

Yorkshire and Humber Neonatal Operational Delivery Network Clinical Guideline

PAN Network

Oral Feeding Guideline for the Neonatal Unit

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This clinical guideline has been developed to ensure appropriate evidence-based standards of care throughout the Yorkshire and Humber Neonatal Operational Delivery Network. The appropriate use and interpretation of this guideline in providing clinical care remains the responsibility of the individual clinician. If there is any doubt discuss with a senior colleague.

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A Guideline Summary

1. Aims

To provide evidence-based guidance for families and staff on introducing and managing oral feeding in high-risk infants, with the following objectives:

1. To establish a consistent feeding approach.
2. To encourage positive, safe, and individualised developmentally appropriate feeding experiences for infants.
3. To reduce risk of aversive feeding behaviours.

Please note that while this guideline can offer practical suggestions, it is always essential to involve the appropriate professionals when addressing complex feeding issues or when further intervention is required. The expertise of Speech and Language Therapists and Infant Feeding specialists remains vital in providing comprehensive care for neonates and their families.

It is important to emphasise that this document does not serve as a substitute for the expertise and guidance provided by Speech and Language Therapists and/ or the Infant Feeding team.

2. Flow Chart/Summary Page of Recommendations

The following tables outline the stages of oral feeding, using a color-coded traffic light system for clarity. In this system, red signifies the pre-oral stage, when infants are not yet feeding orally. Amber indicates the early phase of oral feeding, where oral intake is initially introduced. Green indicates oral feeding is well under way to becoming fully established.

Adapted from Calgary Neonatal Care Committee, Oral Feeding Guideline [40] and Progression from tube to oral feeding (breast or bottle) Southern West Midlands Neonatal Operational Delivery Network [42]

The timing of these interventions should be determined on a case-by-case basis, and the appropriateness of initiating these discussions should be guided by the clinical judgment of the professional involved.

2.1 Pre-Oral Stage (Non-Oral)

Pre- Oral Stage			
INFANT CHARACTERISTICS	GOALS	INTERVENTIONS	WHEN TO REFER
<p>Responds adversely to handling</p> <p>Poor physiological, motor & state regulation with or without stimulation</p> <p>None to very weak oral reflexes (transient)</p> <p>None to very weak non-nutritive skills</p>	<p>Establish and maintain mother's milk supply</p> <p>Positive co regulation relationship</p> <p>Minimize negative oral stimulation</p> <p>Promote neurobehavioural organisation</p>	<p>Offering buccal colostrum ideally within 6 hours for immune boost if available and infant medically stable, even if ventilated [47]</p> <p>Offering sensitive mouthcare with EBM if available</p> <p>Support mother in initiating and maintain lactation</p> <p>Positive experiences to the face, as tolerated by the infant such as:</p>	<p>Refer to Infant Feeding/SLT if mother:</p> <ul style="list-style-type: none"> • Has difficulty establishing/maintaining lactation. <p>Refer to Infant Feeding if mother:</p> <ul style="list-style-type: none"> • Experiences complications as a result of pumping • Has difficulty in accessing breast pump. <p>Refer to SLT when:</p>

<p>Not managing oral secretions (e.g., infants with neurological compromise) requiring suctioning.</p>	<p>0% oral intake, excludes colostrum</p> <p>Facilitate parent feeding goals</p>	<ul style="list-style-type: none"> • Skin to skin • Positive touch <p>Discuss and document parent feeding goals</p> <p>Discuss with parents' realistic expectations of feeding journey from initiation to progression or oral feeding</p> <p>Interventions such as promoting hand to mouth experience and behavioural organisation, should be underpinned by infant and family centred developmental care</p> <p>Olfactory stimulation with EBM near nose should be offered</p> <p>Tube feeding only</p>	<ul style="list-style-type: none"> • Physiologically stable to progress to next stage but no emerging sucking skills • Hypersensitive to oral touch • Not managing oral secretions, absent gag, or compromised suck, swallow.
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By the end of this stage, the infant demonstrates the following characteristics and may be ready to move on to the next stage:

- Consistent physiological stability with handling
- Emerging licking and sucking cues.

2.2 Non-Nutritive Sucking Stage (Non-Oral)

Non – Nutritive Sucking Stage			
INFANT CHARACTERISTICS	GOALS	INTERVENTIONS	WHEN TO REFER
<p>Stable with handling and able to maintain physiological, motor and state stability with NNS practice</p> <p>Oral reflexes emerging</p> <p>Demonstrates licking and rooting</p> <p>Learning to latch</p>	<p>Support mother's milk supply</p> <p>Facilitate parent feeding goals</p> <p>Positive co regulation relationship</p> <p>Promote positive oral experiences at the breast/ dummy</p> <p>Responsive tube feeding</p> <p>0% oral intake, excludes colostrum</p>	<p>Support mother in initiating and maintain lactation</p> <p>Offering sensitive mouthcare with EBM if available</p> <p>Considering the clinical context, it may be appropriate to have a conversation with the parents to discuss their expectations of the feeding journey from initiation to progression of oral feeding</p> <p>Discuss and document parent feeding goals</p> <p>Help parents access breastfeeding/ oral feeding resources/leaflets</p> <p>Provide positive oral experiences and non nutritive sucking (NNS):</p> <ul style="list-style-type: none"> • Skin to skin care • Allow infant to nuzzle and practice at an appropriately pumped breast if this has been agreed to be safe/appropriate by medical/surgical staff and the MDT 	<p>Refer to Infant Feeding/SLT if:</p> <ul style="list-style-type: none"> • Infant shows distress at the breast <p>Refer to Infant Feeding if:</p> <ul style="list-style-type: none"> • There is concern with Mother's breasts or milk supply. <p>Refer to SLT when:</p> <ul style="list-style-type: none"> • Persistent physiological instability with NNS • Consistently refusing NNS • Difficulty transitioning to pairing NNS and tube feeding • Abnormal suck • Query safety of swallowing <p>Refer to SLT, Dietitian, Neonatal Outreach team when:</p>

		<ul style="list-style-type: none"> • Position to allow hand to mouth contact to allow infant opportunity to suck • Parents can use a clean finger, or staff can use a gloved finger, to assist with NNS (non-nutritive sucking). If parents or caregivers have given their consent, a dummy can also be employed to help with NNS. It's important to offer the dummy in a sensitive manner and it should never be forced into the infant's mouth. When introducing a dummy or gloved finger, it's important to proceed at the baby's pace to prevent adverse reactions. <p>Transition to pairing NNS and tube feeding:</p> <ul style="list-style-type: none"> • Once infant attains NNS stability, all above methods of NNS can be combined with tube feeding if tolerated (e.g., NG feeding whilst nuzzling at breast) <p>Consider the best times to carry out the infant's care needs in relation to feeding:</p> <ul style="list-style-type: none"> • If the infant needs a nappy change, try to do this in way that conserves energy and stability 	<ul style="list-style-type: none"> • Infant is to be discharged home exclusively tube feeding.
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		<ul style="list-style-type: none"> • Avoid lifting the infant's legs high off the mattress and move the infant gently • Activities such as nappy changing and bathing are tiring and may leave the infant with depleted energy and reduce capacity for feeding • Avoid any interventions/cares/daily routines immediately following the feed. 	
<p>By the end of this stage, the infant demonstrates the following characteristics and may be able to move on to the next stage:</p> <ul style="list-style-type: none"> • Effective NNS by: • Establishing and maintaining an effective latch • Rhythmical sucking bursts • Coordinating sucking and breathing • Stable with pairing of NNS and tube feeding 			

