NICE guideline review: Neonatal parenteral nutrition (NG154)

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INTRODUCTION

The use of parenteral nutrition (PN) is well established within neonatal units in the UK. Although preterm infants are among the highest users of PN within any patient group, practices vary.[1 2] The National Confidential Enquiry into Patient Outcome and Death and the Paediatric Chief Pharmacist's Group highlighted that up to only a quarter of babies in a study of 264 neonates across neonatal units in the UK received optimal nutrition.[3] Responding to this, the British Association of Perinatal Medicine (BAPM) published 'The Provision of Parenteral Nutrition within Neonatal Services – A Framework for Practice' in April 2016.[4] This guidance incorporated recommendations from the European Society for Paediatric Gastroenterology, Hepatology and Nutrition and the European Society of Clinical Nutrition and Metabolism, with the aim of defining practice and recommending the minimum standards for the provision of PN.

In February 2020, the National Institute for Health and Care Excellence (NICE) published a guideline on neonatal PN (NG154) (see box 1).[5] This guideline covers PN for preterm babies, up to 28 days after their due birth date; and term babies, up to 28 days after their birth. The content is relevant to neonatal practitioners, neonatal networks, commissioners and parents.

EVIDENCE AND BASIS FOR NICE RECOMMENDATIONS

There is limited evidence available for the majority of areas relating to PN use in neonates. This includes defining inclusion criteria and appropriate growth parameters for preterm babies, which has led to recommendations based on in utero growth patterns. Where some evidence is available, it is of uncertain quality due to inconsistency of regimens involved in study subjects. Hence, all the recommendations in the NICE guidance are based on the knowledge and experience of the committee members, which comprised neonatologists, a neonatal nurse, paediatric dieticians with expertise in neonatal nutrition, pharmacists with expertise in neonatal PN, a paediatric gastroenterologist, a paediatric surgeon, a clinical biochemist and lay representatives. This consensus-based approach is similar to that taken by other countries when formulating recommendations on neonatal PN.[6]

KEY ISSUES ADDRESSED IN NICE RECOMMENDATIONS

Indications for starting PN

- Preterm babies born before 31+0 weeks.
- Preterm babies born at or after 31+0 weeks, if sufficient progress not made with enteral feeding in the first 72 hours after birth.
- Any baby who is unlikely to establish sufficient enteral feeding, such as those with a congenital gut disorder or critical illness, like sepsis.
- Any preterm baby whose enteral feeds have been stopped for more than 24 hours and it is unlikely that they will resume feeds or be on a sufficient volume within a further 48 hours.
- Any term baby whose enteral feeds have been stopped for more than 48 hours and it is unlikely that they will be on a sufficient volume within a further 48 hours or that they will resume feeds by 72 hours.

Timing for starting PN

Start as soon as possible from the time when the baby meets the indications for PN and the decision is made, and within 8 hours at the latest. This minimises the risk of nutritional deficit developing in the smallest preterm babies but allows for placement of central lines.

Administration of PN

- Use a central venous catheter, which has a longer life span and lower risk of thrombophlebitis than peripheral lines;

Box 1 Resources

The guideline.
- https://www.nice.org.uk/guidance/ng154/resources/neonatal-parenteral-nutrition-pdf-66141840283333

Preterm babies algorithm.
- https://www.nice.org.uk/guidance/ng154/resources/preterm-babies-algorithm-pdf-7084678573

Term babies algorithm.
- https://www.nice.org.uk/guidance/ng154/resources/term-babies-algorithm-pdf-7084678574

additionally, maximum safe limits of osmolarity for peripheral administration are uncertain.
- Only consider using peripheral venous access if it would avoid a delay in starting PN, short-term use of peripheral venous access is anticipated (<5 days), if it would avoid interruptions in giving PN, or if central venous access is impractical.
- Surgical insertion of a central venous catheter should be considered only if non-surgical insertion is not possible, and long-term PN is anticipated, for example, in short bowel syndrome.
- The bags, syringes, and infusion sets of both aqueous and lipid PN solutions should be protected from light.
- Standardised neonatal PN should be formulated in concentrated solutions to help ensure that the nutritive elements are included within the total fluids allowance.

Constituents of PN

Recommendations have been made for the gradual increase in energy needs of preterm and term babies, including those who are on some enteral feeds and postcritical illness or postsurgery. This includes changes to glucose, amino acid, lipid content; ratios of non-nitrogen energy to nitrogen, and carbohydrates to lipids; iron, calcium, phosphate; ratio of calcium to phosphate; and vitamins, trace elements, magnesium, electrolytes.

'Standardised' bags

Use standardised neonatal PN formulation for preterm and term infants.

Individualised PN may be indicated in some situations, such as renal failure or complex disorders associated with fluid and electrolyte imbalance.

Monitoring PN

Recommendations include measuring blood glucose, pH, potassium, chloride, calcium, serum triglycerides, phosphate, liver function tests and iron status (if on long-term PN).

Stopping PN

- For babies born before 28 weeks, stop PN within 24 hours of reaching and tolerating 140–150 mL/kg/day of enteral feeds.
- For babies born at or after 28 weeks and term babies, stop PN within 24 hours of reaching and tolerating 120–140 mL/kg/day of enteral feeds.

Service design

Neonatal PN services should be supported by a local or network-based specialist multidisciplinary team, which has oversight of governance processes, as well as supports delivery of clinical advice in complex cases.

Information and support for parents and carers

Specific topics on which to provide information that is tailored to the needs of parents and their baby are suggested. This should be up to date, relevant, consistent and in suitable formats.

