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Survey of Oral Feeding Practices Amongst Health Care Professionals for Infants Receiving Nasal Continuous-Positive Airway Pressure (nCPAP) and High Flow Nasal Canula (HFNC) Respiratory Support in the United Kingdom (UK)

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Abstract

There is international uncertainty and little guidance regarding oral feeding on nasal continuous positive airway pressure (nCPAP) and high-flow nasal cannula (HFNC) respiratory support. The aim of this study is to investigate current practice in the UK when deciding to offer oral feeds to infants on nCPAP/HFNC. A novel survey was designed and conducted using Qualtrics. Purposive sampling was used to recruit participants in speech and language therapy, medicine and nursing via professional associations. Participants completed the 41-item survey which explored oral feeding practices for infants on nCPAP/HFNC. The survey included closed-choice and open-ended questions. Descriptive statistics using SPSS, were used to analyse quantitative findings. A frequency count and thematic analysis were used to describe qualitative data. 103 responses were analysed. Regarding frequency of oral feeding on nCPAP, most respondents (45%) never fed; 30% rarely fed; 21% sometimes fed; 3% often fed, and 1% always fed ($n=73$). Regarding HFNC, most respondents (48%) sometimes fed; 23% often fed; 1% always fed and 28% never or rarely fed ($n=69$). 58% of respondents followed no guidelines when making decisions regarding oral feeding on nCPAP/HFNC, and 42% did or had guidelines in development ($n=83$). Qualitative analysis identified the importance of the multidisciplinary team (MDT), infant readiness and the evidence-base when orally feeding an infant on nCPAP/HFNC. A continuum of conflict was acknowledged ranging from agreement amongst the MDT to disagreement within and between disciplines. More clinicians feed on HFNC than on nCPAP and there is little in the way of guidelines to support decision-making leading to variation in practice. Further research is recommended, including empirical studies using instrumental assessment of swallow safety, to guide clinicians with their decision-making.

Keywords Newborn · Suck-feeding · Deglutition · Non-invasive ventilation

Abbreviations

nCPAP	nasal Continuous Positive Airway Pressure
HFNC	High Flow Nasal Cannula
MDT	Multidisciplinary Team
NICU	Neonatal Intensive Care Unit
NIV	Non-Invasive Ventilation
SLT/SALT	Speech and Language Therapist

ODN Operational Delivery Network

Introduction

Preterm and medically fragile term infants often require significant medical and allied health support, particularly when planning the introduction of oral intake [1]. Non-invasive ventilation (NIV) is commonly used for infants with acute and chronic conditions associated with impaired respiratory drive, inadequate lung inflation, and altered gas exchange, all of which contribute to respiratory insufficiency or failure [2]. Consequently, many of these infants experience difficulties with oral feeding. Prematurity further complicates

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this feeding journey, with approximately 80% of premature infants experiencing feeding difficulties during their Neonatal Intensive Care Unit (NICU) stay [3]. Although feeding difficulties are observed across populations in the NICU, some infants are at more risk than others, such as those who were born extremely preterm and thus have increased respiratory morbidity [4].

In the NICU, the introduction of oral feeding occurs when the infant demonstrates signs of oral feeding readiness and co-ordination of the suck-swallow-breathe pattern, often around 32–34 weeks' gestation [5–7, 15]. As the infant matures so does their ability to coordinate their sucking pattern and protect their airway during swallow [8]. However, many clinicians fear that non-invasive ventilation (NIV) such as nasal continuous positive airway pressure (nCPAP) or high-flow nasal cannula (HFNC) may impact co-ordination of breathing and swallowing during feeding, resulting in airway compromise [9]. These concerns, together with the known effects of prematurity on the swallow, place infants receiving NIV at increased risk of aspiration [10, 11].

A review of the available literature showed two recent systematic reviews which both concluded that there is not enough evidence to state whether oral feeding of infants or children on nCPAP or HFNC is safe [12, 13]. As a result, there remains limited guidance to support clinicians in making decisions about oral feeding for infants receiving nCPAP and HFNC, this is reflected in the reported variation in practice and lack of consistency in how HFNC is defined across neonatal units [14].

Postponing the initiation of oral feeding has been linked to medical and developmental consequences, such as delayed oral motor development, prolonged hospital stays, and the persistence of feeding disorders [15]. Offering oral feeds whilst infants are receiving nCPAP has been associated with increased risk of laryngeal penetration and tracheal aspiration [9]. Conversely, a recent study by Weir et al. (2026) [16] found that the level of laryngeal penetration-aspiration was not correlated with flow rate, supporting the belief that aspiration risk should be based upon patient specific factors and not just from receiving HFNC.