2.3 Nutritive Sucking Stage 1 (Minimal Oral Intake)

Nutritive Sucking stage 1: Minimal Oral Intake			
INFANT CHARACTERISTICS	GOALS	INTERVENTIONS	WHEN TO REFER
Emerging oral feeding readiness cues	Minimal oral intake	All feeding methods: Observe the infant's behaviour before	Refer to Infant feeding when:

<p>Managing secretions</p> <p>Good NNS; emergent but no sustained SSB coordination</p> <p>Stable with handling and able to maintain physiological, motor and state stability with minimal oral intake</p>	<p>Oral practice only – focus on quality and ambience rather than quantity taken</p> <p>Facilitate parent feeding goals</p> <p>Support mother's milk supply</p> <p>Develop SSB coordination with small volumes at breast/bottle</p> <p>Positive co regulation relationship</p>	<p>feeding. Look for signs of feeding readiness:</p> <ul style="list-style-type: none"> • Are they awake/ demonstrate a quiet alert state? • Neurodevelopmental readiness • Able to be held in a flexed position/midline • Demonstrate stamina for feeding • Attention is directed toward feeding • Showing early feeding cues, looking around, turning their head and opening their mouth (rooting). Bringing the hands to the mouth/sucking the fist or fingers (Appendix D) • Oral activity, sucking • Sticking out the tongue • Agitation/crying (late hunger signs) <p>Consider using an assessment of readiness for oral feeding such as the one in the Family and Infant Neurodevelopmental Education (FINE)</p> <ul style="list-style-type: none"> • Can the infant keep a flexed posture with midline orientation? • Is he / she awake? • Does he / she have enough energy to feed? • Is the infant's attention directed towards feeding? <p>Minimise distraction stimuli whilst feeding Up to 5 – 10 mins feeding practice</p>	<ul style="list-style-type: none"> • Mother's milk supply is a concern • Complications present e.g., cracked nipples/ mastitis <p>Refer to Infant Feeding/SLT when:</p> <ul style="list-style-type: none"> • Unable to latch • Unable to achieve milk transfer • Infant consistently frustrated at breast <p>Refer to SLT when:</p> <ul style="list-style-type: none"> • Infant at high risk of dysphagia • Gurgling sounds in pharynx • Coughing during feeding • Stridor or noisy breathing during feeding • Difficulty managing secretions
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		<p>Intervene promptly if signs of distress are observed</p> <p>Explore proactive strategies to prevent distress (optimal positioning, pacing, flow rate)</p> <p>At each feed, the choice of either breast or bottle should be offered, as per the parental preference for the feeding method.</p> <p>In the case of mixed feeding, such as a combination of breast and bottle, it is advisable to encourage and support the establishment of breastfeeding before introducing bottles.</p> <p>Breastfeeding practice</p> <ul style="list-style-type: none"> • Position skin to skin and lower infant to good breastfeeding position • Practice at appropriately pumped breast • If disorganised, try NNS first • Hand express or drip milk from syringe onto mother's nipple to assist with latch if needed • Pair tube feeding with breastfeeding practice <p>Bottle feeding practice</p>	<ul style="list-style-type: none"> • Aspiration may be silent • Persistent feeding induced apnoea and bradycardia • Good NNS but refuses NS • Poor, unusual or unstained latch e.g., wide jaw excursion • Failure to progress from this stage • GERD resulting in emerging feeding refusal <p>Refer to SLT, Dietitian, Neonatal Outreach team when: Infant is to be discharged home on any amount of tube feeding.</p>
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		<p>Provide postural stability for example, elevated side lying on a pillow/wedge with head elevated [32, 44-46]</p> <p>Use pacing and rest breaks as needed. You can help the infant to regulate sucking, swallowing and breathing by adjusting the milk flow by lowering the angle of the bottle, allowing the teat to empty.</p> <p>If the infant continues to suck and does not pause to breathe it may be necessary to pace the infant by removing the teat from the mouth.</p> <ul style="list-style-type: none"> • Begin all feeds with brief NNS to help organise infant state and skill • Therapeutic tasting: single drops from 1ml syringe onto dummy. Can progress to milk dripped from syringe into open teat. If volume > 5ml may consider transitioning to bottle. <p>Use a slow flow teat (for example, Dr Brown's preemie, MAM 0 – see Appendix A for further information on teats)</p> <p>A slower flow of milk from the bottle allows the infant to better co-ordinate the suck-swallow-breathe pattern, maintain physiological stability, reduce the risk of aspiration and</p>	
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		<p>allows for neurodevelopmentally positive feeding experiences.</p> <p>Avoid jiggling or turning the teat to stimulate NS; this practice is contraindicated.</p> <p>When offering tube top-ups, offering opportunities for non-nutritive sucking or dummy dips if infant is awake, will be beneficial</p>	
<p>By the end of this stage, the infant demonstrates the following characteristics and is able to move on to the next stage:</p> <ul style="list-style-type: none">• Beginning to self-pace• Breastfeeding – infant demonstrates evidence of milk transfer with physiological stability• Bottle feeding – infant is able to take minimal feed orally with physiological stability			

2.4 Nutritive Sucking Stage 2 (Moderate Oral Intake)

Nutritive Sucking stage II A, B and C: Moderate Oral Intake Modified Responsive Feed			
INFANT CHARACTERISTICS	GOALS	INTERVENTIONS	WHEN TO REFER
<p>NG remains in situ</p> <p>Inconsistent but identifiable readiness cues:</p> <ul style="list-style-type: none"> • Hand to mouth, rooting • Increased motor activity prior to feeding <p>The infant may demonstrate readiness to feed at some feedings throughout the day, but not necessarily all the feedings</p> <p>Improving SSB</p> <p>Improving endurance but not enough to maintain full oral feeding</p> <p>Immature state control – unable to maintain quiet alert state throughout entire feeding</p> <p>Consistent self-pacing may or may not be present</p>	<p>Support mother's milk supply</p> <p>Facilitate parent feeding goals</p> <p>Breastfeeding goal at this stage is increased exposure and experiences at the breast</p> <p>Positive co-regulated relationship</p> <p>To facilitate the transition to full oral feeding by supporting endurance, skills and physiologic stability</p> <p>Quality and ambiance are still more</p>	<p>Mum to be present for several consecutive breast feeds. Use the neonatal breastfeeding assessment tool [48]</p> <p>When offering oral feeds, offer preferred method of oral feeding when feeding cues are demonstrated</p> <p>Liaise with Dietetic and medical colleagues to ensure adequate weight gain</p> <p>Use a gentle approach to invite infant to feed (e.g., gentle touch, soothing voice, closer proximity to breast, soother to lip)</p> <p>If infant does not wake - do not orally feed Give 3hourly amount by tube feed</p> <p>DO NOT LEAVE LONGER THAN 3 HOURS BETWEEN FEEDS [42]</p> <p>Once aroused, NNS may help with state control and SSB coordination</p>	<p>Refer to Infant Feeding when:</p> <ul style="list-style-type: none"> • Milk supply is a concern • Poor milk transfer suspected • Poor unsustained latch • Considering use of nipple shield <p>Refer to SLT when:</p> <p>Considering use of nipple shield</p> <ul style="list-style-type: none"> • Poor latch evident • Infant falls asleep at breast • Poor unsustained latch • Good NNS but poor NS • Signs of dysphagia/feeding difficulty • Persistent feeding induced apnoea and bradycardia • Failure to progress from this stage • GERD resulting in emerging feeding refusal

