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Obstetrical Events Support Team (OEST): Preventing harm and reducing costs from neonatal brain injury

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Abstract

Aims

The consequences of Neonatal Hypoxic Encephalopathy, in both human and financial terms, are enormous.

Methods

In an attempt to address this problem the Obstetrical Event Support Team (OEST) was formed to discuss, with the hospital in which the infant was delivered, the clinical circumstances that were associated with the adverse outcome and to see what factors contributed to the outcome.

Results

Of the first 75 qualifying cases there were 13 deaths, 4 being intrapartum and 9 neonatal deaths. Sixty two infants were treated with Therapeutic Hypothermia (TH) and 39(62.9%) of these were delivered to nulliparous mothers. In 41 cases treated with TH it was concluded that the timing of the insult was in labour.

Discussion

We recommend that all term intrapartum and early neonatal deaths, including all infants requiring TH, are reviewed in a standardised manner taking into account, the pregnancy, labour, birth and the postnatal period. The management of labour and induction, particularly in first time mothers, is critically to the prevention of these cases.

Introduction

Hypoxic neonatal brain injury is the most frequent cause of death in normally formed term infants[1] and is responsible for profound and lasting neurodevelopmental delay to some survivors[2]. Follow up studies on infants with HIE treated with TH show that some children without motor impairment will have a linguistic, cognitive and behavioural disabilities. Studies of infants with neonatal encephalopathy (Grade 2&3) show 15% mortality, 20% significant handicap, and on average significantly reduced verbal skills[3, 4]. It is also the single largest cost

of medical negligence insurance claims in Ireland[5, 6, 7].

The National Neonatal Encephalopathy Action Group (NNEAG) was formed in 2019 to focus attention on Hypoxic Ischemic Encephalopathy (HIE). NNEAG was an alliance of three of the major stakeholders, the Department of health, the State Claims Agency (SCA) and the Health Service Executive (HSE). In addition to highlighting the issue part of the remit of the NNEAG was to propose solutions as to how the incidence of avoidable neonatal brain injury could be reduced. During the pandemic the work of NNEAG ceased, in common with much work that was not associated with Covid. However, during that period the concept of OEST was developed. The principle behind the OEST is that cases of term neonatal brain injury, or death, are discussed with the hospital in which the baby was delivered, the circumstances explored, and learning extracted that could then be distributed to the maternity system. The concept of the OEST was accepted by the Safety and Quality committee of the HSE Board as an important quality and safety initiative, and instruction to facilitate the implementation was given by the CEO of the HSE to the hospital groups in July 2021.

The problems associated with hypoxic neonatal brain injury, both medical and legal are not unique to Ireland. In the United Kingdom the Royal College of Obstetricians & Gynaecologists (RCOG) initiated the Each Baby Counts Programme (EBCP) in 2014 with the ambition to reduce still births, neonatal deaths and brain injuries
occurring during term labour. By examining the case reviews of the infants involved it was hoped to learn why the incident happened, with the view to decreasing the incidence through shared learning[8, 9].This programme concluded its work in 2020 and the principle of reviewing each individual case passed to the Healthcare Safeties Investigation Branch (HSIB) of the UK. The HSIB carry out an external review rather than rely on the local review.

The purpose of this paper is to explain both how the OEST functioned and to report the clinical circumstances of the first 75 cases and from the examination of these cases suggestions are made as to how the incidence may be reduced. The impact that the initiative made on the incidence of hypothermia rates will be described elsewhere.

