

Topic Expert Group: Patient safety and hygiene practice

Prevention of necrotising enterocolitis (NEC)

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Target group

Very preterm infants (<32 weeks gestational age), preterm infants (<37 weeks), and parents

User group

Healthcare professionals, neonatal units, hospitals, and health services

Statement of standard

Neonatal services implement bundles of care designed to prevent necrotising enterocolitis (NEC).

Rationale

Necrotising enterocolitis (NEC) is a devastating bowel disease affecting approximately 7% of very preterm infants. The incidence of NEC increases with decrease in gestational age (GA). It is associated with increased mortality, serious neonatal morbidity, prolonged NICU stay, high costs, late neurodevelopmental impairment, and decreased quality of life in survivors. (1–5)

The pathogenesis of NEC is multifactorial, including gut immaturity, infection, enteric colonisation by pathogens, and local vascular injury, in the presence of milk. (1–4)

Prematurity is the main risk factor for NEC, thus preventing prematurity remains the main action in preventing NEC. Additional prenatal factors associated with an increased risk of NEC include fetal growth retardation, intrauterine infection and inflammation, the use of the antibiotic amoxicillin-clavulanic acid during pregnancy, and the use of indomethacin for tocolysis, while protective interventions include antenatal corticosteroids and the judicious use of antibiotic treatment when indicated. (6) Neonatal risk factors include absent or limited exposure to human milk, either donor or maternal (7,8), exposure to inhibitors of gastric acidity (9,10), exposure to cow-milk derived proteins provided as fortifier (7), or as formula milk (8), and the prolonged use of antibiotics during the first days of life. (11) The role of several other variables, such as changes in the daily increase in the amount of enteral feeding or packed red blood cells transfusion, have been assessed but to date there is no solid evidence of a direct causative relationship with the onset of NEC. (12,13)

A limited number of strategies have proven effective in reducing the prevalence of the most severe stages of NEC (5), including human milk, with fresh maternal milk being more protective than donor's (8), and human milk-based fortifiers more protective than bovine milk-based fortifiers. (14,15) Conversely, a beneficial effect of bovine Lactoferrin (16), and of different preparations of probiotics, detected in some clinical trials, has only low to moderate level of certainty, and is still matter of investigation. (17–20). It is likely that only multifaceted, comprehensive strategies will consistently lead to the prevention of NEC.

Benefits

Short-term benefit

- Reduced risk of NEC and comorbidity (7,8,18)
- Reduced mortality (21)

Long-term benefits

- Reduced risk of poor neurodevelopmental outcome (21,22)
- Reduced risk of poor nutritional outcome including impaired growth and dependence on nutritional devices (consensus)
- Reduced healthcare costs (consensus)

Components of the standard

Component	Grading of evidence	Indicator of meeting the standard
For parents and family		
1. Parents are informed by healthcare professionals, prenatally and postnatally, about the benefits of human milk feeding. (8)	A (High quality) B (High quality)	Patient information sheet
2. Where human milk-based fortification products are available, parents are informed by healthcare professionals about the benefits of human milk-based fortification over bovine milk-based fortification.	B (Moderate quality)	Patient information sheet
3. Mothers are instructed about how to early initiate expressing breast milk (see Nutrition). (23)	A (High quality)	Parent feedback
4. Parents are instructed by healthcare professionals about the need for hand hygiene to reduce the risk of nosocomial infections (see Patient safety & hygiene practice).	B (Moderate quality)	Patient information sheet, training documentation
For healthcare professionals		
5. A written unit guideline on the implementation of bundles of care designed to prevent necrotising enterocolitis (NEC) is adhered to by all healthcare professionals.	B (High quality)	Guideline
6. Own mother's milk is used where available, donor milk is substituted if necessary, and where available. (3,8)	A (High quality)	Clinical records, guideline
7. Where human milk-based fortification products are available human milk-based	B (Moderate quality)	Guideline

fortifiers should be preferred over bovine milk-based fortifiers. (14,15)