<p>A positive breastfeeding experience is defined as an infant who demonstrates a good latch, sustained bursts of nutritive sucking, and audible swallowing for several minutes</p>	<p>important than quantity taken</p> <p>Introduce (modified) responsive oral feeding as soon as possible (i.e., allowing the infant to wake for feeds and offering oral feeds whenever the infant is awake, giving tube top-ups if necessary)</p>	<p>Ensure correct placement of NG tube if the infant consistently decompensates during oral or tube feeding</p> <p>Feedings should not be pushed. Infants will become physiologically unstable and/or aversive if pushed</p> <p>Watch for distress/ disengagement cues closely see section 1.15</p> <p>Smaller volumes and more frequent feeding practices accelerate feeding skill maturation</p> <p>Allow the infant to rest and bring up wind if they show signs of discomfort e.g., squirming, grimacing, colour changes. When winding, move the infant slowly. Vigorous patting or rubbing the back is not necessary</p> <p>Offer NNS at breast/dummy/ parents cleanfinger/ gloved finger (if staff) with tube feed. If tolerated, offer dummy dips alongside tube feed.</p> <p>Consider advancing feeding stage when infant shows consistent feeding competency for a minimum of 24 hours</p>	<p>Refer to SLT, Dietitian, Neonatal Outreach team when:</p> <p>Infant is to be discharged home on any amount of tube feeding</p>
<p>By the end of stage II C, the infant demonstrates the following characteristics and may be ready to move to the next stage:</p>			

- The infant consistently demonstrates readiness to feed with attainment of self-regulatory strategies at the majority of feedings throughout the day
- Sufficient but not necessarily efficient SSB
- Endurance to achieve modified responsive feeding oral feeding
- External pacing may be required
- The infant demonstrates consistent positive breastfeeding experience for longer periods of time with improved milk transfer

2.5 Nutritive Sucking Stage 3 (Full Oral Feeding)

Nutritive Sucking stage III: Full Oral Feeding: Responsive Feeding			
INFANT CHARACTERISTICS	GOALS	INTERVENTIONS	WHEN TO REFER
<p>Sufficient SSB throughout the feeding with or without pacing</p> <p>Feeding cues more consistent:</p> <ul style="list-style-type: none"> • Hand to mouth, rooting • Increased motor activity • Wakes on own for most feeding • Slips off nipple at end of feeding • Falls asleep at end of feeding 	<p>Facilitate parent feeding goals</p> <p>Promote efficient feeding skills</p> <p>Oral feeding that supports growth</p> <p>Feeding experience is positive to infant and caregiver</p>	<p>Encourage caregivers to spend extended times in NICU to understand infant feeding cues and participate in semi responsive/ responsive feeding</p> <p>ALWAYS follow feeding cues & infant's feedback at feed times</p> <p>Aim to meet infant's desired frequency/volume/duration</p> <p>Maximum 30 minutes of oral feeding time for bottle feeds</p> <p>Optimal positioning</p> <p>Use pacing and rest breaks as needed</p>	<p>Refer to Infant Feeding/SLT/ Dietitian when:</p> <ul style="list-style-type: none"> • Poor latch evident • Poor milk transfer suspected • Poor weight gain • Poor milk supply • Use of a nipple shield <p>Refer to SLT when:</p> <ul style="list-style-type: none"> • SSB incoordination • Signs of dysphagia • Immature or atypical sucking pattern • Inefficient feeding (e.g., prolonged feeding time) • Poor endurance • Neurological impairment • Persistent feeding refusal

<p>An effective oral feed is when:</p> <ul style="list-style-type: none"> • Feeding by breast or bottle is without cardiorespiratory compromise • Demonstrating endurance to maintain nutritional intake to support growth 		<p>Offer wind break</p> <p>Liaise with Dietitians and Medical Team to consider no tube top-up if infant consumes majority of feed for at least 24 hours</p> <p>Transition to responsive (no longer than 3 hours) cue-based feeding before discharge; volume and frequency between feedings may vary greatly throughout day and will need to be carefully monitored</p> <p>If infant is not taking enough orally, replace NG tube and allow infant to feed semi responsively by topping up the volume shortfall</p> <p>Discuss feeding expectations for home</p> <p>Most infants at this stage are sufficient feeders and may need time to become efficient feeders and build their stamina and endurance levels</p> <p>Breastfeeding:</p> <ul style="list-style-type: none"> • Nipple shield teaching and plan for weaning • Discuss pumping strategies for home • Where formula or breast milk fortifier top ups are required due to maternal 	<ul style="list-style-type: none"> • GERD impacting feeding or sleep
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		<p>supply or because the infant requires extra volume or calories, consider top ups with a bottle for a maximum of 30 minutes total feeding time but breast feeding must be established prior to this.</p> <p>Bottle feeding:</p> <ul style="list-style-type: none">• The infant should be transitioned to the teat and feeding regime that parents are planning to use at home. This will enable matching of the infant's skills to the teat to be used. A slow flow teat such as a MAM 0 or Dr Brown's Preemie may be appropriate (see appendix for further information)• Continue side-lying elevated position if needed	
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B Full Guideline & Evidence

1. Background

The ability of preterm infant to master feeding is limited by an infant's developmental stage. It is a complex activity that requires careful observation in order to understand the infant's readiness and challenges, and thus to make appropriate feeding plans. Whilst there is evidence to support the introduction of breastfeeding at early gestations it is rare for infants to be developmentally ready for bottle feeding before 34 weeks.

In line with the BFI Neonatal Standards, Speech and Language Therapist's work alongside the wider multidisciplinary team to support parents and infants with breastfeeding. Where that is not always possible, knowledge and guidance around bottle feeding and ensuring this is undertaken sensitively and safely, is beneficial. [1].

Parents and families will model their feeding practices on those of the caregivers they observe, and it is therefore important to ensure that every feed is a comfortable experience and a sensitive dialogue between the caregiver and infant. It is particularly important that neonatal staff are aware about the development of feeding skills and feeding cues so that they can adopt sensitive strategies to avoid unpleasant feeding experiences that may lead to ongoing feeding problems with aversive behaviours [2] [3].

As Speech and Language Therapists working on the Neonatal Unit, our role includes working with the wider multi-disciplinary team (MDT) to maximise an infant's development as well as support their neurodevelopment by ensuring that we incorporate developmental care and neuroprotective principles. Speech and Language Therapist's also have a role in educating and empowering families and staff in supporting and managing an infant's feeding and early communication journey.

2. Aim

The aim of this guideline is to ensure that neonatal unit staff are fully aware of the development of feeding skills and that they recognise and follow the infant's cues. **It is important to emphasise that this document does not serve as a substitute for the expertise and guidance provided by Speech and Language Therapists and/ or the Infant Feeding team.**

The purpose of this guideline is to complement and enhance the existing support systems in place. By adhering to these guidelines, staff members can contribute to the holistic care and well-being of both infants and their families, while working collaboratively with Speech and Language Therapists and Infant Feeding teams.

3. Areas Outside of Remit

Areas outside of this remit include the administration of buccal colostrum and nutritional management.

4. Evidence

Evidence for this guideline comes from comparative studies, literature reviews and expert opinions.

