BRITISH ASSOCIATION OF PERINATAL MEDICINE

Newborn Early Warning Trigger and Track (NEWTT)

A Framework for Practice

April 2015

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Organisations and representatives involved in the consultation process

Members of the British Association of Perinatal Medicine (BAPM), the British Maternal and Fetal Medicine Society (BMFMS) and the Royal College of Midwives.

Executive Summary

The findings of the Working Group recommend that:

- All newborn infants should be assessed following birth for any condition that may put them into a high risk group
- Risk identification should result in heightened surveillance utilising a standardised observation chart
- All maternity services should have a system in place for referral of, and escalation of, care for newborn infants triggering this increased surveillance

1. Introduction

1.1 Definitions

Early warning systems have been used across acute hospital care in both adult (National Early Warning Score – NEWS) and paediatric (Paediatric Early Warning – PEW) settings for a number of years. It is generally accepted that the use of such tools is valuable in detecting subtle deterioration in clinical conditions and leads to early medical review, which in turn reduces morbidity (1). The remit of this Working Group was to develop a Newborn Early Warning System for use within newborn and maternity services across the United Kingdom.

Due to the acronym NEWS being used for the adult early warning system it was decided to use Newborn Early Warning Trigger and Track (NEWTT) for this tool, as identifying the risk group would ***trigger*** use of the chart and the ongoing observation would ***track*** the infant's clinical progress.

1.2 Target Users

The NEWTT tool is designed to be used by healthcare professionals working in areas caring for newborns in the early and ongoing postnatal period. Whilst this will predominantly be midwives, it may also include maternity care assistants, nursery nurses and, in some instances, neonatal nurses. The areas where it may be utilised are delivery suites and post natal ward areas. In certain circumstances, it may be deemed appropriate for other settings such as special care units (SCU), transitional care units (TCU) and even community settings.

1.3 Purpose of framework

The NEWTT tool seeks to;

- Identify those babies at risk of clinical deterioration following birth
- Provide a standardised observation for monitoring clinical progress
- Provide a visual prompt to aid identification of abnormal parameters by colour coding e.g. red, amber, green (2,3)
- Reduce admission to neonatal units (NNUs)

- Reduce/limit separation of mother and baby by early identification of and intervention for at risk infants
- Through early identification and intervention reduce the severity of illness for some infants who will require admission to neonatal units.

N.B. The NEWTT tool should be used as an adjunct to aid clinical assessment of infants and is not intended to replace competent clinical judgement (3). Additionally it should be used alongside local clinical guidelines recognising that acceptable parameters for normal values will vary between institutions.

1.4 Background

The annual birth rate in the United Kingdom for 2012 was approximately 813,000 livebirths (4) with nine percent of these infants requiring admission to a neonatal unit for their ongoing management (5). Outwith this population are an undetermined number of infants who are at a higher risk of developing postnatal problems but who are being cared for in a low risk post natal setting. Early identification and management of these infants may reduce the potential negative impact of any problems.

It is recognised that adult and paediatric population early warning scores measure physiological changes in the already ill, hospitalised patient, whereas newborn early warning scores need to detect early deterioration in seemingly healthy, but “at risk”, babies. In 2010 Roland and colleagues published a framework for identifying and monitoring potentially at risk infants utilising a traffic light system to record adverse changes in their physiological parameters in the early newborn period. As this was the only published work available at the time this group convened, it has provided the basis of further development of the framework.

The determination of increased risk is key to managing potential illness and reducing the adverse consequences for the baby and family. The problems these infants encounter may be as a result of maternal illness during pregnancy, gestational age, birthweight, intrapartum events or a predisposition to sepsis.

2. Process

The process of development of the framework included review of other pre-existing early warning systems already in clinical use and identification of factors that could put infants at risk of clinical deterioration following birth. These risk factors were agreed initially by consensus and then further rationalised in relation to potential mortality and morbidity, supported by current published evidence where possible. It was recognised that local populations and specific circumstances may warrant increased surveillance in a particular infant group and that the framework should be flexible enough to include these variances.