The aim of this study was to explore current oral feeding practices, amongst healthcare professionals in the United Kingdom (UK), when deciding to orally feed infants receiving nCPAP and HFNC.

Methods

Data were reported according to the Checklist for Reporting of Survey Studies (CROSS) [17].

Study Design

An original survey was designed and conducted using the online platform Qualtrics [18] (see Appendix). The survey was developed by adapting a published survey [14] and using themes identified from the literature. The survey was reviewed by a stakeholder group consisting of four neonatal Speech and Language Therapists (SLTs), a neonatal nurse and a neonatologist. The group was selected to reflect the demographic and professional characteristics of the target respondent population. Improvements were made, based on feedback, to the content, grammar, and technical functionality of the survey. The survey was advertised via 3 professional associations (British Association of Perinatal Medicine, SLTs in Neonatal Care Clinical Excellence Network, Neonatal Nursing Association) using their X accounts, Basecamp platform (SLTs in Neonatal Care Clinical Excellence Network only) and newsletters (Neonatal Nursing Association and the British Association of Perinatal Medicine only).

A Participant Information Sheet detailed the purpose of the study, the length of the survey, how data would be stored, how long data would be stored for and who the investigator(s) were. There was no preparation process required before completing the survey. Participants had access to an anonymous link and no personally identifiable questions were asked as part of the survey. Qualtrics [18] collected IP addresses to allow participants to partially complete and return a survey for up to two weeks, these details were not provided to the researchers in the standard results and were never accessed by the researchers.

The survey consisted of 41-items exploring assessment tools, variability of terms, clinical considerations when deciding to orally feed infants on nCPAP or HFNC, strategies to assist oral feeding, existence of written guidelines and staff opinions regarding swallow safety. Closed-ended and open-ended questions were included, with qualitative data collected through free-text responses.

Recruitment and Participants

The survey was open to Health and Care Professions Council (HCPC) registered SLTs, Nursing and Midwifery Council (NMC) registered nurses and General Medical Council (GMC) registered doctors currently working on a neonatal unit in the UK. In this study, the term 'medical staff' refers specifically to doctors. 'Medical staff (neonatology)' denotes neonatal physicians/neonatologists, and 'medical staff (respiratory)' refers to respiratory physicians, a role broadly equivalent to pulmonologists in the United States. Purposive sampling was used to recruit participants via the above-named professional associations. Snowball sampling

was also used to distribute the survey amongst professional networks.

Data Analysis

The survey was open from 7th February 2024 to 20th March 2024 inclusively. Survey responses were accessed via the online platform Qualtrics [18]. Quantitative responses were analysed using SPSS [19]. Descriptive statistics (counts, percentages, means, ranges and standard deviations) were used to report findings. Content analysis [20], with a frequency count, was used alongside thematic analysis [21] to analyse qualitative data extracted from six open-ended questions. Data were exported to Microsoft excel where RM (first author) became familiar with respondents' comments. Recurrent ideas, across the data, were coded manually into themes and subthemes. To corroborate the saliency of themes and increase reliability in the coding procedure ND (second author) and MC (third author) discussed and re-coded responses. The first, second and third authors were concordant in coding and assigning data to themes. Additional discussion was required to refine the representation of Themes 3 and 4. For Theme 3: Local Speech and Language Therapy team don't allow it; the team reviewed the data together to ensure it accurately reflected respondents' descriptions of SLT-driven restrictions. For Theme 4: Continuum of conflict related to orally feeding infants on non-invasive ventilation, the wider range of perspectives required discussion, and the team reached consensus that a 'continuum' best captured the variability and disagreement expressed. Several quotations held relevance across multiple themes; therefore, some extracts may be reflective of more than one theme.

Results

A total of 154 responses were received. Fifty-one responses were excluded due to insufficient data for extraction, as they provided demographic data only with no clinical data, leaving 103 responses for analysis. All responses related to feeding infants hospitalised on the neonatal unit.

Quantitative Analysis

Complete data were available for 64 responses, with partial data provided by an additional 39. Data are therefore reported on a per-question basis, using the number of respondents who answered each item, as a result the (n) varies across questions.

Demographics

The characteristics of respondents are presented in Table 1. 59% of respondents worked in a Neonatal Intensive Care Unit (Level 3), 33% worked in a Local Neonatal Unit (Level 2) and 8% worked in a Special Care Baby Unit (Level 1) ($n = 103$).

Guidelines

58% of respondents followed no guidelines when making decisions regarding oral feeding on nCPAP or HFNC, and 42% did or had guidelines in development ($n = 83$).