4.1 Development of Oral Feeding

Oral feeding “is a highly complex, multi-system skill involving anatomic stability, neuromuscular control and co-ordination, sensory perception, gastrointestinal function, cardio-respiratory support and integration from the autonomic nervous system” [28]. Oral feeding is a developmental process and the factors and skills a baby needs to successfully suck feed, develop with neurological maturation.

Infants who are born pre-term or with medical complexities can face impairment of one, or more of these systems, e.g., respiratory, gastrointestinal, neurological, cardiac. This can impact on the development and progression of oral feeding as well as impacting on positive feeding outcomes [29].

In infants, oral feeding is an involuntary, reflexive process controlled by multiple cranial nerves that are coordinated with the brainstem. It requires co-ordination of more than 30 muscles located in the oral cavity, pharynx, larynx and oesophagus [30].

Sucking emerges between 15-18 weeks and becomes rhythmical at 33 weeks gestation. Non-nutritive sucking is where a baby sucks without receiving nutrition for pacification, exploration, and comfort. Non-nutritive sucking also supports neurobehavioural organisation. Nutritive sucking is for nutritional purposes [41].

Sucking is a motor activity that creates positive pressure (compression) and negative pressure (suction). Sucking creates pressure to move the fluid. Positive pressure or compression pushes fluid out of the nipple or teat and negative pressure or suction draws the fluid out of the nipple or teat. During sucking, positive and negative pressures are generated to create fluid flow [4]. Preterm infants generate suction at the breast but generate less pressure and may find it challenging to maintain suction. Sucking efficiency generally improves with maturation [5] [6].

Suck, swallow, and breathe coordination begins to emerge around 34 weeks of gestation, gradually maturing closer to full term. This coordination is a dynamic and interrelated process, where each element influences the others. Swallowing and breathing do not occur together and breathing briefly stops for every swallow [4].

To compensate for this temporary pause in respiration, the infant must augment their breathing between swallows. Some infants face challenges in increasing their respiration during these pauses, resulting in a decrease in their minute ventilation during feeding, predominantly due to reduced respiratory rates [4].

In situations where milk flow is rapid and abundant, the infant is compelled to swallow at a rate that effectively clears the oropharynx of fluid to prevent aspiration, albeit at the cost of prioritizing swallowing over breathing [41].

Both in breast and bottle feeding, infants must synchronize their breathing with sucking bursts, and the flow of milk impacts swallowing. Bottle feeding, with its continuous fluid flow, can pose challenges in this regard. In contrast, breastfeeding offers variable fluid flow as infants can transition between nutritive and non-nutritive sucking, because the milk flow at the breast is dependent on the milk ejection reflex [5] [6].

When infants struggle to breathe effectively, they adapt their sucking pattern. Any additional effort required for breathing places an added burden on the infant, resulting in excessive calorie expenditure. Moreover, respiratory difficulties can reduce their endurance during feeding [4].

4.2 Foetal Development of Feeding

This table summarises the developmental milestones for a foetus in utero, based on Wolf & Glass [4]:

Gestational Age	Feeding-Related Developmental Milestone
9- 10 weeks	<ul style="list-style-type: none"> • Rooting
12-14 weeks	<ul style="list-style-type: none"> • Swallowing amniotic fluid emerging
15-18 weeks	<ul style="list-style-type: none"> • Sucking emerges
26-27 weeks	<ul style="list-style-type: none"> • Gag reflex evident
28 weeks	<ul style="list-style-type: none"> • Disorganized non-nutritive sucking pattern • Lapping • Some infants will lick drops of expressed milk on nipple • Takes hand to mouth.
30-32 weeks	<ul style="list-style-type: none"> • Emerging use of their lips and tongues more actively and can manage to swallow drops of breast milk • Some infants can attach to the breast • Most infants will lick drops of expressed milk on the nipple. • Rhythmical swallowing (32 weeks)
33 weeks	<ul style="list-style-type: none"> • Rhythmical sucking
32-34 weeks	<ul style="list-style-type: none"> • Rooting (searching for the nipple) and attachment • Reliable cough and gag reflexes • Co-ordinated nutritive sucking begins • Some infants maybe ready to take a full breast feed. • Development of reflexes that protect the airway, e.g., Laryngeal chemo reflex, cough and gag reflex
34-36 weeks	<ul style="list-style-type: none"> • Strong rooting and mature suck, swallow and breathing patterns

	<ul style="list-style-type: none"> • Period wake-sleep pattern emerges with robust sleep and arousal for feeding • The majority of a 's sucking development occurs between 34-36 weeks, with sucking pressure, frequency, duration and efficiency maturing week on week from 32 weeks • Increased truncal tone • Lungs mature • The swallow process is fully functional, and this then continues to mature to include respiration for a coordinated suck - swallow- breathe pattern between 34 – 42 weeks CGA • Some babies may achieve full breast feeding
37 weeks	<ul style="list-style-type: none"> • Healthy infants are able to sustain their nutrition totally at the breast

The swallow reflex is evident between 11-13 weeks gestation and the sucking reflex develops between 15 - 18 weeks gestation. Most of a 'baby's sucking development occurs between 34-36 weeks, with sucking pressure, frequency, duration and efficiency maturing week on week from 32 weeks.

Compression is seen first before suction; therefore, suction may not be seen initially in pre-term infants, however, term infants should present with suction.

At 32-34 weeks gestation the reflexes that protect the airway develop, e.g., Laryngeal chemo reflex, cough and gag reflex.

From 34 weeks onwards the swallow process is fully functional, and this then continues to mature to include respiration for a coordinated suck - swallow- breathe pattern between 34 – 42 weeks CGA [10].

4.2.1 Physiology of the Swallow

During the feeding process, the infant uses a combination of compression (positive pressure) and suction (negative pressure) to draw milk from the nipple. The tongue plays a role in maintaining and propelling the milk towards the back of the month triggering a swallow [4] [35].

During the swallow process, the tongue effectively seals the oral cavity, while the soft palate closes and seals the nasopharynx. Breathing is briefly interrupted. The larynx shifts upward and forward, the vocal cords close, and the epiglottis descends to safeguard the airway. The upper oesophageal sphincter opens, propelling the milk into the oesophagus where peristalsis begins. This all takes less than a second [4] [35].

Sensory receptors located in and around the oral cavity, pharynx, and larynx play a vital role. They transmit crucial information to and from the brain, providing details on the bolus's size, shape, and texture, while also initiating the swallow reflex and ensuring the protection of the airway and the coordinated peristaltic movement [4] [35].

4.2.2 Differences between breast and bottle feeding

Evidence suggests that breast and bottle feeding have different physiological presentations. Some of these differences have already been outlined such as breastfeeding infants generally suckle more times per day and maintain a higher level of oxygen saturation [7] and skin temperature than bottle-feeding babies. The differences within the premature population are even greater given their neurological, sensory and motor development and weight. Other differences include the breathing patterns of babies on inspiration/expiration [8], extension of the head and jaw to latch and position/movement of tongue.

With breastfeeding, milk flows from the breast by the stimulation of oxytocin that triggers milk ejection resulting in a series of bursts of rapid milk flow. The breastfed infant will suck to trigger milk flow and then swallow milk as it is let down, this may require a number of sucks, swallows in succession to manage milk flow. This variation in milk flow rate throughout a breastfeed is synchronised with swallowing and breathing by the infant. The pattern of suck-swallow-breathe, therefore, shows more variation in its pattern compared to bottle feeding [41].