In the following section, recommendations are either referenced or are asterisked (*) where based on expert opinion or consensus of the Working Group.

As a consequence of this, the Working Group set out to define which infants constitute a "high risk" population that would benefit from having increased surveillance utilising the NEWTT. Following discussion and literature review, the following infants were identified to trigger use of the NEWTT:

- Infants of any gestation at risk of sepsis
- Infants at risk of hypoglycaemia
- Infants of hypertensive mothers who have received beta blockers
- Late preterm infants
- Small for gestational age infants
- Infants demonstrating intrapartum compromise evidenced by need for newborn resuscitation, low APGAR score or low cord pH
- "Other" categories

There was group consensus that infants outwith these categories could also trigger NEWTT observations, due to perceived local population needs. In this instance, the rationale must be given by the attendant neonatal or midwifery personnel to ensure only infants who truly need extra observations are put onto the chart in order to prevent medicalisation of otherwise normal, healthy infants and also to maintain the integrity of the process and not devalue the tool.

The rationale for selection of these groups is presented in Table 1.

3. Search Strategy

A first meeting of the Working Group discussed potential risk factors to derive an initial consensus of opinion. Members of the group were then tasked to undertake literature searches on the individual indentified topics. This included searches of MEDLINE, PubMed 1976 to June 2013 and hand searches of reference lists of relevant articles. Clinicians and researchers known to have specific specialist interest in particular areas were contacted directly and, where possible, their data and expert opinions are included in the appendices.

This process yielded evidence and the rationale supporting inclusion of risk factors within the ***trigger*** element of the system. These were further reviewed and refined via in depth discussion within the group.

A request for other pre-existing charts generated a further five for consideration. As several of the charts appeared to be based, to differing degrees, on the original work by Roland et al (3) it was decided to use this original work as a basis for the development of the ***track*** element of the system.

Normal neonatal physiological parameters were established (refs 6,7,8,9,10,11,12) with the agreed acceptable values being plotted in the green area of the chart. A moderate deviation from normal would be delegated amber and significant deviations into the red area on the chart (3). The plotted parameters would track the infant's progress and determine whether management needed to be escalated.

4. Analysis and Framework Generation

Content and parameters of existing charts were reviewed including the use of a 'traffic light' system to track the infant's progress and draw attention to the need for early clinical review and potential escalation of management. A draft chart was then produced for circulation.

The draft chart, including the risk indicators, was further discussed by the group and following modifications was circulated to five clinical sites for review (Appendix 1). These sites were self-nominated and consisted of areas which did not have a pre-existing early warning system in place. During this process, practitioners were asked to utilise the 'risk identification' side of the chart for each newborn admitted to the ward alongside their normal practice. If no risk was identified then the form could be used for the next baby. If a risk was identified, the observational chart was completed using the colour codes to identify any action required. It was vital to reiterate that at this stage, we were only testing for ease of use and that there was no need to collect any data from the baby and neither should there be patient identifiers on the chart. Once this aspect of the process was completed there was a short questionnaire for practitioners to complete which was returned with the completed chart (Appendix 2)

Additional to this process, members of the Royal College of Midwives and midwife educators were also approached to comment on the chart. The results of this are included in Appendix 2.

On the whole, the chart was favourably received by all reviewing it with regard to clinical usefulness and ease of use. Several aspects of the chart were modified or included following this process. One clinical site however encountered significant "red tape" issues with managers unable to proscribe to its review within that clinical area, consequently no data or feedback was received from that unit.

5. Results

The evidence from the literature defined the risk factors which if recognised and responded to early may reduce infant morbidity and mortality.

5.1 Categories of Infants Requiring NEWTT

The following seven categories are included as having the potential increased risk for morbidity or mortality in the newborn period (Table 1.)

