery is by caesarean section; 61% of the 67 babies who had infant formula at first feed were delivered by caesarean section.

Maternal breast milk, usually by breastfeeding, was the first feed overall for 40% of 106 babies in the enquiry (50% of 68 babies remaining with their mothers and 21% of 38 babies admitted to a neonatal unit,  $p=0.003$ ). Donor breast milk was given to only two babies.

**Table 6**

Type of milk at first feed for term babies of mothers with type 1 and type 2 diabetes

Type of milk*	Babies remaining with mother (N=70)		Babies admitted to NNU (N=42)		Total (N=112)	
	n	%	n	%	n	%
Maternal breast milk	34	50	8	21	42	40
Donor breast milk	2	3	0	0	2	2
Infant formula	36	53	31	82	67	63
<i>Type of milk at first feed not recorded</i>	2		4		6	

\*some babies had more than one option for first feed ticked.

The first feed was not the mothers' intended type of feed for 28% (27/96) of babies (16% of 62 babies remaining with their mothers and 50% of 34 babies admitted to a neonatal unit ( $p<0.001$ )). Information about mothers' intended type of feed was not available for 14% (8 babies in each group) of babies.

While it is recognised that there may be a number of factors which affect breastfeeding, infant formula supplementation may suppress the process of normal metabolic adaptation after birth<sup>14, 15</sup> and formula milk should therefore not be the first choice for babies of mothers with diabetes.

### 6.8 Breastfeeding support

Only 28% (29/105) of mothers with diabetes who intended to breastfeed were documented to have received support with breastfeeding within the first hour after birth (37% of 65 mothers whose babies remained with them and 13% of 40 mothers whose babies were admitted to a neonatal unit,  $p=0.007$ ). The panels' view was that supporting breastfeeding was not possible for 23% (9/40) of babies admitted to a neonatal unit and 2% (1/65) of babies remaining with their mothers (Table 7). In five cases this was due to babies requiring urgent transfer to the neonatal unit and in three cases due to the clinical condition of the mother (in two cases the panel did not give the reason for breastfeeding support being impractical).

It is recognised that lack of documentation of breastfeeding support does not necessarily equate to a lack of such support. However, maternity units should ensure that all women, including those with diabetes, have access to breastfeeding support soon after delivery.



**Table 7**

Documented evidence of breastfeeding support on the labour ward for mothers with type 1 and type 2 diabetes

Breastfeeding support	Babies remaining with mother (N=70)		Babies admitted to NNU (N=42)		Total (N=112)	
	n	%	n	%	n	%†
Yes	24	37	5	13	29	28
No	23	35	14	35	37	35
Not possible	1	2	9	23	10	10
Not applicable*	17	26	12	30	29	28
Missing	5		2		7	

\* Breastfeeding was not mother's intended method of feeding.

† Percentages are calculated from all babies in relevant category excluding those where data was missing.

## 6.9 Temperature control

Infants of mothers with diabetes are potentially at risk of hypoglycaemia which could be further exacerbated by cold stress. It is therefore important that these babies should be kept warm.

The median temperature [interquartile range, IQR], (range) first recorded for babies in the neonatal enquiry was 36.8°C [36.6-37.0], (35.3 - 38.0) for babies remaining with their mothers and 36.7°C [36.4-37.0], (35.0 - 37.8) for those admitted to a neonatal unit. The median time of the first temperature recording was 80 minutes.

Panels were asked whether the baby's temperature was maintained appropriately while on the labour ward (i.e. if the baby's temperature was less than 36°C, did it reach 36°C?). Twenty-one per cent (13/62) of babies who had temperature documented were described by panels as not receiving optimal thermal management on the labour ward.

### 6.10 Panel assessment of place of babies' care

All babies should remain with their mothers during the neonatal period unless there is a specific medical indication for admission to a neonatal unit.

[SIGN Guidelines No.9]

[Diabetes NSF – Intervention details;

[www.publications.doh.gov.uk/nsf/diabetes/ch2/interventions/pregnancy.htm](http://www.publications.doh.gov.uk/nsf/diabetes/ch2/interventions/pregnancy.htm)

Separation of mother and baby at birth may affect a number of important processes such as early establishment of breastfeeding, temperature control and emotional bonding. National guidance for the management of pregnant women with diabetes state that these babies should remain with their mothers and only be admitted to a neonatal unit if there is a specific medical indication to do so<sup>11, 12, 13</sup>.

The location of care after birth was assessed by panels to be inappropriate for 23% (24/103) of babies, with this assessment being more common for babies admitted to a neonatal unit (53% of 40 babies admitted to a neonatal unit versus 5% of 63 babies remaining with their mothers,  $p < 0.001$ ) (Table 8).

**Table 8**

Panel assessment of appropriate place of care for term babies of mothers with type 1 and type 2 diabetes

	Babies remaining with mother (N=70)		Babies admitted to NNU (N=42)		Total (N=112)	
	n	%	n	%	n	%
Appropriate	60	95	19	48	79	77
Not appropriate	3	5	21	53	24	23
Missing	7		2		9	

Panels made 14 comments on the 24 babies considered to have an inappropriate place of care: all comments related to the fact that the baby was well and should not have been sent to a neonatal unit. The reason for inappropriate place of care was not given by panels for the eight remaining babies.

These findings are in keeping with results published earlier by CEMACH<sup>2</sup>. It is recognised that there are resource pressures for most postnatal wards which may affect local decisions about the place of care for these babies. Increased neonatal input within a transitional care unit setting may help maternity teams feel more confident that these babies will be as safe with their mothers on a postnatal ward as if they were nursed in a neonatal unit.

### 6.11 Panel assessment of overall care on the labour ward

Panels assessed that overall care on the labour ward for babies of women with type 1 and type 2 diabetes, was suboptimal for 60% of 104 babies, with no difference between babies remaining with their mothers and babies admitted to a neonatal unit. (Table 9).

**Table 9**

Panel assessment of overall care on the labour ward for term babies of mothers with type 1 and type 2 diabetes

Assessment of care	Babies remaining with mother (N=70)		Babies admitted to NNU (N=42)		Total (N=112)		OR [95% CI] (admission to NNU vs remaining with mother)
	n	%	n	%	n	%	
Optimal	29	44	13	34	42	40	1.5 [0.7-3.5]
Suboptimal	37	56	25	66	62	60	
Insufficient information	4		4		8		

Panels made 99 comments on 62 babies with suboptimal overall care on the labour ward (Table 10). The most frequently recorded concerns were:

- timing of blood glucose tests – too early or too late;
- no close early contact between mother and baby or breastfeeding opportunities;
- allowing the baby to get cold and
- lack of plan of care.

