

Which Births Are High Risk?: Condition Of Neonates At Birth And Risk Of Intervention Associated With Type Of Delivery And Thickness Of Meconium In The District General Hospital Setting

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Citation

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Abstract

Aims: To determine which births require a paediatrician in attendance at a District General Hospital, by correlating mode of delivery and meconium thickness with birth condition and intervention risk.

Methods: A midwife-entered questionnaire based study of all births in Hinchingsbrooke Hospital starting April 2000. Data on type of birth, meconium thickness, Apgar scores, and resuscitation rates was collected.

Results: 1210 valid data sets were obtained. Five methods of determining "at risk" births were considered: depression of the Apgar score at 1 minute, increased odds ratio of having an Apgar 0-3 or 4-6 at 1 minute, and the odds ratio of needing intubation or face mask ventilation. All five variables were significantly worse in deliveries with thick meconium, emergency, and crash caesarean sections. Three of the variables were significantly worse in births with thin meconium and with forceps, in two of the variables were significantly worse with ventouse deliveries. The Apgar scores were comparatively (non-significantly) better with elective and semi-elective caesarean sections.

Conclusions: With the rationalisation of the paediatric workforce, especially in District General Hospitals, targeting neonatal resuscitation input may be of increasing importance. However, there is a significantly increased risk associated with any child born with thick or thin meconium, assisted deliveries, and emergency and crash caesarean sections. A paediatrician or suitably trained neonatal nurse practitioner should continue to attend these types of delivery. There is no increased risk with elective and semi-elective caesarean sections.

INTRODUCTION

Neonatal resuscitation is unique in its frequency, immediacy, and favourable outcome when compared to adult resuscitation. It is usually carried out by Senior House Officers (residents) with the assistance of a midwife, and needs high levels of training and ability.

However, this is in a setting where a "natural" process, childbirth, is being seen to be over-medicalised, and where the demands on the paediatricians are such, especially in the wake of the a need to curtail doctor's hours of work, as to make attendance at all births an impossibility. Any medical input should therefore be directed to the episodes where it is needed, and be as efficient as possible.

There are nine possible types of births as detailed below (table 1). In our hospital the paediatrician was asked to attend every birth type excepting normal, meconium-free

vaginal deliveries, and elective and semi-elective caesarean sections. Each hospital has its own protocols for attendance of the paediatrician to the delivery room, aiming to have a doctor standing by in case intervention is needed.

Most hospital protocols, and the American Academy of Paediatrics₂, now do not require routine endotracheal intubation of thin meconium staining of the liquor, and some hospitals have now stopped asking the paediatrician to attend thin meconium stained deliveries₃. This has been in response to studies showing that there is no increased risk of meconium aspiration syndrome with solely thin meconium₄. We wished to study whether paediatric attendance at these births was appropriate.

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Figure 1

Table 1: Types of births possible and paediatrician attendance

Type of Birth	Definition	Paediatrician in attendance
Normal vaginal delivery	None of the below	✗
Thin meconium	Defined by midwife	✓
Thick meconium	Defined by midwife	✓
Forceps assisted delivery	Use of Forceps	✓
Ventouse assisted delivery	Use of a suction cap	✓
Elective caesarean sections	Planned caesarean sections in non-labouring women	✗
Semi-elective caesarean sections	Women in early labour who had planned to have a caesarean	✗
Emergency caesarean sections	Unplanned, unexpected caesarean sections	✓
Crash caesarean sections	Caesarean sections requiring delivery within	✓

Previous studies have investigated attendances at caesarean sections, and found no difference between resuscitation rates for babies born by caesarean when compared with normal cephalic vaginal deliveries. A study in Anchorage likewise found that local anaesthesia caesarean sections had no difference in resuscitation rates to their matched controls. A large cohort study in Tasmania performed between 1980-1989 concluded that there was no need for a paediatrician for epidural sections. However they noted a significant, unexplained drop in intubation rates in the second half of the decade, and they based their recommendations on that. Finally, a group from Chicago determined that there was no need for a paediatrician at local anaesthetic caesarean sections.

We felt it necessary to formally identify those deliveries where a paediatrician in attendance was of worth, so as to make childbirth more comfortable, natural, and private for mothers and to lessen the paediatrician's workload. With the current pressure for the reduction of working hours for doctors in the UK, efficiency of input is paramount if the same amount of work is to be carried out by a decreased workforce. Rationalisation of the paediatric junior doctor workforce will impact smaller hospitals most significantly. The setting of the District General Hospital has not been extensively researched in the past, and there are often more demands on the paediatrician as one doctor may have to be responsible for the paediatric ward, paediatric admissions to Accident and Emergency, as well as the neonatal intensive care, whereas a larger hospital may have separate teams of doctors for different areas. Constant interruptions are a significant burden.

METHOD

This was a questionnaire-based study with the

documentation included in the standard paperwork pack with each admission to labour ward. This was done in conjunction with the midwives' full co-operation. The sheets were printed on to yellow paper to aid recognition. There were 15 questions in total. The midwife or paediatrician attending each delivery was asked to fill the sheet in. The study was anonymous and the Huntingdonshire Local Research and Ethics Committee granted ethical approval. The obstetric consultants were all informed and supportive.