Sepsis Early-onset neonatal bacterial infection (infection with onset within 72 hours of birth) is a significant cause of mortality and morbidity in newborn babies (13). The NICE

(2012) recommendations for infants warranting a septic screen and commencement of antibiotics are clear. Some infants do not fulfil these criteria but the presence of a single risk factor should trigger increased postnatal surveillance to detect early onset sepsis (13) e.g. prelabour rupture of membranes, maternal pyrexia >38◦C or maternal (or previous sibling) group B beta haemolytic streptococcal infection.

Diabetes affects two to five percent of pregnancies in England and Wales annually. The majority of these (87.5%) are due to gestational diabetes, with the remainder being a combination of type 1 and type 2 diabetes (14). The infants of these women have a high risk of hypoglycaemia especially if their diabetes is poorly controlled. They should receive early feeding (within one hour of birth, subsequent feed interval should be no longer than three hours) and commence blood sugar monitoring within three hours of birth (15). As units will have varying locally accepted normal parameters for newborn blood glucose level, this is the level that should be adhered to for the trigger of neonatal review.

Hypertension in pregnancy Two to four percent of women with pre-existing hypertension become pregnant, whilst up to a further four percent develop hypertension during pregnancy (16). NICE (17) recommendations indicate Labetolol to be the first line drug for management of this group, however it is well recognised that it considerably increases the risk of neonatal hypoglycaemia (18,19). Additionally high dose beta blockers during pregnancy are associated with intra uterine growth restriction with its concomitant risk of hypoglycaemia.

Late preterm infants, defined as those born between 34 weeks and 36+6 weeks gestation, constitute 70 -75% of the preterm population in the UK (20). These infants have been historically classified as “near term” and it was believed that their outcomes did not significantly differ from those born at ≥ 37 weeks (21). It now appears that morbidity and mortality is greater in this group of infants (20,22,23) than previously thought. As they are less physiologically and metabolically mature than term infants (24) they are at increased risk of respiratory distress (22,25,26), hypothermia (25, 27), hypoglycaemia (25,27), hyperbilirubinaemia (23,25,26), poor feeding (26) and poor weight gain. Infants < 34 weeks are usually admitted to a neonatal unit for their ongoing care, however many late preterm infants are managed on post natal wards with little or no

increased surveillance. Routine increased observation and documentation of findings following birth across this population may serve to prevent previously unrecognised problems in an asymptomatic infant.

Babies defined as **small for gestational age** (SGA ≤2nd centile *Tim Cole Personal communication (28) have an increased incidence of adverse outcomes (29). Not all SGA infants have abnormal growth as some are constitutionally small, whilst others fail to reach their genetically predetermined growth due to pathology. It is hard to determine which of these fetal patterns of growth is clinically relevant to the individual infant and consequently all SGA infants are treated the same. These infants are at particular increased risk of hypoglycaemia (30), altered post natal adaptation, including impaired thermoregulation (31,32,33) and polycythaemia which further increases the risk of hypoglycaemia (30).

Low cord pH (≤7.1) Low APGAR scores (≤ 7@ 5 minutes) Base Excess (≤ - 12.0) are markers for perinatal stress and fetal compromise with infants having an increased incidence of developing respiratory distress, need for admission to NICU and increased morbidity (34,35,36).

Meconium Stained Amniotic Fluid (MSAF). Up to 20% of babies deliver through MSAF and traditionally have been kept in hospital and observed for at least 24 hours. MSAF in isolation appears to have a very low risk of causing respiratory compromise, however if it is associated with APGAR score of less than seven at five minutes the risk increases. Consequently it is recommended that infants with these combined criteria, or those infants requiring intervention at birth, have increased surveillance following birth (34,35,36).

Additional to these seven categories, local population needs may trigger the utilisation of the chart and this should be clearly identified on the chart e.g. maternal drug use other than opiates, other factors e.g. bilious vomiting, abnormal movements or apnoea should be “red flag” indicators for immediate neonatal review (*).