**Table 10**

Panel comments on suboptimal overall care on the labour ward in term babies of mothers with type 1 and type 2 diabetes

	No. of comments	% of babies with suboptimal care on labour ward (N=62)
<b>Blood glucose</b>	<b>22</b>	<b>35</b>
Done too soon	7	
Substandard management	7	
Delayed	5	
Lack of monitoring	2	
No documentation	1	
<b>Feeding</b>	<b>22</b>	<b>35</b>
No skin to skin contact/breast feeding opportunity	11	
Delayed feeding	7	
Suboptimal staff attitudes to breastfeeding	2	
Other management	1	
No documentation	1	
<b>Temperature</b>	<b>29</b>	<b>47</b>
Allowed to get cold	12	
Lack of monitoring	9	
Not documented	8	
<b>Overall management</b>	<b>21</b>	<b>34</b>
Lack of plan of care	12	
Admitted to NNU inappropriately	5	
Lack of clinical assessment	2	
Lack of guidelines/protocol	2	
<b>Other</b>	<b>5</b>	<b>8</b>

Suboptimal care on the labour ward was considered to have impacted on subsequent care for 48% (30/62) of babies (32% of 37 babies remaining with their mothers and 72% of 25 babies admitted to a neonatal unit,  $p < 0.01$ ). The areas of care affected were feeding (for fourteen babies), blood glucose management (for five babies), temperature control (for three babies), and other aspects of care for four babies. For four babies, panels did not give details about which aspects of care had been affected.

These findings highlight the need for national and local guidance on the neonatal care of babies of mothers with diabetes, and the importance of regular training of junior paediatric staff and midwives involved in the care of these babies.

## 7 Care of babies remaining with their mothers

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### Learning points

- More than three-quarters of babies who remained on the postnatal ward with their mothers received infant formula milk.
- The main reason for babies receiving infant formula milk was maternal choice (in half of cases).
- The majority of admissions from postnatal ward to a neonatal unit were avoidable.

This Chapter relates to the 70 babies who initially remained with their mothers on a postnatal ward, transitional care unit or on the labour ward in a maternal high dependency unit. It does not include babies who returned to be with their mothers on a postnatal ward after initial admission to a neonatal unit. Based on data available for 44 out of 70 babies, the median age and interquartile range [IQR] at admission to the postnatal ward was 3.5 hours [2.5-4.8].

### 7.1 Feeding

Infant formula was given to 81% (55/68) and maternal breast milk to 65% (44/68) of babies remaining with their mothers. The type of milk given was different from the intended method of feeding at delivery for 33% (22/67) of mothers.

There was documented evidence of a discussion with the parents regarding feeding once on the postnatal ward or transitional care unit for half (51%, 33/65) of babies who remained with their mothers.

85% (58/68) of babies remaining with their mothers had at least one supplementary feed before day three. The majority of these supplementary feeds were infant formula but three babies had a supplementary feed of breast milk given by another route. Informed consent regarding supplemental feeding was documented in 58% of 31 medical records for which this question was answered.

The main reason documented for babies being given formula milk was maternal choice for 56% (31/55) of babies. For 38% (21/55) of babies, there was a documented clinical indication for formula milk. This included hypoglycaemia in 14 babies (in one case with clinical signs), difficulty with breastfeeding (with associated hypoglycaemia) in one baby, and “other” indications in one baby. For five babies, there was no information about the clinical indication for formula milk. Panels assessed that the clinical decision for formula milk was valid in 18 out of 20 cases.

Seven babies had more than one documented reason for being given formula milk.

Overall, panels assessed that the feeding of babies remaining with their mothers was clinically appropriate in 87% (59/68) of cases. Panels made nine comments on nine babies about inappropriate feeding (Table 11).

**Table 11**

Panel comments on inappropriate feeding in term babies of mothers with type 1 and type 2 diabetes, who remained with their mothers after birth

	No. of comments
Given bottle by staff at night	3
Long interval between feed	2
Lack of breastfeeding support	2
No clinical reason to give formula	1
Missing	1

Breastfeeding rates for babies of diabetic mothers may be improved by pre-pregnancy and antenatal education for women with diabetes about the benefits of breastfeeding for their babies. While formula milk may be given on the postnatal ward due to concerns about babies receiving insufficient breast milk and consequent neonatal admission, maternity staff involved in postnatal care need to be aware that early breastfeeding can avoid the need for formula milk in these babies.

## 7.2 Temperature control

As previously noted, neonatal hypoglycaemia in infants of diabetic mothers can be exacerbated by cold stress, and it is therefore important that these babies are kept warm.

Panels were asked whether babies' temperature was maintained appropriately while on the postnatal ward. Temperature measurements are not routinely required for babies of diabetic mothers who are admitted to a postnatal ward, and this is reflected in the fact that temperature was not documented in 51% of 67 babies. However, five of the 33 babies for whom this information was available were assessed by panels to have received suboptimal thermal care. The comments made by panels for these babies were equally distributed between lack of temperature monitoring and poor management of temperature control.

## 7.3 Movement of babies from postnatal ward or transitional care unit

By day three of life, 33 of 68 babies on the postnatal ward or transitional care unit were discharged from hospital, and 30 babies were still in hospital with their mothers. Five babies were admitted from the postnatal ward or transitional care unit to the neonatal unit. Panels assessed that the decision for discharge or admission to neonatal unit was appropriate for 66 out of 68 babies for whom there was information available in the medical records.

## 7.4 Babies admitted to the neonatal unit from the postnatal ward or transitional care unit

There were five babies admitted to the neonatal unit after having initially been admitted to the postnatal ward with their mothers after birth. The age at admission was available for only two of these babies: 5.6 and 13.3 hours. Length of stay in the neonatal unit was only recorded for three out of five babies, and was 18.8, 25.5 and 48 hours respectively.

The decision to admit was made by paediatric staff: the senior house officer (SHO) in two cases, a middle grade paediatrician in two cases and an advanced neonatal nurse practitioner in one case. A discussion with the parents about the reason for admission was documented in two out of five cases.

The reasons for admission were hypoglycaemia in three cases, hypoglycaemia and hypothermia in one case and jaundice in one case. There were no clinical signs of hypoglycaemia in the four babies admitted due to hypoglycaemia. Panels assessed that four out of the five admissions were potentially avoidable.

The median temperature on admission to the neonatal unit was 36.8°C [IQR 36.0, 37.3] in the four babies for whom admission temperature was available in the medical records.

The decision to admit to a neonatal unit had an impact on the subsequent care of two of the five babies: in one, this related to problems with feeding and blood glucose management, and for the other baby problems with blood glucose management. This supports the case for offering alternative arrangements such as transitional care to enhance the quality of neonatal care within maternity wards.

Two of the five babies admitted to the neonatal unit from the postnatal ward or transitional care received breast milk and their mothers were shown how to maintain lactation; however both these babies also received formula milk, by bottle, tube or cup. Two babies received intravenous fluids: one had an intravenous dextrose infusion and one an intravenous bolus of dextrose. Panels assessed that feeding practices were appropriate in four cases (one baby had missing data) and that management of feeding did not impact on subsequent care.

## 8 Care of babies admitted to a neonatal unit directly from labour ward

### Learning points

- Over half of all neonatal admissions were assessed by panels to be avoidable.
  - Two-thirds of these babies had no specific medical indication for admission
  - A fifth had suboptimal thermal care on the labour ward.
- Subsequent care, mainly feeding, was adversely affected for two-thirds of babies assessed to have avoidable admissions to the neonatal unit.
- All babies admitted to a neonatal unit were given formula milk.
- There was documented evidence of breastfeeding support for less than half of mothers whose babies were admitted to a neonatal unit.