It was concluded that at least 1000 deliveries would be needed to achieve statistical significance. The data was collected during 2000. The completed sheets were data entered by hand in to a Microsoft Excel spreadsheet. Statistics were performed within Microsoft Excel.

Our main outcome measure was based on the Apgar score at one minute. This was considered an "intervention independent" score, which best reflects the need for intervention. Although the Apgar score at one minute is not associated with long-term outcome, this may well be because of early intervention which has been indicated by the low score. For instance, an apnoeic baby who is intubated early can have an Apgar of 8 at five minutes without having any spontaneous ventilation, but without intervention would probably have a poor outcome. Apgar scores at 5 and 10 minutes, although recorded, were not processed because they may have been skewed by (beneficial) intervention by the medical team.

The mean Apgar scores were calculated with 95% confidence intervals. The odds ratios of having an Apgar of 4-6 and of 0-3 were also calculated for every type of birth. Finally, the odds ratios for having facemask ventilation or being intubated were calculated with 95% confidence intervals. The term 'intubation' was used to refer only to those cases where intubation was performed for ease of ventilation. Suctioning of the trachea after a meconium-stained delivery was not counted as intubation.

All results were compared to the "normal" births, ie the normal vaginal deliveries without meconium, for which a paediatrician would not be called.

RESULTS

Our sample was of 1255 babies. 45 forms were excluded due to inadequate data entry, giving 1210 valid data points.

The demographics were as follows:

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Figure 2

Number of births analysed	1210
Gestation (Median)	39+6 weeks (range 29+0 to 42+3)
Weight (Median)	3489 grams (range 1245-6069g)

The breakdown of modes of birth were as follows:

Figure 3

Normal Vaginal Delivery	794
Caesarean Section	311
Ventouse delivery	52
Forceps delivery	63
Thin meconium	135
Thick meconium	45

Figure 1 presents the data for mean Apgar score at one minute, including 95% confidence interval error bars, with the baseline of the graph at the mean Apgar for normal vaginal deliveries without meconium (ie at 8.40).

Figure 4

Figure 1: Mean Apgars at 1 minute with 95% Confidence Intervals Baseline at NVD without meconium

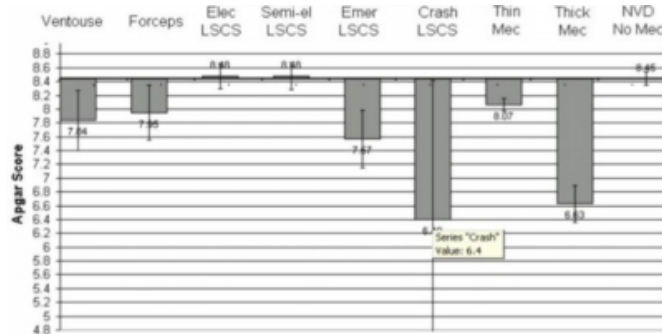


Figure 2 shows the odds ratios of having an Apgar at 1 minute of either between 0-3, or 4-6, when compared to normal vaginal deliveries without meconium, for each type of birth. 95% confidence interval error bars are presented.

Figure 5

Figure 2: Odds ratios of Apgar scores of 0-3 or 4-6 at 1 Minute by Type of Birth with 95% Confidence Intervals Compared With Normal Vaginal Deliveries without Meconium

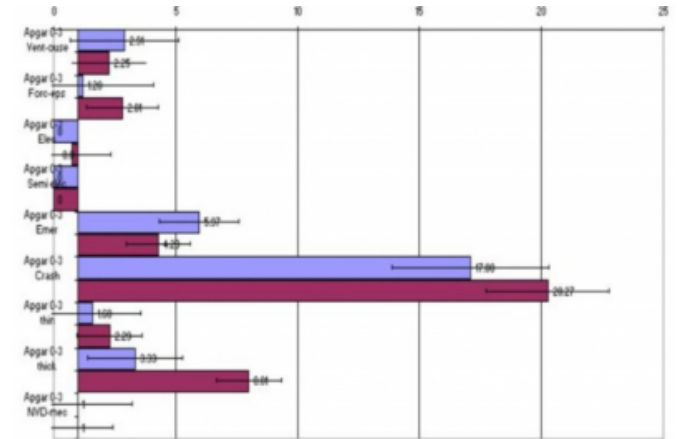
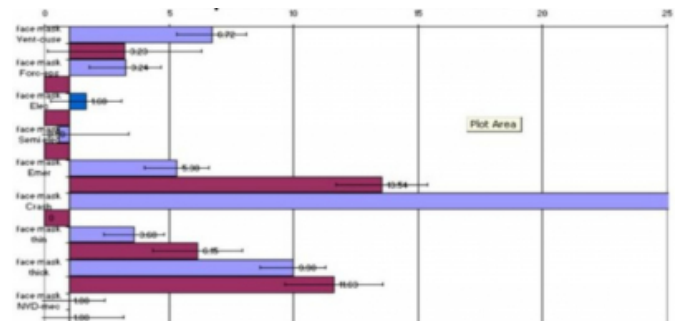


Figure 3 shows the odds ratios of a baby needing intubation or facemask ventilation, again by type of birth and compared to normal vaginal deliveries without meconium.