When it comes to the development of feeding skills, it's important to recognise that every infant follows their unique timeline, doing the best they can. Some infants will achieve successful breastfeeding earlier than others. It's worth noting that the introduction of breastfeeding can often be safely initiated before bottle feeding. This distinction arises from the fact that the sucking action in bottle feeding differs from that in breastfeeding [8] [41].

4.3 Readiness for Oral Feeding

Feeding is a continuous and gradual journey and more than just volume [35]. A baby's readiness to orally feed depends on the neurological development and maturation of the swallow but also on the infant's general neurological maturity and stability and regulation of other systems within the body [11]:

- physiological stability (heart rate, respiratory rate)
- levels of alertness
- motor stability
- levels of attention
- an infant's ability to maintain homeostasis/stability across these areas.

Preterm infants have underdeveloped internal regulation and face increased external demands on the neonatal unit and with medical comorbidities face interference with their internal regulation [35].

For infants who are born early or with complex medical needs, many other factors also need to be considered when deciding if an infant is ready to orally/suck feed, e.g., structural issues, levels of alertness, presence of oral feeding reflexes, e.g., rooting and non-nutritive suck, medical situation and stability, presence of feeding cues.

Pre-feeding strategies aim to support an infant's oral feeding development prior to their ability to latch to a breast or bottle. Supportive feeding practices can be implemented to support early feeding skills. Examples of this include skin-to-skin and offering opportunities for positive oral experiences such as mouth care with EBM, non-nutritive sucking, dummy dips with EBM when being tube fed and offering opportunities to go to the breast once expressed. If the infant is awake, parents can be encouraged to hold their infant in skin to skin during tube feeds or in an elevated side lying position.

Whilst there is evidence to support the introduction of breastfeeding at early gestations [12], bottle feeding is not recommended before 34 weeks of age as it is unlikely that the infant is developmentally ready for this (see developmental norms) and time for maturation should be allowed to support safe and positive oral feeding [12].

Whether an infant is breast or bottle feeding, homeostasis and readiness to orally feed should always guide our decisions on the initiation and progression of oral/suck feeding [31].

There is evidence to suggest that specific gestational age is not the only criteria for determining when to commence oral feeding and that observation of an infant's behaviour and physiological maturation are better indicators of feeding readiness [13]. A careful and sensitive approach is required to progress the infant's feeding skills alongside their neurological development, to avoid potential aversive feeding behaviours in the future [13].

There is a benefit to moving away from being volume driven where the focus is on increasing intake or volume to ensuring we prioritise the quality of the feed. Infants can then build on skill, efficiency, and endurance [35].

4.4 Colostrum & EBM for mouth care

Please refer to your unit's guideline on the administration of maternal colostrum. This should be started ideally within 6 hours but no longer than the 24 hours of life [47], for all preterm and term infants who are unable to feed orally and who are admitted to the Neonatal Unit.

The benefits of human milk and breastfeeding are well documented in the literature.

By administering colostrum, before the infant begins enteral feeds and before the infant can orally feed, the baby gains the same benefit of coating the oral mucosa that breastfeeding receive.

Using the mother's own colostrum during mouth care is easy, inexpensive, and well-tolerated by even the smallest and sickest baby. Infants who are unwell often undergo many adverse oral procedures such as suctioning, intubation and indwelling oral gastric tubes and therefore mouth care with colostrum can provide positive oral experiences [32].

4.5 Breastfeeding

Breast feeding is the preferred method of feeding all preterm and sick babies who display feeding cues which indicate they are developmentally ready for oral feeds. Links to the BAPM toolkit and the UNICEF Friendly Initiative can be found here:

[Maternal Breast Milk Toolkit | British Association of Perinatal Medicine \(bapm.org\)](#)
[The UNICEF UK Friendly Initiative](#)

4.6 Bottle Feeding

Breast feeding is the preferred method of feeding all preterm and sick neonates who display feeding cues which indicate they are developmentally ready for oral feeds.

Bottle feeding should only be considered in the first instance if:

- A mother is unable to breast feed for medical reasons (maternal HIV, HTLV, or she is on a medication which renders her breast-milk unsafe)
- Or following information about the merits of breastfeeding, the decision is made by the parents to bottle feed. (Ideally this will be with breast milk if the mother chooses to express)
- Or where the medical condition of the baby makes full breast feeding impractical or unsafe.

4.7 Contraindications

- Where the mother has chosen to breast feed.
- Where the baby has a medical condition and specialist assessment has indicated that bottle feeding is contra-indicated

4.8 Teats and Positioning

Special care must be taken in introducing an infant to bottle feeds where:

- The medical condition indicates that oral motor skills may be compromised /delayed. (e.g., Extreme prematurity, Chronic lung disease, Cleft palate, certain syndromes and neurological dysfunction)

Evidence shows that infants need a slow and consistent flow of milk whilst they are learning to feed, to help them achieve safe and positive feeding experiences [Appendix A].

A slower flow of milk from the bottle allows the infant to better co-ordinate the suck-swallow-breathe pattern, maintain physiological stability, reduce the risk of aspiration and allows for neurodevelopmentally positive feeding experiences [33].

An infant's positioning during bottle feeding will depend on their individual medical needs, this will be in the cradled position or elevated side lying.

Most preterm infants who do not have medical or surgical challenges that contraindicate the elevated side lying position, will benefit from being positioned in elevated side lying for bottle feeds. There are many benefits to this position:

- It facilitates appropriate.
- postural support.
- It gives the baby more control over the feed.
- Conserves energy
- Facilitates the baby using self-regulatory strategies.
- Enables safer clearance of oral residue.
- Allows feeder to feel respiration and the feeder can feel for pauses and pace accordingly.
- Improved oxygenation during feeds
- Bottle is horizontal so flow rate is more controlled [34].

Always provide support to their back as otherwise infants can tire and end up with their chest sinking into their stomach which can impact breathing.

Even in a cradle hold, an infant's head and trunk should be elevated given poor peristalsis in the preterm infant [35].

4.9 Cup Feeding

Cup feeding is currently being reviewed by the national Speech and Language Therapy Clinical Excellence Network. We would encourage any cup feeding undertaken is done so sensitively and responsively, adhering to neurodevelopmental and neuroprotective principles with awareness of stress and avoidance cues.

4.10 Impact and Prevalence

Some examples of what aetiologies can impact feeding are listed below:

- Neurology - HIE, Seizures, brain abnormalities, neuromuscular
- Respiratory conditions - CLD, other acute respiratory illness, lung abnormalities

- Anatomical - cleft lip/or palate, TOF, OA, laryngomalacia, tracheomalacia, micrognathia, vocal fold palsy
- Prematurity - gestations age, weight
- Gastrointestinal - reflux, NEC
- Cardiac - pre op, post op, energy, endurance
- Genetic conditions - Down Syndrome, Metabolic disorders

Recent research has found the incidence of feeding difficulties is:

- between 25-45% in a typically developing paediatric population
- between 31-99% for children with cerebral palsy
- between 21-44% for children with general neurodevelopmental disabilities
- between 26.8-40% of babies born prematurely
- between 68-72% of children with acquired conditions during the acute phase of care. [28].