### 8.1 Age at admission to neonatal unit

The following data relate to the 42 babies initially admitted from labour ward to a neonatal unit for special care. They do not include babies moved to a neonatal unit after initial admission to a postnatal ward or transitional care unit; these have been described separately (see section 7.3). Based on the data available (28 out of 42 babies), the median age at admission was 2.1 hours (IQR 0.7-5.4, range 0.2 - 10.7).

### 8.2 Reason for admission to a neonatal unit

The reason for admission to the neonatal unit was determined from the reason for admission recorded by panel assessors after review of the medical records, and also from panels' assessment of diagnoses at discharge from the neonatal unit (Table 12). The three main reasons found were:

- a) hospital policy of admitting well babies of mothers with diabetes (33%);
- b) non symptomatic hypoglycaemia in a well baby (30%) and
- c) babies who were admitted for clinical reasons such as poor feeding and respiratory problems (38%).

**Table 12**

Panel assessments of the reasons for admission to the neonatal unit of term babies of mothers with type 1 and type 2 diabetes

	No. of comments	% of babies
Hospital policy (infant of mother with diabetes)	13	33
Non-symptomatic hypoglycaemia in a well baby	12	30
Baby clinically less well:	15	38
Hypothermia (with hypoglycaemia)	5	
Poor feeding (with hypoglycaemia)	3	
Macrosomia (otherwise well baby)	2	
Respiratory difficulties	4	
Other medical condition (cardiac)	1	
Not known	1	
Missing	1	



Panels were asked if there were any abnormal clinical signs consistent with hypoglycaemia at the time of admission. There were three babies who were recorded to be jittery, but none with convulsions, reduced level of consciousness or abnormal tone.

### 8.3 Decision for admission to the neonatal unit

A paediatrician made the decision to admit a baby to the neonatal unit from the labour ward in 74% (31/42) of cases, with this being the paediatric senior house officer in 57% (24/42) of cases. The advanced neonatal nurse practitioner (ANNP) was involved in the decision to admit two babies, and the midwife was involved in the decision to admit a further two babies. Information on who had made the decision to admit was not available for nine babies.

### 8.4 Avoidable admissions to neonatal unit from labour ward

All babies should remain with their mothers during the neonatal period unless there is a specific medical indication for admission to a neonatal unit.

[SIGN Guidelines No.9]

[Diabetes NSF – Intervention details;

[www.publications.doh.gov.uk/nsf/diabetes/ch2/interventions/pregnancy.htm](http://www.publications.doh.gov.uk/nsf/diabetes/ch2/interventions/pregnancy.htm)]

Panels assessed that 57% (24/40) of admissions to the neonatal unit from the labour ward could have been avoided.

Panels made 24 comments for the 24 babies with avoidable admissions to the neonatal unit (Table 13). In 63% of cases (15/24) no medical indication was identified.

**Table 13**

Panel comments on avoidable admissions to the neonatal unit of term babies of mothers with type 1 and type 2 diabetes

	No. of comments	% of babies
No medical reason for admission	15	63
Allowed to get cold	5	21
Delay in initiating breastfeeding/feeds	2	8
Poor maternal blood glucose management during labour and delivery	1	4
Blood glucose tested too early	1	4



Panels felt that avoidable admissions to the neonatal unit adversely affected subsequent care for 65% of 23 babies out of the 24 babies (Table 14). The main area of care affected was feeding (in 12 instances).

**Table 14**

Panel assessment of the impact of avoidable neonatal admissions on subsequent care for term babies of mothers with type 1 and type 2 diabetes

Aspect of care affected	No. of comments* (N=23)	% of babies† (N=23)
Feeding	12	86
Blood glucose management	4	29
Temperature control	4	29
Other (separation from the mother)	4	29

\*Multiple options were allowed.

†Panels did not make comments for 9 babies.

In conclusion, only a third of babies were assessed by panels as needing admission to the neonatal unit for medical reasons. This reinforces the need for regular training of midwives and junior paediatric staff, and access to senior paediatric advice and support.

### 8.5 Communication to parents and timing of admission

It was documented for 36% (14/39) of babies that neonatal staff had, at the time of admission, explained to the parents the reasons for admission and anticipated care.

The median time interval from decision to admit to actual admission was 0.5 hours [IQR 0.23-1.33]. Panels assessed that this time interval was appropriate for 74% of the 27 babies for whom information was available.

### 8.6 Management of temperature

Based on the data available (37 out of 42 babies), the median temperature on admission was 36.70C [IQR 36.4-37.0], (range 35.3, 37.8). Panels were asked whether the temperature of the baby was maintained appropriately whilst on the neonatal unit (i.e. if temperature was less than 36°C, did it reach 36°C?). Temperature monitoring subsequent to admission was not documented or missing in 21% (9/42) of babies admitted to neonatal unit. Of the remaining 33 babies, 9% (3/33) were assessed by panels not to have had their temperature maintained adequately during their stay on neonatal unit.

### 8.7 Feeding

A record of communication with parents regarding feeding once the baby was admitted to the neonatal unit for special care was present in 58% (21/36) of the medical records. Parental consent regarding supplemental feeding was recorded in the notes of 47% of 30 babies who were noted by panels to have received supplemental feeding.

The type of enteral feed given while on the neonatal unit was documented in 41/42 babies. Infant formula was the most frequently recorded type of enteral feed given at first feed (41 babies), either as an exclusive method or in association with other types of enteral feed. Breast milk was given in 25 instances but never exclusively. Donor milk was given in one instance in association with another type of milk.

There was evidence that the mother was shown how to feed and maintain lactation (e.g. express breast milk) when separated from her baby in only 42% (13/31) of cases; in eight cases this was not applicable as the mother did not wish to breastfeed, and data was missing for three babies.

Forty-three per cent (17/40) of babies received intravenous (IV) fluids/feeding while on the neonatal unit: fifteen babies received an intravenous glucose infusion, six babies received an intravenous bolus of dextrose and two babies received other non-specified intravenous fluids.

Panels assessed that feeding was appropriate for 67% (26/39) of babies.

The finding that formula milk was given to all babies admitted to the neonatal unit, either as an exclusive method or in association with breast milk, implies that babies admitted for "routine" reasons were given infant formula for no sound medical reason.

#### 8.7.1 Impact of overall management on feeding

Panels assessed that, over and above the fact of being on the neonatal unit, overall management of the baby was likely to have had an impact on establishment of feeding for 41% (15/37) of babies; 48% of babies when there was maternal intention to breastfeed and 29% of babies whose mothers did not intend to breastfeed ( $p=0.25$ ) (Table 15).

**Table 15**

Panel assessment of the impact of overall management on establishment of feeding

	Maternal intention to breastfeed				Total	
	Yes (N=25)		No (N=17)		(N=42)	
	n	%	n	%	n	%
Likely	11	48	4	29	15	41
Unlikely	12	52	7	71	22	59
Not enough information	1		2		3	
Missing	1		1		2	

Panels were asked if there were any clinical maternal reasons that prevented the mother from visiting her baby on the neonatal unit. This was the case for 34% (12/35) of babies. These related mainly to maternal surgical conditions: nine mothers were recovering from caesarean section, one had a post-operative complication and one needed a further surgical procedure. One mother had problems with hypertension.