Table 1 Demographics of respondents

	Count	Speech and Language Therapist	Nurse	Medical Staff (Neonatal)	Other
Age (in years)					
N (%)	103	51 (49.51)	26 (25.24)	22 (21.36)	4 (3.88)
Mean (SD)	44 (8.36)	42 (7.94)	46 (9.51)	46 (7.92)	48 (5.48)
Median (Range)	44 (27-63)	43 (27-57)	46 (31-62)	44 (36-63)	50 (40-52)
Years' experience as a health professional					
Mean (SD)	21 (9.22)	19 (8.09)	24 (11.51)	22 (8.55)	25 (4.11)
Median (Range)	20 (5-42)	18 (5-35)	24 (6-42)	20 (12-40)	26 (20-30)
Gender (Male)					
Male	11	2	1	8	0
Female	88	48	25	11	4
Prefer not to say	2	0	0	2	0
My gender is not listed	2	1	0	1	0
Ethnicity					
Asian, Asian British or Asian White	7	1	0	5	1
Black, Black British, Black Welsh, Caribbean or Mixed or multiple ethnic group	2	0	1	1	0
White	89	46	24	16	3
Other, ethnic group	4	3	1	0	0
Country					
England	85	46	17	19	3
Scotland	11	1	6	3	1
Wales	3	1	2	0	0
Northern Ireland	4	3	1	0	0

Oral Feeding Assessment

When asked who is involved in carrying out oral feeding assessments on the neonatal unit, respondents ($n=81$) were able to select multiple options, with most choosing SLTs (90%) as part of the assessment team. The most reported reasons for assessing an infant's oral feeding readiness were 'prior to commencing oral feeds' (63%) and 'at around 32–34 weeks' gestation' (52%) ($n=81$). When asked which oral feeding observation assessment tools they use, 40% of respondents reported using the UNICEF Breastfeeding Assessment Tool. A subgroup analysis showed that a similar percentage of SLTs ($n=44$; 41%), nurses ($n=19$; 38%) and doctors ($n=18$, 39%) used the UNICEF Breastfeeding Assessment Tool. Other assessment tools used were the Infant Driven Feeding Scale (13%), Neonatal Oral-Motor Assessment Scale (NOMAS) (9%), Non-nutritive Sucking (NNS) Scoring System (7%), Early Feeding Skills (EFS) Assessment (6%) and the Neonatal Eating Assessment Tool (NeoEAT) (6%). 12% of respondents reported the use of 'other' assessment tools and 10% reported using 'no' assessment tools. When asked what areas they consider when assessing an infant's oral feeding 80% or more of respondents ($n=78$) said they 'always' consider these five things; readiness cues (88%), infant state of alertness (86%), safety of oral feeding (86%), signs of distress (81%) and physiological state at rest (80%). The main indicators respondents use to determine if an infant is not tolerating an oral feed ($n=81$) are behavioural cues (74%), changes in state (71%), organisation of suck-swallow-breathe (71%) and clinical signs of aspiration or laryngeal penetration (70%). In total, 63% ($n=81$) of respondents said they used instrumental

evaluation on their unit, including cervical auscultation (36%), pulse oximetry (34%), video-fluoroscopy swallow study (25%) and fiberoptic endoscopic evaluation of swallowing (8%). These figures reflect overall availability and use of instrumental evaluation on neonatal units, rather than use specific to infants receiving oral feeding on NIV.

Terminology and Definitions

Respondents ($n=44$) were asked, when observed, how often they use specific terms to indicate clinical signs of aspiration or laryngeal penetration (Table 2). Six terms were identified that at least 55% of respondents reported 'always' using when observing an infant: increased respiratory rate (61%), work of breathing (55%), oxygen desaturation (59%), disorganised suck-swallow-breathe pattern (57%), wet breathing (55%) and bradycardia (55%). Fifty-eight respondents reported on the definition of HFNC. HFNC was defined as $>2\text{L/min}$ (43%); $>3\text{L/min}$ (36%); $>1\text{L/min}$ (14%); L/kg (2%) and 'other' (5%).

Reported use of nCPAP and HFNC

94% ($n=80$) of respondents reported that they use nCPAP on their unit and 100% ($n=72$) reported that they use HFNC.