4.11 Infant and Family Centred Developmental Care: The Feeding Journey

Below are links to different models of developmental and neuroprotective care that will help support the baby's feeding and communication journey:

- European Standards of Care for Newborn Health – Infant & Family-Centred Developmental Care
<https://newborn-health-standards.org/standards/standards-english/infant-family-centred-developmental-care/>
- Yorkshire & Humber ODN Education
<https://www.yorkshireandhumberodneducation.com/login/index.php>
- BAPM Family Integrated Framework (November 2021)
https://hubble-live-assets.s3.amazonaws.com/bapm/file_asset/file/793/BAPM_FICare_Framework_November_2021.pdf
- Family and Infant Neurodevelopmental Education (FINE) Training
<https://finetraininguk.com/>

4.12 Communication

Babies communicate across different systems, and it is important not to override what a baby is telling you. If we do not respond appropriately to the baby's communication, it may lead to feeding refusal and/or oral aversion [33].

Relaxed babies may demonstrate self-regulation including hand to mouth activity, sucking, hand or foot claspings, bringing hands and/or legs to midline.

Through careful observation before, during and after feeds, we can gain insight into what the baby is communicating with us. When we are aware of what the baby is trying to communicate and respond to what they are telling us, this will help to regulate and organise the baby and ensure they are comfortable. In ensuring a developmentally supportive care approach for oral feeding, we can help to ensure the infant has feeding experiences that are pleasurable and positive.

4.12 Cue-Based Feeding

Prolonged, frequent skin-to-skin contact is encouraged for all babies, irrespective of feeding method. Skin contact needs to be recognised as a part of essential care, not as a desirable ‘add on’. Parents and staff who are bottle feeding should be supported to do this responsively, recognising the baby’s feeding readiness and feeding cues and need for comfort and closeness during feeding, ensuring babies are fed prior to becoming distressed or upset to avoid stress for both babies and parents [33] [36].

4.14 Approach and Avoidance Signs

Approach Signs

Feeding is interactive and the brain is influenced by experiences. Therefore, it’s crucial that any feeding experience a baby has, is positive, pleasurable, supportive and safe [35].

Oral feeding readiness is affected by the baby’s autonomic, motor and behaviour states. If these are stable, this will help guide decisions around when to initiate oral feeds and progress with them [31].

Signs of Avoidance and Stress

Breast feeding is the best example there is of co-regulation and cue-based and infant led feeding [37].

For those babies that are bottle feeding, we need to ensure we do not override any avoidance or stress signs the infant may be communicating with us and respond to these signs by pausing or stopping oral feeds. These signs include:

<p>Autonomic:</p> <ul style="list-style-type: none"> • Change in respiration rate • Change in heart rate • Change in oxygen saturations • Colour changes • Hiccups • Vomiting 	<p>Motor:</p> <ul style="list-style-type: none"> • Limbs are tense/extended • Jerky movements • Flaccidity of trunk, neck or limbs • Arching • Variable tone • Tongue extensions • Fingers splayed/spread • Nasal flaring
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	<ul style="list-style-type: none"> • Moving head away
<p>Behaviour:</p> <ul style="list-style-type: none"> • Sudden loss of alertness • Sudden fussing or crying • Sudden onset of sleepiness • Frowns or grimaces • Sudden fatigue or weak state • Irritability • Hyperalert (panic or worried look) • Frantic activity • Flaccid face 	

4.15 Ideal Feeding Environment

There are ways to provide a neuroprotective and stable environment to maximise feeding, these include:

- Quiet comfortable environment – think about lighting, noise, interruptions.
- Parent and baby relaxed and unrushed.
- Watching for baby’s cues – pacing, distress, level of arousal etc.
- Following baby’s cues and responding accordingly.

4.16 Common Challenges for Feeding

4.16.1 Ventilation

A significant number of pre-term babies present with respiratory failure after birth and require some form of ventilation to manage this in order to maintain vital functions and optimise long term outcomes [38]. There are different type of ventilation for infants, including:

- Invasive (IV)
 - Intubation – conventional ventilation, oscillation. The focus for these infants on invasive ventilation will be around mouth cares as opposed to oral feeding.
- Non-Invasive (NIV)
 - Continuous Positive Airway Pressure (CPAP)
 - Bilevel Positive Airway Pressure (BiPAP)
 - High Flow Nasal Cannula (HFNC)

Invasive Ventilation is an intervention for acutely unwell patients [39] therefore oral feeding is not considered at this stage for the infant due to medical instability. At this

stage of the infant's feeding journey the focus is on certain pre-oral strategies and early bonding strategies delivered through the models of Family Integrated and Developmental Care.

The evidence base regarding the safety of oral feeding whilst on HFNC or NCPAP is not conclusive and does not provide a consensus or any specific recommendations or guidance around the introduction of oral feeding. Infants will benefit from an SLT assessment to support the introduction of oral feeding based on the individual infant, their medical needs, clinical history and current presentation and development. All decisions to feed on HFNC or nCPAP should be made as part of an MDT.

Please refer to the appendix to access the Wolf and Glass decision making tool and the Leeds Children's Hospital SOP for examples of supportive decision making in terms of oral feeding on non-invasive ventilation. Please also refer to the Royal College of Speech and Language Therapists (RCSLT) Neonatal Clinical Excellence Network (CEN) Position Paper: Speech and Language Therapy in Neonatal Care: Feeding and Non-Invasive Respiratory Support [49].

5. Education Resources

All neonatal staff should have regular training updates from the Speech and Language Therapist.

An online video on feeding and early communication can be accessed as part of the Yorkshire and Humber Neonatal Operational Delivery Network's Family Care Package on neurodevelopmental care. This can be accessed through Moodle.

There is SLT teaching on both the Foundation and QIS programmes run by the Yorkshire and Humber Neonatal Network.

6. Audit Criteria

The following areas are suggested as audit topics:

- Nursing updates for feeding and communication on the neonatal unit
- Observational audit
- Parent satisfaction