## 8.8 Length of stay and discharge from the neonatal unit

The median length of stay on the neonatal unit for the 18 out of 42 babies for whom this information was available, was 28.4 hours [IQR 23.0-46.2], (range 6 – 94.3 hours).

At day three of life, twenty-two babies initially admitted to the neonatal unit had returned to the postnatal ward, three had been transferred to a transitional care unit, 11 were still on the neonatal unit and four babies had been discharged home (Table 16). Four of these decisions were thought to be inappropriate by panels: a) one case of a baby transferred from the neonatal unit to the postnatal ward and then discharged home within hours; b) three babies who should have gone back to their mothers on the postnatal ward or transitional ward instead of staying on the neonatal unit.

**Table 16**

Place of care at day three of life, for term babies of mothers with type 1 and type 2 diabetes, who had initially been admitted to the neonatal unit

	Panel assessment of destination			Total
	Appropriate destination (N=33)	Inappropriate destination (N=4)	Missing (N=5)	
Home	3	0	1	4
Postnatal ward	20	1	1	22
Stayed in NNU	8	2	1	11
Transitional care	2	1	0	3
Missing	0	0	2	2

Most babies admitted to the neonatal unit were discharged within just over 24 hours. This, together with the finding that a third of babies were admitted due to routine hospital policy, may suggest that a number of these babies could have been appropriately managed in a postnatal ward or transitional care setting. Prevention of routine admission of these babies to neonatal units needs to be supported both nationally and at hospital level. For babies that do need admission, communication with parents regarding the reasons for admission and any supplemental feeding, together with adequate early feeding support for mothers, is important to minimise any potential negative impact on breastfeeding and on the emotional wellbeing of the parents.



## 9 Blood glucose management

### Learning points

- The first blood glucose measurement was often performed too early:
  - in the first two hours after birth in most instances
  - significantly earlier in babies admitted to a neonatal unit.
- The process of blood glucose testing was often inaccurate:
  - A reagent strip was documented to have been used in half of the cases
  - Post-feed testing occurred in a quarter of cases.
- Documentation of blood glucose management was poor in over two-thirds of babies', and this was more common on the postnatal ward.

### 9.1 Timing and results of blood glucose measurements

Babies of a mother with diabetes should have a test of blood glucose concentration by four to six hours of age, before a feed.

[CEMACH Multidisciplinary Resource Group]

[Diabetes NSF – Intervention details;

[www.publications.doh.gov.uk/nsf/diabetes/ch2/interventions/pregnancy.htm](http://www.publications.doh.gov.uk/nsf/diabetes/ch2/interventions/pregnancy.htm)]

After birth neonatal blood glucose concentration falls rapidly, reaches a nadir at one hour, then rises and stabilises by three hours even without nutritional substrate<sup>16,17,18</sup>. Blood glucose testing is therefore best avoided during the first two to three hours after birth as measurements may only record this initial physiological fall<sup>19</sup>.

Panels were asked to document all blood glucose measurements recorded in the medical or nursing notes during the first three days of life.

The first blood glucose test was performed significantly earlier in babies admitted to a neonatal unit (median of 1.2 hours) than in babies remaining with their mothers (median of 2.1 hours,  $p=0.01$ ) (Table 17). Panels were asked if there were abnormal clinical signs attributable to hypoglycaemia at the time of the first blood glucose measurement: two babies were described as jittery with no other symptoms.

These findings are in keeping with the previous CEMACH report which suggested that blood glucose testing was often performed too soon, uncovering the physiological fall in blood glucose level after birth and potentially leading to unnecessary early admissions to the neonatal unit<sup>2</sup>.

For term babies of diabetic mothers who are otherwise well with no clinical signs of hypoglycaemia, avoiding blood glucose testing in the first two hours after birth, should be considered<sup>12, 15</sup>.

**Table 17**

Blood glucose measurements in the first 3 days of life in term babies of mothers with type 1 and type 2 diabetes

	Babies remaining with mother (N=70) (median [IQR] (range))		Babies admitted to NNU (N=42) (median [IQR] (range))		p-value
Time of first blood glucose measurement (hours)	2.1 [1.0 - 4.3] (0.1 - 9.6)	(n=58)	1.2 [0.4 - 2.0] (0 - 7.6)	(n=34)	0.01
First blood glucose value (mmol/L)	2.8 [2.3 - 3.7] (0.8 - 9.0)	(n=68)	2.5 [2.0 - 3.3] (0.8 - 5.7)	(n=39)	0.1
Blood glucose values during first 3 days (mmol/L)	3.2 [2.8, 3.6] (1.5 - 4.7)	(n=69)	3.3 [2.9, 3.7] (1.9 - 4.2)	(n=40)	0.3
Lowest blood glucose value (mmol/L)	2.3 [1.9, 2.7] (0.8 - 3.9)	n=69	1.9 [1.4, 2.3] (0.2 - 4.1)	(n=40)	0.002

The diagnosis of hypoglycaemia should be made using a ward-based glucose electrode or laboratory method, and not by reagent strip testing.

[CEMACH Multidisciplinary Resource Group]

[Diabetes NSF – Intervention details;

[www.publications.doh.gov.uk/nsf/diabetes/ch2/interventions/pregnancy.htm](http://www.publications.doh.gov.uk/nsf/diabetes/ch2/interventions/pregnancy.htm)]

Glucose reagent strips are not reliable as they are likely to give falsely low readings in neonates, and are now regarded as contraindicated in these babies<sup>20</sup> with at least one reliable laboratory value required to make the diagnosis of hypoglycaemia<sup>17</sup>. The suitability of a portable glucose photometer such as HaemoCue to detect neonatal hypoglycaemia is not universally accepted<sup>21-23</sup> and if used as screening, an abnormal result should be followed by laboratory confirmation<sup>24</sup>. More accurate laboratory or ward-based glucose electrode measurements are preferable among babies at risk<sup>20</sup>, even if done less frequently.

Reagent strip was the main documented method of testing neonatal blood glucose, followed by HaemoCue (Haemocue®, Angelholm, Sweden) and glucose electrode methods. In many cases, there was no documentation of the method used (Table 18).

**Table 18**

Method used for first blood glucose measurement in babies of mothers with type 1 and type 2 diabetes

Method used	% of babies*
HaemoCue	10
Reagent strip	48
Glucose electrode method	4
<i>Yellow Springs</i>	0
<i>Blood gas analyser</i>	3
<i>Other glucose electrode method</i>	2
Other	1
Not documented	37

\* Babies could have been tested using more than one method.

It is important to note that while the term 'BM' in the medical records was taken in the neonatal enquiry to denote reagent strip testing, there is a possibility that the term was used in a more generic sense by maternity staff to mean 'blood glucose'. In any event, hospitals should ensure that the diagnosis of neonatal hypoglycaemia is made using ward-based glucose electrode or laboratory methods and not by reagent strip <sup>2, 11</sup>.

### 9.2.1 Timing of blood glucose measurement in relation to feeding

Blood glucose testing should be performed before a feed <sup>2, 12</sup>. In the enquiry, 68% of the tests were done pre-feed and 26% of the tests were done post feed, with no difference between babies remaining with their mother and those admitted to a neonatal unit (Table 19).