IMPACT OF THE RECOMMENDATIONS

As the recommendations re-enforce best practice and existing Medicines and Healthcare products Regulatory Agency safety guidance on the use of light-shielding syringes, lines and bags, their adoption should not produce a significant impact on resources, unless some centres are not currently compliant. Where access to health professionals with expertise in PN is a challenge due to various constraints, these recommendations may help individual units and regional networks to liaise with commissioners to prioritise delivery to these areas.

WHAT I NEED TO DO

- Review and benchmark your own unit practice with the NICE baseline assessment tool.
- Ensure there are available facilities for commencing PN in eligible babies within the first 8 hours of the decision by having standardised stock bags available and appropriate venous access.
- Ensure that there are local or regional/network guidelines on PN, which reflect NICE recommendations.
- Liaise with your neonatal pharmacist, PN pharmacist and dietician regarding any modifications that may be required to meet minimum or recommended standards.
- Review your unit practice with regards to how information about the nutritional needs and management of the infant are conveyed to parents.
- Undertake a gap analysis for the provision of recommended multidisciplinary professional support, including a neonatologist or paediatrician with an interest in neonatal nutrition; pharmacist and dietician, with expertise in neonatal PN; and access to neonatal nurses, clinical biochemist and paediatric gastroenterologist.

CRITICAL REVIEW

- The NICE guidance (NG154) has clear recommendations, with links to separate text describing the evidence and rationale. The additional algorithm flow charts (see box 1) summarise these and facilitate the implementation in preterm and term babies.
- All the recommendations resulted from consensus of the committee members, based on their knowledge and experience. This was due to the challenge of outlining evidence-based recommendations on this topic. Key

Box 2 Key recommendations for research

1. What are the information and support needs of parents and carers with babies on parenteral nutrition?
2. What is the optimal ratio of non-nitrogen energy to nitrogen in parenteral nutrition for preterm and term babies?
3. What is the optimal timeframe for starting parenteral nutrition in term babies who are critically ill or require surgery?
4. What overall osmolality (or concentration of calcium and glucose/dextrose) in parenteral nutrition can determine whether to administer centrally or peripherally?

areas for research were identified and recommended (see box 2).

- There are some key differences with the BAPM framework on PN (see box 3).
- Ideally clinicians would use PN regimens which have been tested in the context of randomised controlled trials with the consideration of relevant safety data. However, the PN criteria and formulation recommendations within this guideline have intentionally not been strictly prescriptive, as the evidence base for the optimal content and delivery of PN is limited.[2]
- The NICE guidance clearly emphasises working in partnership with parents, while informing and supporting them in making decisions about their baby's care. It also makes specific mention of the need of a specialist multidisciplinary team to oversee the governance processes and support the delivery of PN. This aspiration may prove challenging to fully implement due to low national levels of provision of allied health professionals with neonatal expertise. Currently, most infants with complex needs have access to this specialist resource at some point during their patient journey.
- The recommendations provide some clarity on situations when PN should be considered for late preterm and term babies. They specifically excluded weight as an inclusion criteria for PN as they felt that including more than one parameter may lead to uncertainty on when to start, so chose gestational age at birth, which is closely linked to weight.
- This guideline clarifies standardised PN as that where the formulation meets recommended volumes and constituents and is prepared following nationally agreed quality standards. Standardised PN is recommended as it can be immediately available as a stock bag, suitable for most babies, minimises clinical variation and prescription errors, has lower acquisition costs, and improves compliance with national recommendations.
- The committee have steered clear of endorsing any particular products and acknowledged that some PN formulations may not have UK marketing authorisation for this indication. The decision of which product is best suited for their needs lies with individual units and networks. The majority of neonatal operational delivery networks have facilities for regional procurement.
- Specific areas where the committee has not made recommendations due to lack of evidence of benefit or harm include the routine use of composite lipid emulsion such as soybean oil, medium chain triglycerides, olive oil, fish oils, unless associated with PN-associated liver disease; the use of in-line filters, which have additional cost implications; and acetate content, due to lack of evidence about the amount needed to reduce the risk of hyperchloraemia.
- The future development of NICE quality standards to accompany this guideline would enable units to identify and address priority areas for quality improvement through a set of specific, concise and measurable statements.

Box 3 How NG154 differs from the British Association of Perinatal Medicine framework on parenteral nutrition (PN)

- Inclusion criteria of infants less than 31 weeks gestation, instead of 30 weeks gestation.
- No weight criteria for commencing PN.
- More explicit detail for consideration of PN where infants are of 31 weeks gestation or higher.
- Inclusion criteria of infants who are already on enteral feeds but may not be on considerable amount of enteral feeds by 72 hours. It also makes the distinction of quantifying intervals of cessation of enteral feeds and factors in the likelihood of their resumption (48 hours or 72 hours, depending on gestation) as justification for considering starting PN.
- Recommended timeframe to start PN by 8 hours of the decision, instead of as soon as possible with intravenous lipid added within 24 hours of age.
- More explicit detail of when peripheral venous access or surgically inserted central lines may be required.
- Stopping of PN when enteral feeds of 140–150 mL/kg/day are tolerated in case of preterms born at <28 weeks and 120–140 mL/kg/day in infants born at 28 weeks gestation and above, instead of 120 mL/kg/day (75% of nutritional requirement) of enteral feeds.
- Addition of iron to PN recommended after 28 days instead of after 3 weeks.
- No recommendation on in-line filters.

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