Oral Feeding on nCPAP and HFNC

When asked if infants who receive nCPAP feed orally, most respondents said never (45%); 30% said rarely; 21% said sometimes; 3% said often; and 1% said always ($n=73$). Regarding HFNC, most respondents (48%) sometimes fed;

Table 2 Frequency of terms used to indicate clinical signs of aspiration or laryngeal penetration

Clinical Term	Never N (%)	Rarely N (%)	Sometimes N (%)	Often N (%)	Always N (%)	Missing data N (%)
Cynosis	4 (10%)	6 (15%)	6 (15%)	9 (22%)	16 (39%)	62 (60%)
Watery eyes	2 (5%)	4 (10%)	9 (22%)	13 (32%)	13 (32%)	
Eye tearing	2 (5%)	2 (5%)	8 (20%)	14 (34%)	15 (36%)	
Eye blinking	3 (7%)	8 (20%)	7 (17%)	10 (24%)	13 (32%)	
Eye reddening	4 (10%)	6 (15%)	8 (20%)	11 (27%)	12 (29%)	
Grimacing	1 (2%)	1 (2%)	8 (20%)	15 (37%)	16 (39%)	
Work of breathing	0 (0%)	1 (2%)	5 (12%)	11 (27%)	24 (59%)	
Increased respiratory rate	0 (0%)	3 (7%)	3 (7%)	10 (25%)	25 (61%)	
Cough	0 (0%)	1 (3%)	8 (19%)	11 (27%)	21 (51%)	
Wet breathing	1 (2%)	1 (2%)	5 (12%)	12 (29%)	22 (54%)	
Wet vocalisation	0 (0%)	2 (5%)	4 (10%)	15 (37%)	20 (49%)	
Nasal congestion	5 (12%)	5 (12%)	8 (20%)	14 (34%)	9 (22%)	
Noisy breathing	0 (0%)	0 (0%)	11 (27%)	17 (41%)	13 (32%)	
Stridor	2 (5%)	3 (7%)	9 (22%)	9 (22%)	18 (44%)	
Stertor	6 (15%)	11 (27%)	11 (27%)	5 (12%)	8 (19%)	
Oxygen desaturation	0 (0%)	0 (0%)	5 (12%)	12 (29%)	24 (59%)	
Bradycardia	1 (2%)	0 (0%)	4 (10%)	14 (34%)	22 (54%)	
Tachycardia	3 (7%)	1 (2%)	5 (12%)	14 (34%)	18 (44%)	
Disorganised suck-swallow-breathe pattern	1 (2%)	1 (2%)	5 (12%)	11 (27%)	23 (56%)	
Anterior loss / spillage	4 (10%)	5 (12%)	9 (22%)	6 (15%)	17 (41%)	
Gulping	1 (2%)	3 (7%)	7 (17%)	12 (29%)	18 (44%)	
Multiple swallows	1 (2%)	4 (10%)	6 (14%)	15 (37%)	15 (37%)	
Total N	103					

23% often fed; 1% always fed and 28% never or rarely fed ($n=69$) (Fig. 1).

Clinical Factors for Orally Feeding on nCPAP and HFNC

Respondents were asked to select which clinical factors they consider when deciding whether to orally feed an infant on nCPAP ($n = 57$) or HFNC ($n = 34$) (Table 3). Six factors emerged as the most consistently considered, with 65–81% of respondents reporting that they ‘always’ take them into account: medical complexity, gestational age, flow rate, feeding readiness cues, route of oral feeding and pre-existing feeding difficulties. All six factors are also referenced in the Royal College of Speech and Language Therapists (RCSLT) position paper: Feeding on Non-invasive Respiratory Support [22].

Strategies used During oral Feeding on nCPAP and HFNC

When respondents were asked about the strategies they use when orally feeding infants on nCPAP ($n=31$) or HFNC ($n=54$) three approaches emerged as being the most consistently implemented. Between 57% and 80% of respondents reported ‘always’ using the following strategies: monitoring

physiological state; oral preparation (e.g. non-nutritive sucking practice) and monitoring for clinical signs of aspiration. Other strategies are outlined in Table 4.

Who Decides When to Orally Feed Infants on nCPAP or HFNC

When asked who is involved in deciding when oral feeding is initiated for infants receiving nCPAP and HFNC the most common response was medical staff (neonatology) (nCPAP 56%; HFNC 62%), followed by SLT (nCPAP 42%; HFNC 53%), nursing staff (nCPAP 38%; HFNC 48%), parent/carer (nCPAP 14%; HFNC 20%), Infant Feeding Lead (nCPAP 14%; HFNC 18%), medical staff (respiratory) (nCPAP 6%; HFNC 8%), Lactation Consultant (nCPAP 3%; HFNC 2%) and other (nCPAP 15%; HFNC 2%) ($n=78$). In the UK, the Infant Feeding Lead is a recognised role within the National Health Service, responsible for supporting complex feeding decisions, providing staff training, and promoting high-quality feeding practices. Respondents could select more than one option for this question, so percentages do not sum to 100%.