**Table 19**

Timing of first blood glucose measurement in relation to feeding in term babies of mothers with type 1 and type 2 diabetes

	Babies remaining with mother (N=70)		Babies admitted to NNU (N=42)		Total (N=112)	
	n	%	n	%	n	%
Pre feed	43	64	28	74	71	68
Post feed	18	27	9	24	27	26
Random	6	9	1	3	7	7
Not documented	3		4		7	

### 9.2.2 Documentation of blood glucose testing

Panels assessed that overall documentation of blood glucose measurements was more frequently suboptimal for babies remaining on the postnatal ward (81%, 57/69 of babies) than for babies admitted to the neonatal unit (53%, 20/38 of babies,  $p < 0.001$ ). Panels made 124 comments about the reasons why documentation was considered to be suboptimal in these 77 babies' records (Table 20). The two main concerns were lack of documentation of the methods used and lack of a written plan following the blood glucose test.

**Table 20**

Panel comments on poor documentation of blood glucose measurements in term babies of mothers with type 1 and type 2 diabetes

	No. of comments (N=124)	% of babies with suboptimal documentation (N=77)
No documentation of methods used	30	39
No written plan following blood glucose test	23	30
Inappropriate method of blood glucose testing	22	29
Pre and post feed not specified	11	14
“BM” stated as the method of testing	10	13
Baby and mother Blood glucose recorded in the same notes – confusing	11	14
Poor notes design	6	8
Timing of blood glucose testing or feeding not recorded	5	6
Notes/charts not available	4	5
Others	2	3

Standardised templates for documentation of postnatal care specific to babies of mothers with diabetes may help to improve these issues.



## 10 Conclusions

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This report on term babies born to mothers with type 1 and type 2 diabetes suggests that there is scope for improvement in the areas of breastfeeding support, blood glucose testing and documentation of care. It also suggests that staff may not always have easy access to clear guidance on how to manage these babies. A number of recommendations have been made in this report, and the national Diabetes in Pregnancy guideline currently being developed by the National Institute for Health and Clinical Excellence (NICE), is anticipated to include guidance on neonatal care.

Perhaps the most important finding, however, is that many babies entering the world as healthy infants of mothers with diabetes are admitted to neonatal units and separated from their mothers for no sound medical reason, with possible consequences on the establishment of breastfeeding. The structure of most maternity units, with neonatal expertise predominantly concentrated in the neonatal unit, may partly explain why staff are reluctant to provide neonatal care, even when clinically possible, on the postnatal ward. There should be an alternative to the policy of routine neonatal admission, with neonatal care expertise delivered closer to the mother. It is hoped that this report will encourage debate on how basic neonatal care can best be provided in maternity units to babies of mothers with diabetes.



## 11 Some quotes from the panel discussions

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### Examples of good practice

'A unit Neonatal Alert Form - completed during pregnancy providing details for the neonatal team including expected date of delivery. A copy is attached in the obstetric notes.'

'Good: transitional care excellent, breastfeeding support excellent.'

### Unnecessary admissions/separation

'Separated from mother for no clinical reason, affected establishment of feeding, unnecessary blood glucose measurements.'

'Should not have got cold, should not have gone to the neonatal unit, could have ended up breastfeeding.'

'Routine admission to the neonatal unit, breastfeeding not initiated, unnecessary procedures.'

'No clinical indication for baby to have been separated from mother so quickly.'

### Suboptimal blood glucose testing

'Blood glucose taken too early, knock-on effect of care and breastfeeding establishment.'

'Blood glucose done too soon and therefore mother and baby may not have needed to be separated.'

'First measurement at 7 1/2 hours then no more monitoring.'

'No documentation of method of testing used except 'BM'.'

'Blood glucose with no laboratory confirmation before 15 % IV dextrose.'

### Barriers to breastfeeding

'Infant formula milk given on labour ward, no skin-to-skin contact.'

'No skin-to-skin contact, direct admission to neonatal unit, no thermal monitoring.'

'Panel felt that attempts should have been made to express mother's milk when it was clinically indicated to feed baby.'

'Mother wanted to breastfeed, but paediatric SHO overrode this and made the feed to be infant formula.'

**Poor documentation**

'No management plan of care when baby transferred to postnatal ward and baby was left for eight hours without a feed and not enough true blood glucose results.'

'Angry and defensive notes, unprofessional documentation in notes. Documentation -plan written before baby was hypoglycaemic, if baby was hypoglycaemic - plan correct, if not - plan incorrect.'

## 12 References

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## Appendix A Diabetes neonatal enquiry steering group

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Ms Alison Johns	Transitional Care Sister, Neonatal Services Elizabeth Garrett Anderson & Obstetric Hospitals, UCLH
Ms Caron Gooch	Diabetes Specialist Midwife University Hospital Lewisham
Ms Joan Oliver	Head Neonatal Nurse Special Baby Unit, Wansbeck General Hospital
Ms Alree Hunt	Modern Matron SCBU Queen Elizabeth Hospital NHS Trust
Justine Pepperell	Family Support Manger BLISS





## **Confidential Enquiry into Maternal and Child Health**

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### **Diabetes Neonatal Enquiry**

**Do not keep any copies  
or duplicates of this form**

Enquiry reference number:

\_\_\_\_\_

**If you have any queries,  
please contact your CEMACH Regional Manager**



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## **NEONATAL CARE STANDARDS**

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*Where panels are asked for their opinion, please keep the following neonatal care standards in mind.*  
Source: Confidential Enquiry into Maternal and Child Health: Pregnancy in women with Type 1 and Type 2 Diabetes in 2002-03, England, Wales and Northern Ireland. London: CEMACH; 2005.

Labour and delivery should be undertaken in a maternity unit with facilities for the resuscitation and stabilisation of babies and with personnel skilled in advanced resuscitation immediately available on a 24-hour basis.

[SIGN guidelines No.9]  
[Diabetes NSF – Intervention details; [www.publications.doh.gov.uk/nsf/diabetes/ch2/interventions/pregnancy.htm](http://www.publications.doh.gov.uk/nsf/diabetes/ch2/interventions/pregnancy.htm)]

All babies should remain with their mothers during the neonatal period unless there is a specific medical indication for admission to a neonatal unit.

[SIGN guidelines No.9]  
[Diabetes NSF – Intervention details; [www.publications.doh.gov.uk/nsf/diabetes/ch2/interventions/pregnancy.htm](http://www.publications.doh.gov.uk/nsf/diabetes/ch2/interventions/pregnancy.htm)]

Babies born to women with diabetes should be fed as soon as possible after birth and all should receive their first feed within four hours of birth, unless contraindicated for medical reasons.

[SIGN guidelines No.9]  
[Diabetes NSF – Intervention details; [www.publications.doh.gov.uk/nsf/diabetes/ch2/interventions/pregnancy.htm](http://www.publications.doh.gov.uk/nsf/diabetes/ch2/interventions/pregnancy.htm)]

Breast feeding is recommended, but all mothers should be supported in the feeding method of their choice.

[CEMACH Diabetes Multidisciplinary Resource Group - standard derived from SIGN Guideline No. 9]  
[Diabetes NSF – Intervention details; [www.publications.doh.gov.uk/nsf/diabetes/ch2/interventions/pregnancy.htm](http://www.publications.doh.gov.uk/nsf/diabetes/ch2/interventions/pregnancy.htm)]

Interventions should be guided by blood glucose level and clinical assessment.