Figure 6

Figure 3: Odds Ratios of Face Mask Ventilation/Intubation by type of birth with 95% Confidence Intervals Compared to NVD without Meconium



DISCUSSION

The Apgar score was developed by Virginia Apgar to determine which babies require intervention to resuscitate after delivery. Any high-risk birth should be defined as one which has a significantly depressed Apgar score at the intervention-independent stage (ie at one minute), or which needs significantly more interventions, when compared to the normal vaginal delivery without meconium.

Our data of frequency of different types of births is comparable to other studies. Previous incidences of meconium staining have ranged between 8.5%₉ and 18%₁₀, compared to 15% in this study.

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There is a risk when examining data based on a numerical mean of a discrepancy between clinical and statistical significance. In the case of deliveries with thin meconium, depression in the mean Apgar scores, although being significant, was only 0.36 points. Therefore the grouped data (Apgars 0-3, 4-6) and the pragmatic data (intubation and face mask ventilation rates) were examined as well.

We looked at five ways of classifying high-risk births, each of which would be valid in their own right. Any significant depression in mean Apgar scores, a significant increase in odds ratio of having an Apgar of between 0-3 or 4-6, and a significantly increased odds ratio of being intubated or having face mask ventilation. The summary table below shows which modes of birth showed significant differences.

ASSISTED DELIVERIES

Figure 7

All results compared to normal vaginal deliveries without meconium					
Type of birth	Significant depression in Apgar score at 1 minute	Significant increase in odds ratio of having an Apgar between 0-3 at 1 minute	Significant increase in odds ratio of having an Apgar between 4-6 at 1 minute	Significant increase in odds ratio of having face mask ventilation	Significant increase in odds ratio of being intubated
Normal vaginal delivery without meconium	Reference value	Reference value	Reference value	Reference value	Reference value
Ventouse delivery	✓	✗	✗	✓	✗
Forceps delivery	✓	✗	✓	✓	✗
Elective section	✗	✗	✗	✗	✗
Semi-elective section	✗	✗	✗	✗	✗
Emergency section	✓	✓	✓	✓	✓
Crash section	✓	✓	✓	✓	✓
Thin meconium	✓	✗	✗	✓	✓
Thick meconium	✓	✓	✓	✓	✓

Ventouse deliveries had a significant decrease in Apgar score at one minute, and a significant increase in the odds ratio of having face mask ventilation. Forceps similarly had poorer Apgars and increased face mask ventilation, and also a higher chance of having an Apgar between 4-6. Therefore we recommend that a paediatrician attends these births as both modes of delivery are at higher risk of intervention and poorer Apgars.

CAESAREAN SECTIONS

These can be split in to two distinct groups. The semi-elective and the elective sections were the two groups with the best Apgars (non-significant when compared to normal

births) of all modes. There was no increase in intervention. This improvement on the normal vaginal deliveries may be due to the baby not undergoing the trauma of passage through the birth canal. There is no need for a paediatrician to attend these births. However, Emergency and Crash caesarean sections had significantly depressed scores in each of the five categories we studied. Paediatricians should attend all of these births, as they are at very high risk. Crash caesarean sections also had significantly poorer Apgar scores at 5 and at 10 minutes (7.5 and 8.6 respectively, compared to 9.8 for normal births). The mean Apgar score at one minute for crash caesarean sections was 4.89 (sample n=9), for which experienced assistance is vital.

MECONIUM-STAINED LIQUOR DELIVERIES

It has been found that births with thin meconium do not have an increased risk of meconium aspiration syndrome¹¹, but we still found a significantly depressed Apgar score with these types of deliveries, with an increase in odds ratio of needing face mask ventilation or of intubation. Therefore paediatricians should still attend these deliveries, as they are still classified at high risk. Meconium delivery prior to birth indicates fetal distress and should be treated as high risk, even if the risk of meconium aspiration syndrome itself is not high. Deliveries with thick meconium had the second lowest average Apgar at 1 minute after the crash caesarean sections, and had significantly worse scores in each of our five categories. These deliveries are at very high risk.

Our study confirms that only the elective and semi-elective sections are “safe” when compared to normal vaginal deliveries without meconium, to not have a paediatrician in attendance specifically trained in resuscitation of the neonate. Although midwives all have training in resuscitation, it is advisable for a paediatrician to be in attendance in high risk births as interventions, intubation, and admission to the Neonatal Intensive Care Unit, are the specialty of the paediatrician. In some units suitably trained neonatal nurse practitioners (NNP) undertake some of these roles.

The current review of neonatal services in the UK is likely to lead to more maternity units without paediatric cover. Such changes should be introduced with caution in the view of these results. We believe that paediatricians or NNPs should be in attendance for ventouse and forceps deliveries, all emergency and crash caesarean sections, and all births with thin or thick meconium. This requires attendance at 38% of deliveries. There is no scope to rationalise paediatric input to

labour ward further without incurring risk of sub-optimal care.

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Conflict of interest: None

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