7. References

- [1] J. D. Comrie and J. M. Helm, "Common feeding problems in the intensive care nursery: maturatin, organisation, evaluation, and management strategies.," *Seminars in Speech and Language*, vol. 18, no. 3, pp. 239-261, 1997.
- [2] P. K. Lemons, "From gavage to oral feedings: just a matter of time," *Neonatal Network*, vol. 20, no. 3, pp. 7-14, 2001.
- [3] H. K. Daley and C. M. Kennedy, "Meta-analysis: effects of interventions on premature infants' feeding," *Journal of Perinatal and Neonatal Nursing*, vol. 14, no. 3, pp. 62-77, 2000.
- [4] L. Wolf and R. Glass, *Feeding and Swallowing Disorders in Infancy: Assessment and Management*, Seattle: The Psychological Corporation, 1992.
- [5] D. T. Geddes, D. B. Langton, I. Gollow, L. A. Jacobs, P. E. Hartmann and K. Simmer, "Frenulotomy for Breastfeeding Infants with Ankyloglossia: Effect on Milk Removal and Sucking Mechanism as Imaged by Ultrasound," *Pediatrics*, vol. 122, no. 1, pp. 188-194, 2008.
- [6] D. Elad, P. Kozlovsky, O. Blum, A. F. Laine, M. J. Po, E. Botzer, S. Dollberg, M. Zelicovich and L. B. Sira, "Biomechanics of milk extraction during breast-feeding," *Proceedings of the National Academy of Sciences of the United States of America*, vol. 111, no. 14, pp. 5230-5235, 2014.
- [7] K. Wambuch and B. Spencer, *Breastfeeding and human lactation*, Burlington, Massachusetts: Jones & Barlett Learning, 2021.
- [8] O. P. Mathew, "Respiratory control during nipple feeding in preterm infant," *Pediatric Pulmonology*, vol. 5, pp. 220-224, 1988.
- [9] I. Warren and C. Bond, *A Guide to Infant Development in the Newborn Nursery*, 2010.
- [10] S. M. Thoyre, "Feeding outcomes of extremely premature infants after neonatal care," *Jouranal of Obstetric, Gynacological and Neonatal Nursing*, vol. 36, pp. 366-376, 2007.
- [11] M. Kish, "Oral feeding readiness in preterm infant: a concept analysis," *Advanced Neonatal Care*, vol. 13, no. 4, pp. 230-237, 2013.
- [12] K. H. Vyqvist, "Early attainment of breastfeeding competence in very preterm infants," *Aca Paediatrics*, vol. 97, no. 6, pp. 776-781, 2008.
- [13] A. White and K. Parnell, "The transition from tube to full oral feeding (breast or bottle) - A cue-based developmental approach," *Journal of Neonatal Nursing*, vol. 19, no. 4, pp. 189-197, 2013.
- [14] B. Pados, J. Park, S. Thoyre, H. Estrem and W. Nix, "Milk flow rates from bottle nipples used for feeding infants who are hospitalised," *American Journal of Speech-Language Pathology*, vol. 24, pp. 671-679, 2015.
- [15] L. A. Damian and K. Johnson, "Nipple flow rates: What are they really and how does this affect our clinical practice," *Dr Brown's*, August 2016. [Online]. Available: <https://www.drbrowns.com/medical/wp-content/uploads/2016/08/DBM-MilkFlowRates-Dayton-Article.pdf>.
- [16] Y. Segamni, K. Mizuno, M. Taki and K. Itabashi, "Perioral movements and sucking pattern during bottle feeding with a novel, experimental teat are similar to breastfeeding," *Journal of Perinatology*, vol. 33, no. 4, pp. 319-323, 2013.

- [17] C. Lau and R. J. Schanler, "Oral feeding in premature infants: Advantage of a self-paced milk flow," *Acta Paediatrica*, vol. 89, no. 4, pp. 453-459, 2000.
- [18] B. R. Vohr, B. B. Poindexter, A. M. Dusick, L. T. McKinley, L. L. Wright, J. C. Langer and K. P. W, "Beneficial effects of breast milk in the neonatal intensive care unit on the developmental outcome of extremely low birth weight infants at 18 months of age," *Pediatrics*, vol. 118, no. 1, pp. 115-123, 2006.
- [19] G. C. McGain, "An evidence-based guidelines for introducing oral feeding to healthy preterm infants," *Neonatal Network*, vol. 22, no. 5, pp. 45-50, 2003.
- [20] G. C. McGain, "Behavioral state activity during nipple feeding for preterm infants," *Neonatal Network*, vol. 16, no. 5, pp. 434-437, 1997.
- [21] P. Dodrill, S. McMahon, E. Ward, K. Weir, T. Donovan and B. Riddle, "Long-term oral sensitivity and feeding skills of low-risk pre-term infants," *Early Human Development*, vol. 76, no. 1, pp. 23-37, 2004.
- [22] I. Gonzales, E. J. Duryea, E. Vasquez and N. Geraghty, "Effect of enteral feeding temperature on feeding tolerance in preterm infants," *Neonatal Network*, vol. 14, no. 3, pp. 39-43, 1995.
- [23] L. Clark, G. Kennedy, T. Pring and M. Hird, "Improving bottle feeding in preterm infants: Investigating the elevated side-lying position," *Infant*, vol. 3, no. 4, pp. 154-158, 2007.
- [24] E. S. Ross and J. Browne, "Developmental progression of feeding skills: an approach to supporting feeding in preterm infants," *Seminars in Neonatology*, vol. 7, no. 6, pp. 469-476, 2002.
- [25] D. D. Crosson and R. H. Pickler, "An integrated review of the literature on demand feeding for preterm infants," *Advances in Neonatal Care*, vol. 14, no. 4, pp. 216-225, 2004.
- [26] A. T. Kirk, S. C. Alder and J. D. King, "Cue-based oral feeding and clinical pathway results in earlier attainment of full oral feeding in premature infants," *Journal of Perinatology*, vol. 27, no. 9, pp. 572-578, 2007.
- [27] G. McGain, P. S. Gartside, J. M. Greenburg and J. W. Lott, "A feeding protocol for healthy preterm infant that shortens time to oral feeding," *Journal of Pediatrics*, vol. 139, pp. 374-379, 2001.
- [28] RCSLT, 2006 Royal College of Speech and Language Therapists. Available at Home | RCSLT accessed 13 June 2023
- [29] Gianni, M.L., Sannino, P., Bezze, E., Plevani, L., Di Cugno, N., Roggero, P., Consonni, D. and Mosca, F., 2015. Effect of co-morbidities on the development of oral feeding ability in pre-term infants: a retrospective study. *Scientific Reports*, 5(1), p.16603
- [30] Matsuo, K. and Palmer, J.B., 2008. Anatomy and physiology of feeding and swallowing: normal and abnormal. *Physical medicine and rehabilitation clinics of North America*, 19(4), pp.691-707.
- [31] Hsieh, K.H., Chen, S.J., Tsao, P.C., Wang, C.C., Huang, C.F., Lin, C.M., Chou, Y.L., Chen, W.Y. and Chan, I.C., 2018. The analgesic effect of non-pharmacological interventions to reduce procedural pain in preterm neonates. *Pediatrics & Neonatology*, 59(1), pp.71-76.
- [32] Neonatal Nutrition Group, 2022 Colostrum/EBM for Immune Supported Mouth Care. Available at UCLH colostrum EBM for immune supportive mouth care 2022 (3).pdf accessed 1 June 2023

- [33] Shaker, C.S., 2013. Cue-based feeding in the NICU: using the infant's communication as a guide. *Neonatal Network*, 32(6), pp.404-408.
- [34] Clark, L., Kennedy, G., Pring, T. and Hird, M., 2007. Improving bottle feeding in preterm infants: Investigating the elevated side-lying position. *Infant*, 3(4), pp.154-158.
- [35] Ross, E Supporting Oral Feeding in Fragile Infants. Available at SOFFI® Trainings | Integrated Approach Supporting NICU & in the Early Intervention Settings (feedingfundamentals.com) accessed 22 May 2023
- [36] Unicef Baby Friendly Initiative: Baby Friendly Standards. Available at: Baby Friendly Standards - Friendly Initiative (unicef.org.uk) accessed 22 May 2023
- [37] Lucas, R.F., Smith, R.L. and Gephart, S., 2015. When is it safe to initiate breastfeeding for preterm infants? *Advances in neonatal care*, 15(2), pp.134-141.
- [38] Khabbache, K., Hennequin, Y., Vermeylen, D. and Van Overmeire, B., 2021. Current respiratory support practices in premature infants: an observational study. *Pan African Medical Journal*, 39(1).
- [39] Walter, J.M., Corbridge, T.C. and Singer, B.D., 2018. Invasive mechanical ventilation. *Southern medical journal*, 111(12), p.746.
- [40] Alberta Health Services: Oral Feeding Guideline. Available at Oral Feeding Guideline 2-O-2 (ahsnet.ca) accessed 13 June 2023
- [41] Speech and language therapy in neonatal care: Introduction and background. Available at www.e-lfh.org.uk. Accessed 13 June 2023
- [42] Progression from tube to oral feeding (breast or bottle) Southern West Midlands Neonatal Operational Delivery Network. Available at Progression-from-the-tube-to-oral-feeding-Nov-2018 (1).pdf Accessed 13 June 2023
- [43]
- [44] Girgin, BA; Gözen, D; and Karatekin, G (2018) Effects of Two Different Feeding Positions on Physiological Characteristics and Feeding Performance of Preterm Infants: A Randomized Controlled Trial. *Journal for Specialists in Pediatric Nursing*. Vol 23, No2, pp e12214
- [45] Park,J; Thoyre,S; Knafl, GJ; Hodges, EA and Nix, WB (2014). Efficacy of Semielevated Side-Lying Positioning During Bottle Feeding of Very Preterm Infants. *Journal of Perinatal & Neonatal Nursing*. Vol 28, No 1, pp 69-79
- [46] Raczyńska A, Gulczyńska E, Talar T. Advantages of side-lying position. A comparative study of positioning during bottle-feeding in preterm infants (≤ 34 weeks GA). *J Mother Child*. 2022 Jun 9;25(4):269-276.
- [47] British Association of Perinatal Medicine: Maternal Breast Milk Toolkit. Available at Maternal Breast Milk Toolkit | British Association of Perinatal Medicine (bapm.org) accessed 27 June 2023
- [48] UNICEF Breast Feeding Initiative: Breastfeeding Assessment Tool. Available at Breastfeeding assessment tool - neonatal (unicef.org.uk) accessed 27 June 2023
- [49] Royal College of Speech and Language Therapists. Feeding and Non-Invasive Respiratory Support: The role of speech and language therapists. RCSLT Position Paper 2023. London: RCSLT, 2023 Neonatal-care-position-paper-2023.pdf (rcslt.org)