[CEMACH Diabetes Multidisciplinary Resource]

Babies of mothers with diabetes should have a test of blood glucose concentration by 4 to 6 hours of age, before a feed.

[CEMACH Diabetes Multidisciplinary Resource]  
Diabetes NSF – Intervention details; [www.publications.doh.gov.uk/nsf/diabetes/ch2/interventions/pregnancy.htm](http://www.publications.doh.gov.uk/nsf/diabetes/ch2/interventions/pregnancy.htm)

The diagnosis of hypoglycaemia should be made using a ward-based glucose electrode or laboratory method, and not by reagent strip testing.

[CEMACH Diabetes Multidisciplinary Resource]  
[SIGN guidelines No.9]



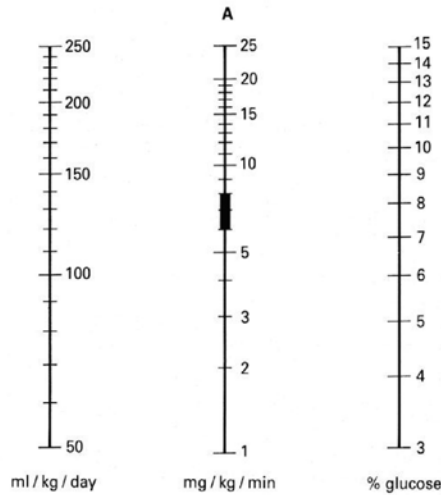
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**GLUCOSE RATE CALCULATOR**

Source: A neonatal Vade-Mecum 2nd Edition, Edited by P.J. Fleming, B.D. Speidel, N. Marlow, P.M. Dunn, *Edward Arnold*; 1991.

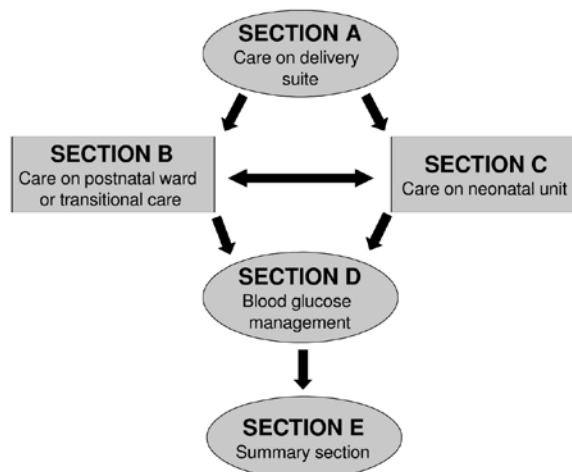
*Metabolic and endocrine problems*



**Fig. 13.1** Glucose rate calculator. Use a straight-edge to determine the glucose infusion rate (column A) mg/kg/min. Normal glucose requirement in the newborn infant is 6–8 mg/kg/min. If this is insufficient to maintain adequate blood levels there is evidence of increased utilization e.g. due to cold stress or hyperinsulinism. (From: Klaus M. H. and Fanaroff A. A. Eds. (1979) *Care of the High-Risk Neonate*. London: W. B. Saunders Co.)

**PANEL GUIDANCE**

*Panel Guidance: please fill in **section A, D and E for all cases. Section B** should be completed if the baby remained with the mother on the postnatal ward or transitional care. **Section C** should be completed if the baby was admitted to a neonatal unit for special care (see flow chart below). In cases where the baby was moved between the neonatal unit and transitional care or postnatal ward in the first 3 days of life please complete all sections.*







**SECTION A: CARE ON DELIVERY SUITE**

**1. Which members of staff were identified as being present at delivery?** *(please tick)*  
*(Adapted from Advanced Neonatal Nurse Practitioner Assessment Project)*

	PRESENT AT DELIVERY	ARRIVED LATER
Midwife	<input type="checkbox"/>	<input type="checkbox"/>
Consultant Obstetrician	<input type="checkbox"/>	<input type="checkbox"/>
Middle grade Obstetrician	<input type="checkbox"/>	<input type="checkbox"/>
SHO in Obstetrics	<input type="checkbox"/>	<input type="checkbox"/>
Neonatal Nurse	<input type="checkbox"/>	<input type="checkbox"/>
ANNP	<input type="checkbox"/>	<input type="checkbox"/>
Consultant Paediatrician or Neonatologist	<input type="checkbox"/>	<input type="checkbox"/>
SpR in Paediatrics or Neonatology	<input type="checkbox"/>	<input type="checkbox"/>
SHO in Paediatrics or Neonatology	<input type="checkbox"/>	<input type="checkbox"/>
Other <i>(please specify)</i>	<input type="checkbox"/>	<input type="checkbox"/>

**2. a) Were there any documented antenatal problems (other than diabetes) affecting the mother or fetus relevant to the subsequent management of the baby?**  Yes  No

**b) If yes, please describe:** \_\_\_\_\_  
 \_\_\_\_\_

**3. a) Was there any documented intra-partum problem relevant to the management of the baby?**  Yes  No *(please go to Q4)*

**b) If yes, please describe:** \_\_\_\_\_  
 \_\_\_\_\_

**c) In the panel's opinion, was it appropriately managed?**  Yes *(please go to Q4)*  No

**d) If no, please describe:** \_\_\_\_\_  
 \_\_\_\_\_

**4. What was the documented Apgar score at:** 1 min?  5 mins?



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CARE ON DELIVERY SUITE continued

**5. If available please give cord blood results in the table below:**

Not available in the notes

	pH	Base Deficit
Arterial	<input type="text"/> . <input type="text"/> <input type="text"/> <input type="text"/>	_____
Venous	<input type="text"/> . <input type="text"/> <input type="text"/> <input type="text"/>	_____
Source not recorded	<input type="text"/> . <input type="text"/> <input type="text"/> <input type="text"/>	_____

**6. a) Was there documented evidence that the baby received cardiorespiratory resuscitation or support immediately after delivery?**

Yes  No

**b) If yes:**

- Was IPPV administered via mask  Yes  No
- Was IPPV administered via tracheal intubation  Yes  No
- Was external chest compression performed  Yes  No
- Were drugs administered  Yes  No
- Was meconium present below cords  Yes  No

**7. a) Was there any evidence of a clear written plan developed for management of the baby?**

Yes (please answer b-f)  No (please go to Q8)  
 Not applicable (please go to Q8)

**b) If yes, did this plan refer to a hospital protocol?**

Yes  No

**c) Did this plan address the following:**

- Recommended location of care for baby  Yes  No
- Blood glucose monitoring  Yes  No
- Temperature management  Yes  No
- Feeding  Yes  No

**d) Was the plan followed?**

Yes fully  No  
 Yes partially

**e) If no or partially, please describe any reasons why:** \_\_\_\_\_  
 \_\_\_\_\_



**f) Who wrote this plan? (Please tick)**

- SHO in Paediatrics or Neonatology
- SpR in Paediatrics or Neonatology
- Consultant Paediatrician or Neonatologist
- Neonatal Nurse
- ANNP
- Midwife
- Consultant Obstetrician
- Middle grade Obstetrician
- SHO in Obstetrics
- Not documented in notes
- Other (please specify) \_\_\_\_\_