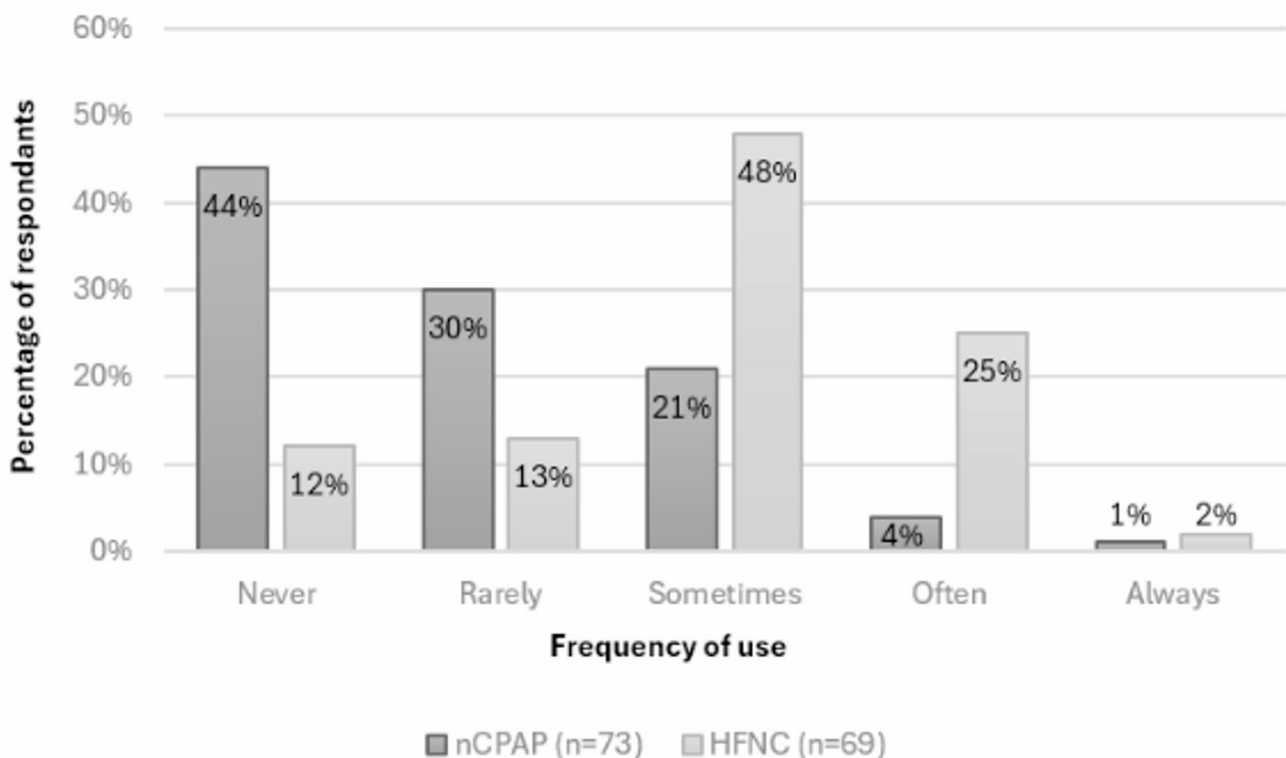


Fig. 1 Frequency of oral feeding on nCPAP and HFNC

Table 3 Frequency of clinical factors considered when deciding to orally feed an infant on HFNC/nCPAP