Table 1. Risk Factors and Rationale (on reverse of chart)

RISK FACTOR	Rationale /Reference
Sepsis; • PROM > 18 hours in preterm infants • Prelabour rupture of membranes in term infants • Maternal Temperature >38◦ C • Maternal GBS vaginal Swab / MSU • Confirmed GBS infection in previous baby	Increased risk of early onset sepsis (13)
Metabolic / Blood sugar monitoring; • Maternal Diabetes	Transient hypoglycaemia (14, 15)
• Maternal Beta Blockers	Increased risk of hypoglycaemia (16,17,18,19)
• Birthweight ≤ 2nd centile	Delayed physiological adaptation (31). Increased risk of hypoglycaemia , hypothermia (31,32,33)

Intrapartum	
• Meconium Stained Liquor	Risk of respiratory distress if associated with APGAR ≤7 at 5 minutes
• Cord arterial pH ≤ 7.1	Increased incidence of respiratory distress and admission to NICU. Increased postnatal and long term morbidity
• APGAR score ≤ 7 at 5 minutes	Increased risk of respiratory distress. Increased risk of need for admission to NICU/ post natal and long term morbidity
• Base excess ≤ - 12 mmol/l	Increased risk of post natal and long term morbidity
• Pathological CTG	Association with fetal compromise in association with above parameters (34,35,36,37,38,39,40,41)
Other ;	
• IPPV > 5 minutes	Indicator of delayed transition (34, 39, 41)
• Maternal pethidine <6 hours before delivery	Respiratory depression (42)
• <37 weeks gestation	Increased risk of morbidity (21) Increased risk of respiratory distress , thermal lability, hypoglycaemia, poor feeding, hyperbilirubinaemia. (21,22,23,24,25,26,27)

Conflicts of interest – All members of the working group are employed in areas of neonatal education or neonatal health care provision. All members confirmed compliance with BAPM's Conflict of Interests Policy (June 2012) and no conflicts were declared.

6. References

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Appendix 1a

Front of chart

Appendix 1b

Back of chart / Trigger

Appendix 2

Introduction

Five units and members of the RCM were approached to review the usability of the chart. These units were self nominated with four out of the five not having an assessment tool currently within the practice area. The RCM members had expressed interest in evaluating the tool at the inception of the work. Each unit had 15 charts allocated along with instructions for use and a feedback form. The charts were issued with the following instructions;

"One side (of the chart) is for risk identification and the other is an observation and monitoring chart. Please utilise the 'risk identification' side for each newborn admitted to your ward. If no risk is identified then the form may be used for the next baby. If a risk is identified please start the observational chart and, using the colour codes, identify any action required.

Please note this is a draft form and should not be copied or kept in patient notes. At this stage it should not replace your current practice in the care of newborns.

As we are, at this stage, only testing for ease of use you do not need to collect any data from the baby and there should be no patient identifiers on the chart.

Once you have used all the charts please complete the short questionnaire overleaf. You should then return the questionnaire, with the completed charts to your designated co-ordinator".

One unit was unable to put the chart into use due to lack of local agreement and another due to sickness of the designated local co – coordinator.

Results

Charts were returned by 76% of participants. Feedback was received from 64% of the participants of which 60% had fully completed the evaluation form. Results are presented below;

Instructions and ease of use

Question 1 60% responded YES for ease of use

Question 2/3 60% responded YES for clarity and understanding of risk factors

Question 4 60% responded YES to use of appropriate language

Question 5 60% responded YES that the chart made sense

Presentation

Comments

Several practitioners commented that the chart was similar to the maternal/obstetric early warning system which made it easier to use.

"Better" than existing form.

Trends easy to spot

Clear when to seek medical assistance

Clear and uncluttered so should encourage midwives to complete it

General comments

Good idea

Good especially for junior nursing and medical staff to know who to monitor and normal values

Easy to use

Better if on one sheet (this unit had copied on to two sheets rather than the intended two sided chart)

"Not all babies who are not feeding are unwell just mucous and the midwife should be left to decide whether to escalate management"

2nd centile too low should be 10th centile

PROM should be 24 hours not 18 hours

"Put PTO at bottom of page so that people are aware of risk factors on back"

Reasons for use other than stated criterion

Soft grunting post delivery

Readmission for hypernatraemic dehydration

Group G Strep

Previous maternal chlamydia

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