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A National Review of Neonatal Jaundice Identification

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Abstract

Background
Physiological neonatal hyperbilirubinemia is a normal transitional phenomenon, however bilirubin encephalopathy can develop due to exposure to very high bilirubin levels. A systematic approach to early detection of high levels can prevent this outcome.

Methods
We designed a questionnaire to assess local jaundice management practices in Irish maternity units.

Results
All 19 units responded to our clinical questionnaire. Early discharge (<48 hours) occurs in 12 units (63%). Six units universally screen all babies with a transcutaneous bilirubinometer (TCB) (32%) while 12 units only do so if clinically jaundiced (83%). 12 units follow up <5% of their babies for jaundice monitoring after discharge (67%), which is lower than expected for optimal jaundice management.

Conclusion
Our survey responses show a high degree of variability in jaundice identification and follow up practices around the country. As maternity units trend towards earlier discharge of mothers due to resource constraints, we need to develop national systems to stratify risk before discharge and monitor jaundice in the out-patient setting.

Introduction

The purpose of this study is to detail the methods used by neonatal units in the Republic of Ireland to identify and follow up infants at risk of severe hyperbilirubinaemia.

Jaundice describes a yellow discolouration of the skin and sclera due to elevated serum bilirubin. Kernicterus describes encephalopathy as a result of very high serum bilirubin levels.

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Most newborn infants develop elevated serum bilirubin levels in the first few days of life. However infants with serum bilirubin values >425 umol/L are widely considered to be at highest risk of neurotoxicity[1]. Recent data from the UK and Canada has suggested the incidence of kernicterus to be 0.01-0.02 in every 1,000 live births[2] ; this rises in low resource settings with estimated incidence of up to 66.78 per 1,000 live births in Africa.[3]

Risk factors that increase risk of developing kernicterus include the onset of jaundice before 24 hours of life, ABO or rhesus incompatibility, prematurity, cephalhematoma, weight loss >10% from birth or family history of a red blood cell disorder. Jaundice peaks at day 3-4 of life, therefore early discharge from hospital <48 hours of life without risk assessment and appropriate follow up can increase risk of severe hyperbilirubinaemia.

The Bhutani predictive risk nomogram is used to identify infants who are at high risk of developing severe hyperbilirubinemia and to see which infants require repeat bilirubin measurements and / or follow up of bilirubin levels post discharge, and can be used in infants over 35 weeks gestation[4]. The NICE and AAP phototherapy graphs guide the decision to initiate phototherapy. The NICE graphs cover all infants down to 23 weeks gestation, and the AAP graphs can be used in infants over 35 weeks gestation.

NICE guidelines (2016) recommends using a transcutaneous bilirubinometer (TCB) to measure the bilirubin level as routine practice in neonates who have a gestational age of 35 weeks or more. Clinical assessment of jaundice severity is not reliable and therefore if a TCB is not available, serum bilirubin (SBR) measurement is advised. If TCB measurement indicates a bilirubin level >250 micromol/litre or a level at the relevant treatment threshold on appropriate gestation-specific graph, SBR is advised.[5]

Despite the availability of clinical guidelines for jaundice management from the American Academy of Pediatrics and the UK's National Institute for Clinical Excellence, we believe there is wide variation in jaundice management in the Republic of Ireland. Our study aims to examine jaundice identification and follow up practices across all maternity hospitals in the Republic of Ireland.

Aim

To describe jaundice management practices in the 19 maternity units in the Republic of Ireland.

Methods

We designed a questionnaire to assess local jaundice management practices in each maternity unit. Questions were based on clinically relevant aspects of the NICE and APP guidelines for neonatal jaundice.[5] Questions were designed to identify aspects of jaundice management which may have an impact on incidence of severe hyperbilirubinaemia. These include questions regarding screening for hyperbilirubinaemia, phototherapy graph usage, and discharge and follow up practices. Answers were in multiple choice format, where one or more relevant answers could be selected.

We identified a lead consultant neonatologist or consultant paediatrician in each of the 19 maternity units in the Republic of Ireland who was asked to complete the questionnaire on behalf of the unit. Their answers were based on their knowledge of their local unit. We did not confirm the accuracy of their responses.

Ethics approval was obtained from the Rotunda Hospital Research and Ethics Committee.

Results

All 19 units responded to our clinical questionnaire, the results of which are summarised in Table 1.

	N=19 (%)
Early discharge (within 48 hours of birth for uncomplicated deliveries)	12(63)
Phototherapy graph usage	
Bhutani predictive risk nomogram	10(53)
Gestational age specific NICE phototherapy curves	14(74)
AAP phototherapy curves	8(42)
Use of multiple curves	8(42)
Screening for hyperbilirubinaemia	
Universal pre-discharge TCB	6(32)
TCB with SBR as required if clinically jaundiced	12(63)
SBR as required if clinically jaundiced	1(5)
Universal screening with TCB of non-Caucasian infants	1(5)
Direct Coombes test	
On cord bloods of Rhesus negative mothers	11(58)
With first SBR	12(63)
No routine direct coombes test	4(21)
Outpatient follow up rates	**N=18**
<5%	12(67)
5-10%	4(22)
>10%	2(11)

Table 1: Summary of results

We considered early discharge as discharge from hospital within 48 hours of birth for an uncomplicated vaginal delivery. Early discharge is standard practice in 2/3 of maternity units in ROI and is a known risk factor for hyperbilirubinemia.