Clinical Factor	Never	Rarely	Sometime	Often	Always	Missing data
HFNC						
Medical complexity	1 (2%)	0 (0%)	3 (5%)	6 (10%)	49 (83%)	44 (43%)
Gestational age	1 (2%)	1 (2%)	3 (5%)	11 (19%)	42 (72%)	45 (44%)
Weight	2 (3%)	8 (14%)	21 (36%)	10 (17%)	18 (30%)	44 (43%)
Infant recently weaned into air or low flow oxygen	2 (3%)	3 (5%)	6 (11%)	14 (25%)	32 (56%)	46 (45%)
Flow rate (L/min, L/kg)	1 (2%)	2 (4%)	3 (5%)	11 (19%)	40 (70%)	46 (45%)
Feeding readiness cues	1 (1%)	0 (0%)	1 (2%)	5 (9%)	50 (88%)	46 (45%)
Route of oral feeding	3 (5%)	2 (4%)	4 (7%)	11 (19%)	37 (65%)	46 (45%)
Type of milk	8 (14%)	7 (12%)	15 (27%)	6 (11%)	20 (36%)	47 (46%)
Tolerance of touch around the face and/or mouth	4 (7%)	4 (7%)	8 (14%)	12 (21%)	29 (51%)	46 (45%)
Pre-existing feeding difficulties	1 (2%)	0 (0%)	5 (9%)	12 (21%)	39 (68%)	46 (45%)
Other	2 (33%)	0 (0%)	0 (0%)	1 (17%)	3 (50%)	97 (94%)
nCPAP						
Medical complexity	1 (3%)	0 (0%)	2 (6%)	6 (17%)	26 (74%)	68 (66%)
Gestational age	1 (3%)	0 (0%)	1 (3%)	10 (29%)	22 (65%)	69 (67%)
Weight	1 (3%)	4 (12%)	10 (29%)	7 (21%)	12 (35%)	69 (67%)
Flow rate (cmH2O)	1 (3%)	0 (0%)	5 (15%)	5 (15%)	23 (67%)	69 (67%)
Infant recently weaned into air or low flow oxygen	2 (6%)	0 (0%)	2 (6%)	10 (28%)	21 (60%)	68 (66%)
Feeding readiness cues	1 (3%)	0 (0%)	0 (0%)	6 (18%)	27 (79%)	69 (67%)
Route of oral feeding	2 (6%)	0 (0%)	0 (0%)	9 (26%)	24 (69%)	68 (66%)
Type of milk	3 (9%)	5 (14%)	5 (14%)	3 (9%)	19 (54%)	68 (66%)
Tolerance of touch around the face and/or mouth	3 (9%)	2 (6%)	3 (9%)	8 (23%)	18 (53%)	69 (67%)
Pre-existing feeding difficulties	0 (0%)	0 (0%)	4 (12%)	3 (9%)	27 (79%)	69 (67%)
Other	1 (33%)	0 (0%)	0 (0%)	0 (0%)	2 (67%)	100 (97%)
Total N	103					

How are Infants Orally Fed on nCPAP or HFNC

Respondents ($n=78$) were asked which feeding methods they used to feed infants on nCPAP and HFNC. Respondents could select multiple responses. The most common response for nCPAP was ‘infants are not orally fed when receiving nCPAP’ (31%) (HFNC; 8%), the most common response for HFNC was ‘breastfeeding’ (56%) (nCPAP 28%). Other methods reported where ‘bottle feeding’ (nCPAP 18%; HFNC 49%), ‘cup feeding’ (nCPAP 1%; HFNC 5%), ‘syringe feeding’ (nCPAP 5%; HFNC 6%) and ‘other’ (nCPAP 5%; HFNC 6%).

No Oral Feeding on nCPAP and HFNC

Respondents ($n=78$) were asked why infants may not be orally fed on nCPAP or HFNC. Selecting from a list provided, the most common reason for both nCPAP and HFNC was the ‘aspiration risk is unclear’ (nCPAP 31%; HFNC 9%). Other reasons included ‘medical team do not allow it’ (nCPAP 22%; HFNC 3%), ‘infants are too young to commence oral feeding’ (nCPAP 12%; HFNC 5%), ‘team doesn’t have sufficient expertise at this current point in time’ (nCPAP 6%; HFNC 4%) and ‘other’ (nCPAP 19%; HFNC 9%).

Staff Opinions

The final survey question asked how often respondents agreed with specific professional groups regarding oral feeding practices for infants on nCPAP or HFNC. Overall, respondents most commonly reported that they ‘always’ agreed with SLTs (nCPAP: 51%, $n=57$; HFNC: 47%, $n=58$). However, this pattern was largely driven by SLTs’ own responses: among SLTs ($n=29$), 90% reported ‘always’ agreeing with SLTs for nCPAP and 83% for HFNC, indicating strong intra-professional agreement. In contrast, smaller proportions of nurses ($n=12$; nCPAP 25%, HFNC 15%) and doctors ($n=16$; nCPAP 0%, HFNC 6%) reported ‘always’ agreeing with SLTs. Taken together, these findings suggest that while SLTs demonstrate high internal agreement, this is not reflected across the wider multidisciplinary team, indicating limited inter-professional agreement on oral feeding practices for infants on NIV.”