**8. a) Was there documented evidence that the mother was given an opportunity for early skin contact, i.e. within 30 minutes of delivery, or as soon as the mother was able to respond following caesarean section? (BFI Step 4)**

- Yes     No     Not possible

**b) If not possible, please state reason:**

**i) Maternal reason:** \_\_\_\_\_

\_\_\_\_\_

**ii) Baby reason:** \_\_\_\_\_

\_\_\_\_\_

**9. a) Was the first feed given on the delivery suite?**

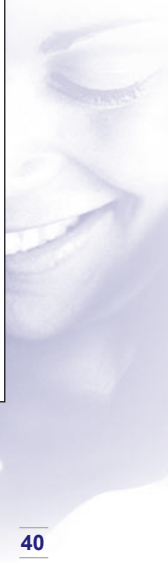
- Yes     No     Location not documented

**b) What was the method of the first feed? (Please tick)**

	Breastfeeding	Bottle	ROUTE Cup	Tube feeding	Method not recorded
Maternal breast milk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Donor breast milk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Formula	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please describe)	_____	_____	_____	_____	_____

**c) Was this the mother's intended method of feeding? (Please see information sourced from CEMACH Diabetes Cohort and Maternal Enquiry Databases Q1).**

- Yes     No     Not documented



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CARE ON DELIVERY SUITE continued

10. a) Was there any documented evidence that the mother received help to initiate breast feeding soon after birth (within the first hour)? (BFI Step 4)
- Yes     No     Not possible
- Not applicable as breastfeeding was not mother's intended method of feeding
- b) If not possible, please state reason: \_\_\_\_\_
- 
11. a) What was the value of the first recorded temperature?     deg C
- b) At what age was this measured?     hours     minutes
12. Was the body temperature maintained appropriately while on the delivery suite? (If  $T < 36$  deg C, did it reach 36 deg C?)
- Yes     No     Not documented
- No, baby was not on delivery suite long enough to stabilize temperature
13. a) Following delivery did the baby go to: (please tick as appropriate)
- A postnatal ward
- Transitional care (See footnote\*)
- Neonatal Unit for Special care
- Other (please describe) \_\_\_\_\_
- 
- b) Does the panel consider that the destination of the baby was:     Appropriate     Inappropriate
- c) If inappropriate, please describe: \_\_\_\_\_
- 
14. a) How does the panel rate the overall care and management of this baby on the delivery suite? (Panel guidance: please take into consideration whether appropriate action was taken in response to blood glucose level, clinical signs, temperature and establishment of feeding – refer to standards).
- Optimal
- Adequate
- Poor
- Insufficient information in the notes to determine

\* **Transitional care:** refers to the care of term or near-term babies not needing high-dependency or intensive care which can safely be delivered without being separated from their mothers in a so-called transitional care unit or nursery.



**CARE ON DELIVERY SUITE** continued

b) If adequate or poor, what issues did the panel identify?

\_\_\_\_\_

c) In the panel's opinion, did these issues adversely impact on any aspects of the subsequent care of the baby:  Yes  No

d) If yes, which aspects (please tick)

- Feeding
- Blood glucose management
- Temperature control
- Other (Please describe) \_\_\_\_\_

*(If the baby went to the postnatal ward or transitional care please go to SECTION B: Care on the Postnatal Ward or in Transitional Care. If the baby was admitted to a neonatal unit for special care, go to SECTION C: Care on the Neonatal Unit)*

**SECTION B: CARE ON THE POSTNATAL WARD OR IN TRANSITIONAL CARE** (See Footnote\*)

15. What was the postnatal age at admission?  hours  minutes  
 Not documented

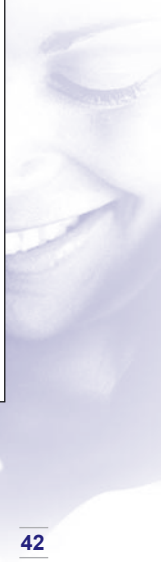
16. Was there any documented evidence of communication with parents regarding feeding once on the postnatal ward or in transitional care?  Yes  No

17. a) What enteral feeds did the baby receive whilst on the postnatal ward or in transitional care? (please tick all that apply):

	Breastfeeding	Bottle	ROUTE Cup	Tube feeding	Method not recorded
Maternal breast milk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Donor breast milk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Formula	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

b) Did the method of feeding change whilst on the postnatal ward or in transitional care from the mother's intended method of feeding at delivery? (please refer to Q9c)  Yes  No  Not documented

\* **Transitional care:** refers to the care of term or near-term babies not needing high-dependency or intensive care which can safely be delivered without being separated from their mothers in a so-called transitional care unit or nursery.



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**CARE ON THE POSTNATAL WARD OR IN TRANSITIONAL CARE continued**

**18. a) If either donor breast milk or formula was given (Q17a), what was the documented reason?**

- Mother's choice
- Clinically indicated (*please describe and go to Q18b*) \_\_\_\_\_
- Other (*please describe*) \_\_\_\_\_

**b) In the panel's opinion was the recorded clinical indication valid?**  Yes  No

**c) If no, please describe why:** \_\_\_\_\_

**d) Was informed consent regarding any supplemental feeding (*feeding over and above mother's choice*) recorded in the notes?**  Yes  No  Not applicable

**19. a) In the panel's opinion, overall was the feeding of the baby clinically appropriate?**  Yes  No

**b) If no, please describe why:** \_\_\_\_\_

**20. a) Was the body temperature of the baby maintained appropriately? (*If T<36 deg C, did it reach 36 deg C?*)**  Yes  No  Not documented

**b) If no, please give details:** \_\_\_\_\_

**21. a) Within the first 3 days, did the baby go: (*please tick as appropriate*)**

- Home
- Stayed in the Postnatal Ward
- Stayed in Transitional Care
- Neonatal unit for special care
- Other (*please describe*) \_\_\_\_\_

**b) Does the panel consider that this decision was:**  Appropriate  Inappropriate

**c) If inappropriate, please describe:** \_\_\_\_\_

**(If the baby was admitted to a neonatal unit for special care, go to SECTION C: Care Whilst on Neonatal Unit)**

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**SECTION C: CARE WHILST ON NEONATAL UNIT**

22. What was the postnatal age at admission?  hours  minutes

23. What was the *documented* reason(s) for admission? *(Please describe)* \_\_\_\_\_

Not documented

24. a) Were there any other factors *documented* (e.g. organisational/systems problems such as staffing) that contributed to the decision to admit.  Yes  No

b) If yes, please describe: \_\_\_\_\_

25. What was the recorded differential diagnosis at the time of admission?  
*(Please list in order as it appears in the notes)*

Not documented

26. Who was the *documented* person making the decision to admit? *(Please tick)*

- SHO in Paediatrics or Neonatology
- SpR in Paediatrics or Neonatology
- Consultant Paediatrician or Neonatologist
- Neonatal Nurse
- ANNP
- Midwife
- Consultant Obstetrician
- Middle grade Obstetrician
- SHO in Obstetrics
- Not documented in notes
- Other *(please specify)* \_\_\_\_\_

27. a) What was the time interval from decision to admit to admission?  hours  minutes