Abbreviation	Definition
EBM	Expressed Breast Milk
NNS	Non-Nutritive Sucking
SLT	Speech and Language Therapist
MDT	Multi-disciplinary Team
BFI	UNICEF Baby Friendly Initiative
SSB	Suck, swallow, breathe
NS	Nutritive Sucking

8. Appendices

Appendix A: Factors impacting on Bottle Flow Rates

Factors impacting on bottle flow rates [14]	
Hole size in teat	The size and number of holes in the teat affects milk flow. Teats have been tested with breast pumps to assess flow rate and vast variation was found, even amongst 'slow flow teats' [15] . Disposable hospital teats have more variation, from one teat to another, than commercially available teats [14].
Shape and size of teat	Teats come in various shapes; orthodontic and traditional shape being common. The width of the teat at the collar changes the angle of the chin during the feed and may also change the pressures used [16]. Orthodontic teats may reduce gagging.
Material of teat	Softer teats are easier to compress, and firmer teats require more pressure to compress [14] and extract milk. Silicone teats are often firmer than latex-free plastic teats.
Hydrostatic pressure in the bottle	The force which makes the milk drip from a bottle when turned upside down can be eliminated when the bottle is held level with the infant's mouth [17]. By eliminating this pressure, have more control over the flow rate.
Air exchange while bottle feeding	There is a gradual build-up of a vacuum within bottles as the feed progresses which gradually decreases flow rate [4]. Different bottle and teat combinations attempt to tackle this in different ways

Appendix B: Agreed Criteria for Oral Feeding on HFNC

- 1:1 Breast Feeding:
 - on >4LPM
 - can be put to empty breast at any age for positive experiences including skin to skin and positive oral experiences e.g., licking, nuzzling etc. as long as they are medically stable and tolerating handling
 - Kangaroo care in place
 - Mothers supported to express
 - on ≤ 4LPM
 - Before 32 weeks can be put to empty breast for positive experiences including skin to skin and positive oral experiences e.g., licking, nuzzling etc. as long as they are medically stable and tolerating handling
 - Once is 32 weeks and showing feeding cues, they can be given opportunities to breast feed
 - This should be baby led
 - Continue with good practice pre-oral strategies e.g., skin to skin, positive oral experiences etc if not showing feeding cues
 - Continue to support mothers to express
 - Stop if concerns and refer to SLT service for assessment

- 1:2 Bottle Feeding:
 - under 34 weeks
 - No oral feeding
 - Ensure pre-oral feeding strategies are in place (as are appropriate to 's medical status) e.g., Kangaroo care, skin-skin, mouth care with EBM/sterile water, held/skin-skin/touch when tube fed, positive touch around the face/mouth, non-nutritive sucking, dummy/finger dips of milk
 - Expressing support for mum as appropriate
 - Will be seen by SLT if preventative referral criteria met (see criteria). If not ward to refer to SLT if need identified.
 - 34 weeks and over
 - Referred to SALT to support MDT decision making around the introduction of oral feeding
 - Assessed on a case-by-case basis
 - Decisions are made on an individual basis, based on assessment including state, feeding cues, stability, comorbidities/contraindications, self-regulation, age/weight vs level of high flow, previous information on oral feeding
 - May use the 'Wolf & Glass Risk Assessment for Oral Feeding on HFNC' (2014) see appendix - to inform decision making
 - who are deemed not appropriate to orally feed at that time will be supported with oral stimulation advice / pre-oral feeding strategies

- If oral feeding indicated this will be introduced in a structured manner on a need led basis with parents/carers, nursing staff and medical involved. Ongoing SLT assessment and advice provided as required

Appendix C

Risk Assessment for Oral Feeding on HFNC

	2	1	0
Full oral feeding prior to HFNC	None	< 3 weeks	≥ 3 weeks
Medical Complexity	Very complex	Moderately complex	One system only
Respiratory Status	Extremely fragile; high FiO ₂	Stable with significant support: mod FiO ₂	Weaning respiratory support regularly; RA
Airway Protection / Aspiration Risk	High risk or known aspirator	Moderate risk	Respiratory status is the only risk factor
Flow Rate (based on corrected age)	<37 wk: ≥4L ≥37 wk: ≥5L ≥2 mo: ≥6L	< 37 wk: 2.5 - 3.5L ≥ 37 wk: 3.5 - 4.5L ≥ 2 mo: 4.5 - 5.5L	<37 wk: ≤ 2L ≥37 wk: ≤ 3L ≥ 2 mo: ≤4L

- Score range: 0-10
- Score 0 - 2: Low risk; consider oral feeding
- Score 3 - 4: Greater risk; needs discussion; may be candidate for limited oral feeding activity
- Score ≥ 5: Highest risk; not a good candidate for oral feeding
- Baby must also meet the general criteria for feeding at that level - gestational age, resp rate, feeding readiness cues

Wolf & Glass Risk Assessment for Oral Feeding on HFNC (2014)

Appendix D

Baby Feeding Cues (signs)



EARLY CUES - "I'm hungry"



- Stirring



- Mouth opening



- Turning head
- Seeking/rooting

MID CUES - "I'm really hungry"



- Stretching



- Increasing physical movement



- Hand to mouth

LATE CUES - "Calm me, then feed me"



- Crying



- Agitated body movements



- Colour turning red

Time to calm crying baby

- Cuddling
- Skin to Skin on chest
- Talking
- Stroking



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9. Version Control Table

Version Control Table - Document History			
Date <i>(of amendment/ review)</i>	Issue No. (<i>e.g V1</i>)	Author <i>(Person/s making the amendment or reviewing the Guideline)</i>	Detail <i>(of amendment/misc notes)</i>
NEW June 2023	V1	See Page 1	N/a – NEW Guideline