Qualitative Analysis

Where free text responses were minimal (e.g. 1–3 words) content analysis was used with a frequency count to quantify how often particular words, items, or ideas appeared within each theme or subtheme, providing an indication of their importance in the dataset (Table 5). Respondent’s comments focused on documentation, approaches, clinical considerations, multidisciplinary input, risk, assessment,

Table 4 Frequency of strategies when orally feeding an infant on HFNC/nCPAP

Strategy	Never	Rarely	Sometime	Often	Always	Missing data
HNFC						
Changes to environment	5 (9%)	10 (18%)	17 (31%)	11 (20%)	12 (22%)	48 (47%)
Changes to staff / family carer's ability to read infants communication	2 (4%)	3 (5%)	10 (18%)	15 (27%)	25 (46%)	48 (47%)
Volume limited feeds	3 (6%)	4 (7%)	16 (29%)	24 (44%)	8 (14%)	48 (47%)
Time limited feeds	1 (2%)	1 (2%)	16 (29%)	22 (40%)	15 (27%)	48 (47%)
Changes to calorific density of milk	15 (27%)	13 (24%)	19 (35%)	8 (14%)	0 (0%)	48 (47%)
Monitoring physiological state	1 (2%)	0 (0%)	2 (4%)	10 (18%)	41 (76%)	49 (48%)
Specific criteria for respiratory stability	1 (2%)	7 (13%)	7 (13%)	15 (28%)	24 (44%)	49 (48%)
Respiratory support reduced	8 (14%)	5 (9%)	7 (12%)	15 (27%)	21 (38%)	47 (46%)
Changes to flow rate (L/min, L/kg)	5 (9%)	7 (13%)	7 (13%)	15 (27%)	21 (38%)	48 (47%)
Positioning modifications	1 (2%)	1 (2%)	9 (17%)	18 (34%)	24 (45%)	50 (49%)
Swaddling	4 (8%)	9 (17%)	17 (32%)	16 (30%)	7 (13%)	50 (49%)
Positive oral touch	8 (15%)	6 (11%)	8 (15%)	16 (30%)	16 (30%)	49 (48%)
Oral preparation	1 (2%)	1 (2%)	2 (4%)	19 (35%)	31 (57%)	49 (48%)
Therapeutic tastes	2 (4%)	3 (5%)	13 (24%)	24 (43%)	13 (24%)	48 (47%)
Modifying fluid consistency	20 (37%)	19 (36%)	11 (21%)	3 (6%)	0 (0%)	50 (49%)
Specific feeding equipment	2 (4%)	1 (2%)	14 (26%)	16 (29%)	21 (39%)	49 (48%)
Chin / buccal support	12 (23%)	11 (21%)	14 (26%)	13 (24%)	3 (6%)	50 (49%)
External pacing	1 (2%)	1 (2%)	9 (16%)	20 (36%)	24 (44%)	48 (47%)
Monitoring for clinical signs of aspiration	1 (2%)	1 (2%)	2 (3%)	7 (13%)	44 (80%)	48 (47%)
Other	2 (40%)	0 (0%)	1 (20%)	1 (20%)	1 (20%)	98 (95%)
nCPAP						
Changes to environment	5 (16%)	4 (12%)	8 (25%)	6 (19%)	9 (28%)	71 (69%)
Changes to staff / family carer's ability to read infants communication	1 (3%)	1 (3%)	6 (20%)	10 (32%)	13 (42%)	72 (70%)
Volume limited feeds	4 (13%)	1 (3%)	8 (26%)	10 (32%)	8 (26%)	72 (70%)
Time limited feeds	3 (9%)	1 (3%)	8 (25%)	11 (35%)	9 (28%)	71 (69%)
Changes to calorific density of milk	7 (23%)	4 (13%)	10 (32%)	5 (16%)	5 (16%)	72 (70%)
Monitoring physiological state	2 (6%)	0 (0%)	1 (3%)	4 (13%)	25 (78%)	71 (69%)
Specific criteria for respiratory stability	2 (7%)	3 (10%)	5 (16%)	6 (19%)	15 (48%)	72 (70%)
Respiratory support reduced	6 (19%)	1 (3%)	5 (16%)	9 (28%)	11 (34%)	71 (69%)
Changes to pressure (cmH2O)	5 (16%)	3 (9%)	7 (22%)	6 (19%)	11 (34%)	71 (69%)
Positioning modifications	2 (6%)	1 (3%)	5 (16%)	8 (25%)	16 (50%)	71 (69%)
Swaddling	3 (10%)	6 (19%)	6 (19%)	9 (29%)	7 (23%)	72 (70%)
Positive oral touch	5 (16%)	3 (9%)	5 (16%)	7 (22%)	12 (37%)	71 (69%)
Oral preparation	2 (7%)	1 (3%)	2 (7%)	8 (25%)	18 (58%)	72 (70%)
Therapeutic tastes	2 (6%)	3 (9%)	3 (9%)	12 (38%)	12 (38%)	71 (69%)
Modifying fluid consistency	7 (22%)	9 (29%)	9 (29%)	3 (10%)	3 (10%)	72 (70%)
Specific feeding equipment	3 (9%)	2 (6%)	8 (25%)	12 (38%)	7 (22%)	71 (69%)
Chin / buccal support	3 (10%)	9 (29%)	11 (35%)	5 (16%)	3 (10%)	72 (70%)
External pacing	2 (6%)	1 (3%)	4 (13%)	10 (31%)	15 (47%)	71 (69%)
Monitoring for clinical signs of aspiration	2 (6%)	1 (3%)	0 (0%)	7 (23%)	21 (68%)	72 (69%)
Other	3 (38%)	1 (12%)	0 (0%)	1 (12%)	3 (38%)	95 (92%)
Total N	103					