In relation to screening for hyperbilirubinaemia, 1/3 of units routinely screen all babies with TCB, while almost 2/3 of units will carry out TCB only if an infant is clinically jaundiced. One unit acknowledged the difficulty assessing jaundice visibly in dark skinned babies, and another unit described a policy of screening all non-Caucasian babies with TCB at 24 hours and pre-discharge.

11 units routinely assess DCT status from the cord bloods in rhesus negative mothers, and 12 units routinely assess DCT status with the first SBR measurement. 4 units did not assess DCT status either from cord bloods or with the first SBR sample.

10 units use the Bhutani predictive risk nomogram, 14 units use the NICE phototherapy graphs and 8 units use the American Academy of Paediatrics phototherapy graph. 8 units use more than 1 graph.

Regarding discharge and follow up, 3 units keep jaundiced babies as inpatients until their jaundice has improved, either clinically or with SBR measurements. Ten units discharge jaundiced infants with follow up scheduled over the coming days, while 6 units discharge jaundiced infants without follow up but with parental advice. In relation to the percentage of infants followed up in the outpatient setting for jaundice, 12 units follow up <5% of infants, 4 units follow up 5-10%, 2 units follow up 10-20% and 1 unit declined to answer.

Discussion

Our survey responses show a high degree of variability in jaundice management practices around the country. This variation in practice around the country likely reflects variation in local resources, and perception of risk among the paediatric staff. Some practices may lead to increased risk of severe hyperbilirubinaemia, in particular early discharge, low rates of hospital follow up and reliance on clinical assessment of jaundice instead of TCB and SBR measurements. Although local practices vary widely around the country, it is worth acknowledging that NICE guidelines do not give rigid recommendations for how jaundice must be managed, but rather act as a guide.

As Ireland trends towards earlier discharge of uncomplicated deliveries, the risk of missing severe hyperbilirubinaemia will increase, unless robust out-patient monitoring systems are in place. The Bhutani graph is of particular value in cases of early discharge as it can be utilised from 12 hours of age onwards, as a risk assessment to identify which patients need to be followed up as an outpatient. Comparatively, the NICE guidelines recommend in hospital monitoring for any infants with an SBR value within 100 umol/L of the phototherapy line, which would prevent early discharges in many cases.

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Where early discharge is being considered, easy access to outpatient monitoring over subsequent days is required to minimise risk of developing hyperbilirubinaemia. As there is poor reliability between clinical assessments of jaundice and measured SBR value, it is insufficient to discharge patients with parental advice to return if the infant appears to be more jaundiced, or to discharge these patients to their GP for follow-up of jaundice. Since primary care settings do not usually have access to TCB or SBR measurements, this monitoring remains the responsibility of neonatal and maternity services. It is alarming that 2/3 of maternity units are following up <5% of infants, suggesting post discharge monitoring of hyperbilirubinemia in many maternity units is sub-optimal.

Our study has a number of limitations. Questionnaire responses relied on local knowledge of jaundice identification and management practices in each unit. Although we have shown variation in practice around the country, information was not gathered on the rates of severe hyperbilirubinaemia in each unit, and therefore it is outside the scope of this study to link variations in practice with variations in rates of severe hyperbilirubinaemia. The rate of severe hyperbilirubinaemia nationally could be ascertained by requiring hospital laboratories to notify bilirubin levels >425 umol to a central authority.

Declarations of Conflicts of interest:
None declared.

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References:

1. Bhutani VK, Johnson LH. Urgent clinical need for accurate and precise bilirubin measurements in the United States to prevent kernicterus. Clinical Chemistry. 2004;50(3):477–80.

2. Hamza A. Kernicterus. Autopsy and Case Reports. 2019Jan14;9(1).

3. Slusher TM, Zamora TG, Appiah D, Stanke JU, Strand MA, Lee BW, et al. Burden of severe neonatal jaundice: A systematic review and meta-analysis. BMJ Paediatrics Open. 2017Nov25;1(1).

4. Bhutani VK, Johnson L, Sivieri EM. Predictive ability of a predischarge hour-specific serum bilirubin for subsequent significant hyperbilirubinemia in healthy term and near-term newborns. Pediatrics. 1999Jan;103(1):6–14.

5. Overview: Jaundice in newborn babies under 28 days: Guidance [Internet]. NICE. 2016 [cited 2023Sep30]. Available from: https://www.nice.org.uk/guidance/cg98

6. O'Reilly P, Walsh O, Allen NM, Corcoran JD. The Bhutani Nomogram Reduces Incidence of Severe Hyperbilirubinaemia in Term and Near Term Infants. Irish Medical Journal. 2015Jun;:181–2.