Methods

When a qualifying event *(Intrapartum fetal death, early neonatal death or babies requiring therapeutic hypothermia in term infants of at least 36 weeks with no major malformation)* occurs in a maternity hospital, the OEST is contacted by the hospital or hospital group. The clinical events chosen are similar to those in the EBCP. These events reflect care given to term infants with no significant congenital abnormality. The outcome in this cohort reflect the effectiveness of care. The factors that lead to the adverse outcomes are analysed with the hospital group concerned and what might have been done differently is discussed. This robust discussion usually concludes when an agreement is reached as to the causes or contributory factors related to the adverse outcome. This could be an agreement that nothing could have

been done differently to alter the outcome or that the underlying cause remains unknown.
In Ireland there are 19 hospital units that deliver babies and these are divided into 6 hospital groups. In each hospital group 1 hospital acts as a tertiary referral centre and lead hospital. The OEST consists of a consultant obstetrician, a senior midwife, a risk manager and a neonatologist / general paediatrician when necessary. To date we have had site visits to the units in three hospital groups. Through the same process we have had access to the cases (but not direct visits) from the other hospital groups. The start of the OEST programme was phased with some hospital groups joining later.

Results

To the middle of December 2023 we have had engagement in a total of seventy five perinatal cases. Of these cases there were 62 infants treated with TH and 13 perinatal deaths; of the 13 perinatal deaths 4 were intrapartum and 9 were early neonatal deaths.
The causes of the perinatal deaths are given in Table One.

Perinatal Deaths
Table One: Causes of Death in infants reported to OEST.

Cause of death	Numbers
Fetal / Feto Maternal Bleed	3
Placental abruption	3
Breech	1
Cord accident/thrombosis	1
Uterine rupture	1
Subgaleal Haemorrhage	1
Free Birth	1
Baby Born on way to Hospital	1
Unrecognised IP Hypoxia	1
Total	13

Therapeutic Hypothermia

There were 62 cooled infants, 39(63%) of these were to 1st time mothers and 23(37%) were to mothers having their second or subsequent baby. This distribution is similar to the National Hypothermia report in which 58% of the infants are to first time mothers (10).

When the timing of the possible insult is considered it can be seen that in 41(66.3%) out of the 62 cases occurred in the intrapartum period, 12(19.3%) occurred antenatally, the timing was unknown in 7(11.2%) of the cases and 2(3.2%) occurred in the postnatal period.
Figure 1, shows the distribution of the timing of the hypoxic insult, when nulliparous women and multiparous women are compared. The main finding here is that in the majority of nulliparous women, the insult appears to have happened during the intrapartum period.

Figure 1: Timing of the Hypoxic insult by parity.

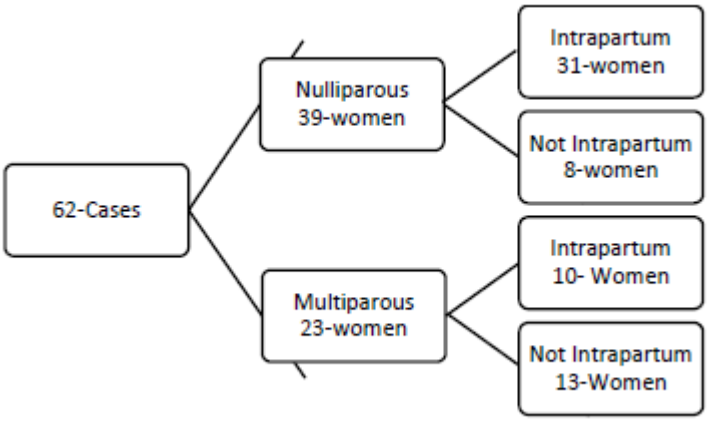

Table 2 shows the mode of delivery in these cases and not unexpectedly the single most frequent type of delivery is by emergency caesarean section. Also notable is the fact that only one baby delivered by elective caesarean section needed therapeutic hypothermia.

Table 2: Mode of delivery in infants that receive TH.

Delivery Method Number (%) of Infants Emergency C–Section	33(53.2%)
Instrumental / Assisted	12(19.3%)
Spontaneous	9(14.5%)
Failed Instrumental C-Section	5(8.6%)
Breech*	2(3.2%)
Elective Section	1(1.6%)
Total	62

Table 3 outlines the main factors in the 40 cases where the problem was in the intrapartum period.
Table Three: Intrapartum Event leading to HIE.