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| 8. Specific probiotic preparation (either Lactobacillus rhamnosus GG ATCC53103 or the combination of Bifidobacterium infantis Bb-02, Bifidobacterium lactis Bb-12, and Streptococcus thermophilus TH 4) are used following ESPGHAN. (17,18,20,24) | B (Moderate quality) | Guideline |
| 9. Inhibitors of gastric acidity (H2-blockers, proton pump inhibitors, etc.) and unnecessary antibiotics are avoided. (9,10) | A (High quality) | Guideline |
| 10. Appropriate insertion and management of umbilical vein and artery catheters is ensured (see standard Vascular access). (24,25) | A (Moderate quality) | Guideline |
| 11. Education and training of all healthcare professionals for the rapid recognition of a developing NEC (early warning clinical signs) and the immediate initiation of the first diagnostic and treatment steps to avoid or reduce late sequelae is provided. | B (Low quality) | Guideline |

For neonatal unit

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| 12. A unit guideline on the implementation of bundles of care designed to prevent NEC is available and regularly updated. | B (High quality) | Guideline |
| 13. Standardised feeding protocols are available and regularly updated. (26,27) | A (High quality) | Guideline |
| 14. Healthcare professionals in the NICU are regularly educated, trained and updated by specifically trained staff members (parental counsellors) on the role of human milk and breastfeeding in preventing NEC. | B (High quality) | Guideline |
| 15. Antibiotic stewardship to reduce unnecessary antibiotics is adopted in each neonatal unit (see Patient safety & hygiene practice). | B (High quality) | Guideline |
| 16. Prenatal and postnatal counselling to the parents and to breastfeeding mothers is provided (see standards Promotion of breastfeeding and Providing mother's own milk (MOM) for preterm and ill term infants). (28–31) | B (High quality) | Audit report, clinical record |

17. The proportion of very preterm infants who develop NEC is audited regularly.	B (High quality)	Audit report
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For health service

18. A national guideline on the implementation of a bundle of care designed to prevent NEC is available and regularly updated.	B (High quality)	Guideline
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19. Human milk banks are available. (32)	A (High quality)	Audit report
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Where to go – further development of care

Further development	Grading of evidence
For parents and family	
N/A	
For healthcare professionals and neonatal unit	
<ul style="list-style-type: none"> Confirm the beneficial effect of specific probiotic preparations, define the optimal probiotic to be used in the NICU and address all safety issues. 	B (Low quality)
<ul style="list-style-type: none"> Assess the beneficial effect of human milk-based fortifiers over bovine milk-based fortifiers. 	B (Low quality)
<ul style="list-style-type: none"> Assess the role of blood transfusions/chronic anaemia, the effects of withholding of feeding before/during/after blood transfusion, speed of transfusion, withholding a change of feeding amount and amount of fortification during blood transfusions. 	B (Moderate quality)
For hospital	
<ul style="list-style-type: none"> Ensure availability of own mother’s milk and donor milk for all preterm infants. (32) 	A (High quality)
<ul style="list-style-type: none"> Create incentives for special professions such as breastfeeding counsellors and make them mandatory in NICUs. 	B (High quality)
For health service	
N/A	

Getting started

Initial steps
For parents and family
<ul style="list-style-type: none"> Parents are verbally instructed by healthcare professionals about the importance of the use of own mother’s milk where available and in the benefits of donor milk as a substitute.
For healthcare professionals
<ul style="list-style-type: none"> Monitor the proportion of very preterm infants who develop necrotising enterocolitis (NEC).
For neonatal unit
<ul style="list-style-type: none"> Develop and implement a unit guideline on bundles for prevention practices for NEC.

- Develop information material about the benefits of human milk feeding and the need for hand hygiene for parents.

For hospital

- Provide donor milk supply (see Nutrition).

For health service

- Develop and implement a national guideline on the implementation of bundles of care designed to prevent NEC.

Source

1. Manzoni P, Meyer M, Stolfi I, Rinaldi M, Cattani S, Pugni L, et al. Bovine lactoferrin supplementation for prevention of necrotizing enterocolitis in very-low-birth-weight neonates: a randomized clinical trial. *Early Hum Dev.* 2014 Mar;90:S60–5.
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