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**A survey of the definition and monitoring of neonatal hypoglycaemia in English Neonatal Units**

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3 **Definition and monitoring of neonatal hypoglycaemia: A nationwide survey of NHS England**

4 **Neonatal Units**

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Neonatal hypoglycaemia is common; however there is ongoing controversy regarding its operational definition, with recent guidance from the Paediatric Endocrine Society (PES) recommending using significantly higher blood glucose thresholds and longer periods of monitoring than existing guidance [1].

A 2014 survey of Australasian neonatal units identified that the commonest clinical threshold for treatment of hypoglycaemia was 2.6 mmol/L, and some units utilised potentially unreliable near-side blood glucose monitoring devices [2]. The most recent published survey of British neonatologists showed wide variation in definitions of neonatal hypoglycaemia from <1 to <4mmol/L [3].

We surveyed neonatal units in England to assess current working practice on the definition and monitoring of neonatal hypoglycaemia.

All 161 NHS neonatal units in England were surveyed between April and August 2015 via telephone or online questionnaire.

Respondents were asked (1) if a hypoglycaemia guideline was used; (2) definition of hypoglycaemia; (3) methods used to monitor blood glucose; (4) whether hypoglycaemia was confirmed by laboratory samples (5) the number of satisfactory pre-feed blood sugar readings required to discontinue monitoring.

Responses were received from 84% of units (135/161). 1.5% (2/135) reported not having a formal hypoglycaemia guideline.

88.1% of units defined hypoglycaemia as <2.6 mmol/L (119/135). Values ranging from 2.0 to 3.0 mmol/L were used by 11.9% of respondents (16/135), with some units defining hypoglycaemia according to differing neonatal clinical characteristics or feed type (Table 1).

*Table 1: Definition of hypoglycaemia in surveyed English Neonatal Units*

Definition of hypoglycaemia (mmol/L)	Number of units	Percentage of units (%)
<2.0	5	3.7
<2.2	1	0.7
<2.4	1	0.7
<2.5	1	0.7

<2.6	119	88.1
<2.7	3	2.2
<3.0	2	1.5
<2.0 for breast-fed <2.5 for bottle-fed	1	0.7
<3.0 for diabetes in pregnancy <2.0 for other neonates	1	0.7
<4.0 for diabetes in pregnancy <2.6 for other neonates	1	0.7

Glucometers were used by 87.4% of units (118/135) and blood gas machines by 68.1% (92/135).

Both methods were used in 56.3% of units (76/135).

57.7% (78/135) of units confirmed low blood glucose values with a laboratory sample: of these, 34.6% (27/78) of units used a threshold of < 2.6 mmol/L, while 38.5%(30/78) used other thresholds, and 26.9% (21/78) reported that decisions were based on clinical judgement.

43.7% (59/135) of respondents required two and 45.9% (62/135) required three satisfactory pre-feed blood glucose readings to discontinue monitoring. The remaining 10.4% units (14/135) utilised other criteria such as a fixed monitoring period or clinical judgement.

Although the majority of units defined hypoglycaemia as <2.6 mmol/L , this survey identified variation in its definition and monitoring.

Point of care glucometers are the most common measurement method, and laboratory confirmation of low blood glucose readings using these devices is not universal. These findings are significant as there is evidence to suggest some point of care glucose testing devices may overestimate blood glucose levels [4].

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5 Current practice does not comply with recent guidance from the PES, which aims to help clinicians  
6 recognise persistent hypoglycaemia disorders using higher thresholds than existing guidance from  
7 the American Academy of Paediatrics[1]. Implementing such guidance may increase neonatal unit  
8 admissions, separation from parents and impact on breast feeding, while there is controversy  
9 regarding its effect on neurodevelopmental outcomes[1]. The feasibility of adopting nationwide  
10 consensus guidelines should be explored.  
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### 18 References

- 19  
20 1. Adamkin, D., & Polin, R. (2016). Imperfect advice: Neonatal hypoglycemia. The Journal of  
21 pediatrics. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/27297210>
- 22  
23 2. Harris, D.L., Weston, P.J., Battin, M.R. and Harding, J.E. (2009) 'A survey of the management  
24 of neonatal hypoglycaemia within the Australian and New Zealand neonatal network',  
25 Journal of Paediatrics and Child Health, 50(10), pp. E55–E62. doi: 10.1111/j.1440-  
26 1754.2009.01599.x.
- 27  
28 3. Koh, T. and Vong, S. (1996) 'Definition of neonatal hypoglycaemia: Is there a change?',  
29 Journal of paediatrics and child health., 32(4), pp. 302–5.
- 30  
31 4. Roth-Kleiner M, Stadelmann Diaw C, Urfer J, Ruffieux C, Werner D. Evaluation of different  
32 POCT devices for glucose measurement in a clinical neonatal setting. European Journal of  
33 Paediatrics. 2010; 169(11): 1387-95.  
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