Intrapartum Event Number Failure to escalate care to appropriate area of hospital	6
Partogram / Slow progress*	5
Impacted head at Section	5
Difficult Instrumental Delivery	5
Uterine Rupture	4
CTG (not done or misinterpreted)	4
Abruption	3
Breech	2
Shoulder dystocia	3
Delay in implementing decision	2
Pyrexia	1
Total	40

Table 4: The factors in cases that did not arise during the intrapartum period or alternatively, no cause could be found.

Table Four: HIE Cases where causation was not intrapartum

Causation Number	7
No Cause or not HIE	
Postnatal	2
Abruption	3
Cord Accident / Thrombosis	2
Missed IUGR	2
Decreased Fetal Movements	2
CTG (not done or misinterpreted)	2
Placenta Acreta	1
Total	21

The cumulative cost of neonatal brain injury may be enormous but it is a rare event in an individual unit; the rate of TH in Ireland is approximately one in a thousand births[10]. When the OEST meets with the local team to discuss events the main functions are educational, reflective and supportive. The educational component involves an exchange of information, in that the local team give the individual case details and the OEST can inform how similar cases have arisen nationally. The reflective component encourages an exchange of what might, or could, have been done differently to achieve a different outcome, cognisant that in

some of the cases the result was unavoidable. The staff are supported in dealing with a potentially problematic outcome and in preparing to deal with sequelae, if required. The OEST is not in the line of governance in that it has no responsibility for patient management and is sensitive to possible future litigation.

For many of the 75 cases that we were involved in no cause could be identified or the cases were managed in a standard and appropriate manner. There are some cases that are unpredictable, for example, an umbilical cord thrombosis in a first, apparently normal pregnancy. There are other cases that the hospital had little or no opportunity to influence the outcome, for example a free birth or a delivery that takes place before arrival at the hospital. In examining the 62 cases treated with TH it is speculative to say that 40 to 50% of the cases were unpredictable and probably unpreventable. The remaining 50 to 60% of cases include some in which different management *might* have made a difference and some in which different management *would* have made a difference.

The initiative taken by the RCOG to reduce adverse outcomes in term babies, Each Baby Counts, set the "ambitious aim to reduce by 50% the incidence of stillbirth, neonatal death and severe brain injuries a result of incidents during term labour". In the Each Baby Counts report of 2015 reviewers identified 24% of cases in which different care might NOT have changed the outcome. The very clear implication of these statements is that many of these cases have factors that are open to improvement**.**

In addition to the significant human costs, there are financial implications. Using figures from the SCA, maternity services account for more than two thirds of the State's outstanding liability in respect of clinical claims. This means that maternity services account for approximately 2.5 billion of outstanding liabilities. If this potential liability is settled over the next 10 years this is equivalent to 250 million per annum or if they are settled over the next five years 500 million per annum on average. Each preventable case can cost the state 10 to 20 million euros to settle. The scale and importance of this subject has been addressed before and is not unique to Ireland[11, 12]. This topic, i.e. neonatal encephalopathy is one of the very few instances where preventative medicine interfaces with acute hospital service and will result in very real, substantial, if deferred savings.

A finding of the OEST has been to confirm the preponderance of first time mothers and the importance of labour as the time of the insult to the infant's brain. Whilst the risk associated with the day of birth are known they may not be fully appreciated. The risks of dying on the day of birth exceed that of any other average day until the age of 92[13].

The importance of labour as an antecedent event in nulliparous women has been noted previously[14, 15]. An awareness of the problem, and a wish to solve it, will not be sufficient to eliminate all avoidable cases. Labour ward staffing and access to labour ward beds is a significant barrier to decreasing the number of encephalopathic babies. Increasing induction rates mean that more women are spending longer periods in an environment where

increased foetal surveillance is necessary. This means that continuous risk assessment for this group will be necessary. This changing environment requires altering midwifery and medical staffing arrangements and may require changes to the capacity of the labour ward area.

We suggest that OEST is a useful QI tool in leading to increased understanding and learning of HIE.

Declarations of Conflicts of Interest:
None declared.

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