Not documented



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**CARE WHILST ON NEONATAL UNIT** continued

b) In the panel's opinion, was the time interval between the decision to admit and admission appropriate in relation to the clinical circumstances?  Yes (please go to Q28)  No

c) If no, please describe: \_\_\_\_\_  
 \_\_\_\_\_

d) In the panel's opinion, did this adversely impact on the any aspects of the subsequent care of the baby :  Yes  No

e) If yes, which aspects? (please tick)

Feeding

Blood glucose management

Temperature control

Other (please describe) \_\_\_\_\_  
 \_\_\_\_\_

28. Was there any record of communication with the baby's parents at the time of admission, explaining the reason for admission and anticipated care? (Adapted from Advanced Neonatal Nurse Practitioner Assessment Project)  Yes  No

29. What was the body temperature at the time of admission to the neonatal unit?     deg C  Not documented

30. Was the body temperature adequately maintained during the baby's stay on the neonatal unit? (If T<36 deg C, did it reach 36 deg C?)  Yes  No  Not documented

31. a) Were there any abnormal clinical signs consistentat with hypoglycaemia at the time of admission?  Yes  No

b) If yes, please describe: \_\_\_\_\_  
 \_\_\_\_\_

32. Was there any record of communication with parents regarding feeding once the baby was admitted to the neonatal unit for special care?  Yes  No





**CARE WHILST ON NEONATAL UNIT** continued

**33. What enteral feeds did the baby receive whilst in the neonatal unit. (Please tick all that apply)**

	Breastfeeding	Bottle	ROUTE Cup	Tube feeding	Method not recorded
Maternal breast milk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Donor breast milk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Formula	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**34. Was there any documented evidence that the mother was shown how to feed and maintain lactation (e.g. express breast milk) when separated? (BFI Step 5)**

- Yes     No  
 Not applicable as mother did not wish to breastfeed

**35. a) Did the baby receive any I.V. fluids/feeds whilst in the neonatal unit for special care?**

- Yes     No (please go to Q36)

**b) If yes, please tick all that apply**

- IV glucose/parenteral nutrition  
 IV dextrose bolus  
 Other (please describe) \_\_\_\_\_

**c) If exclusive I.V. fluid was given please provide:**

(Please see page 3 for a Neonatal Vade-Mecum glucose rate calculator)

Initial glucose infusion rate     /  /  mg/kg/min

Maximum glucose infusion rate     /  /  mg/kg/min

Not documented

**36. Was informed consent regarding any supplemental feeding recorded in the notes?**

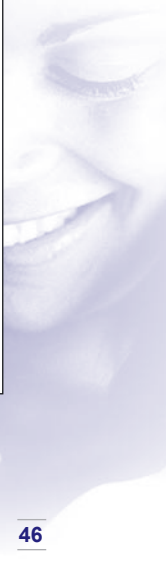
- Yes     No     Not applicable

**37. In the panel's opinion, was the feed the baby received clinically appropriate?**

- Yes     No

**38. In the panel's opinion, over and above the fact of being on the neonatal unit for special care, did the management of the baby have an impact on establishment of feeding?**

- Highly likely  
 Likely  
 Unlikely  
 Highly Unlikely  
 Not enough information in the notes to determine



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**CARE WHILST ON NEONATAL UNIT** continued

39. a) Were there any clinical reasons (maternal) that prevented or inhibited the mother from visiting her baby?  Yes  No  Not documented

b) If yes, please describe: \_\_\_\_\_  
 \_\_\_\_\_

40. How long (if known) was the baby in the neonatal unit for special care?  hours  minutes  
 Not documented

41. a) Within the first 3 days, did the baby go: (please tick as appropriate)

- Home
- Postnatal Ward
- Transitional Care (see footnote\*)
- Stayed in the neonatal unit for special care
- Other (please describe) \_\_\_\_\_

b) Does the panel consider that this decision was:  Appropriate  Inappropriate

c) If inappropriate, please describe: \_\_\_\_\_  
 \_\_\_\_\_

42. What was the documented diagnosis at discharge:

\_\_\_\_\_  
 \_\_\_\_\_

43. a) In the panel's opinion, was this admission: (please tick as appropriate)

- Avoidable
- Potentially avoidable
- Unavoidable
- Insufficient information in the notes to determine

b) If avoidable or potentially avoidable, what issues did the panel identify?  
 \_\_\_\_\_

\* **Transitional care:** refers to the care of term or near-term babies not needing high-dependency or intensive care which can safely be delivered without being separated from their mothers in a so-called transitional care unit or nursery.



**CARE WHILST ON NEONATAL UNIT** continued

c) In the panel's opinion, did these issues adversely impact on any aspects of the subsequent care of the baby?

Yes     No

d) If yes, which aspects (please tick)

- Feeding
- Blood glucose management
- Temperature control
- Other (please specify) \_\_\_\_\_

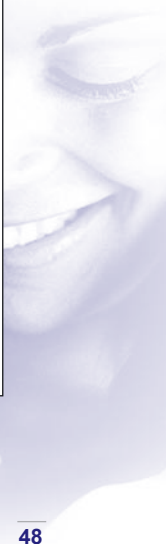
*(If the baby was discharged to the postnatal ward or transitional care in the first 3 days, please fill in Section B: Care on the Postnatal Ward or in Transitional Care)*

**SECTION D: BLOOD GLUCOSE MANAGEMENT**

44. Please document all recorded blood glucose measurements

DAY (1, 2, 3)	TIME (24 hour clock)	BLOOD GLUCOSE VALUE (mmol/L)	DOCUMENTED METHOD OF MEASUREMENT (*)	LOCATION OF BABY AT TIME OF MEASUREMENT (Delivery suite, postnatal ward, neonatal unit, other)

\* For documented method of measurement please choose one of the following: Haemacue, Reagent strip (e.g. Dextrostix, BM please specify type), Yellow Springs, Blood gas analyser, Other glucose electrode method, Other, Unknown.



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**BLOOD GLUCOSE MANAGEMENT** continued

45. a) Was the first blood glucose measurement pre or post feed?

- Pre feed
- Post feed
- Random
- Not documented

b) Were there any abnormal clinical signs (attributable to hypoglycaemia) at the time of the first blood glucose measurement?

- Yes       No

c) If yes, please describe: \_\_\_\_\_  
 \_\_\_\_\_

46. a) How does the panel rate the overall documentation and record keeping of blood glucose measurements (e.g. methods used) in this case?

- Optimal
- Adequate
- Poor

b) If adequate or poor, please describe: \_\_\_\_\_  
 \_\_\_\_\_

**SECTION E: SUMMARY SECTION**

47. a) How does the panel rate overall documentation and record keeping of this case?

- Optimal
- Adequate
- Poor

b) If adequate or poor, please describe: \_\_\_\_\_  
 \_\_\_\_\_

48. a) How does the panel rate the overall care and management of this baby?

*(Panel guidance: please take into consideration whether appropriate action was taken in response to blood glucose level, clinical signs, temperature and feeding of baby – please refer to standards).*

- Optimal
- Adequate
- Poor
- Insufficient information in the notes to determine

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**SUMMARY SECTION** continued

**b) If adequate or poor, please describe:** \_\_\_\_\_

\_\_\_\_\_

**49. Are there any other issues or examples of good or poor care the panel would like to raise:**

\_\_\_\_\_

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