pre-feeding, dis/agreement within teams, timing of feeding and methods.

For more detailed responses, thematic analysis was used. From this, five main themes and ten subthemes were identified. These are presented in Tables 6, 7, 8 and 9 and appear again in the headings used to structure the section that follows. Excerpts from the transcripts are provided within the tables and demonstrate content from all themes and subthemes.

Theme 1: Decision-making when Orally Feeding Infants on Non-invasive Ventilation

Respondents discussed the variation in consultant decision-making and the variable influence the SLT assessment has on decision-making for oral feeding infants on NIV (Table 6). It's possible that the lack of guidelines (58% of respondents reported having no guidelines for orally feeding infants on nCPAP or HFNC, $n=83$) has contributed to this variation in practice. Decision-making on a 'case-by-case' basis, considering the infant's 'readiness' to feed was also noted as important in the decision-making process.

Table 5 Frequency count for themes and subthemes from content analysis

Themes and Subthemes			
Themes	N	Subthemes	N
Supporting documents used to inform decision-making about feeding on non-invasive ventilation		We have locally developed guidelines	8
		We don't have locally developed guidelines	15
		Local guidelines are in development	6
		External documents	9
		Evidence-based documents	14
Approach to feeding on non-invasive ventilation		We don't feed on nCPAP	19
		We don't feed on HFNC	7
		We sometimes feed on non-invasive ventilation	23
Clinical considerations for feeding infants on non-invasive ventilation	25		
Multidisciplinary input when deciding to feed infants on non-invasive ventilation		Speech and Language Therapists	39
		Parents	14
		Multidisciplinary team	36
Risk of aspiration when feeding on non-invasive ventilation	22		
Assessment of infant feeding		We use formal assessments	20
		We use informal assessments	8
		Benefits of assessments	4
Pre-feeding oral stimulation for infants on non-invasive ventilation	5		
Varying agreement of healthcare professionals		Healthcare professionals agree	17
		Healthcare professionals have a difference of opinion	13
Pressure around best time to feed	3		
Method of feed for infants on non-invasive ventilation	7		

Theme 2: Risk of Aspiration Suggested by the Evidence-base

Both the frequency count ($n=22$) and thematic analysis identified risk of aspiration as a key challenge. Respondents recognised the 'risk of aspiration for oral feeds based on research'. However, acknowledged that the research was 'limited' (Table 7). The lack of evidence and clarity regarding decision-making for orally feeding infants on NIV is repeatedly cited in the literature and may explain the 'varying agreement of healthcare professionals' identified in the frequency count (Table 5) as well as the conflict referred to in theme 4.

Theme 3: Local Speech and Language Therapy team don't allow it

Thematic analysis indicated that some respondents, primarily medical staff, perceived local Speech and Language Therapy teams as not allowing oral feeding for infants receiving NIV. These respondents felt that SLTs tended to overstate the risk of aspiration, which they believed contributed to a more restrictive approach to oral feeding.

Table 6 Decision-making when orally feeding infants on NIV

Quotes illustrating Theme 1: Decision-making when orally feeding infants on non-invasive ventilation	
Subthemes	Example quotes
Decision-making differs from consultant to consultant	"...Some consultants are more conservative, others allow feeding on higher levels of respiratory support" (Speech and Language therapist, female, 33) "Can vary from nurse to nurse and doctor to doctor what kind of approach is taken" (Speech and Language Therapist, female, 42)
The multi-disciplinary team agree	"In our unit these decisions are discussed mindfully as an MDT with equal parts in decisions" (Speech and Language therapist, female, 43)
The influence of the Speech and Language Therapy assessment is variable	"I trust the SALT to assess this and tell me if it's safe or not, regardless of what I might initially think. I don't think anyone else has the skills to assess this" (Medical staff - neonatology, female, 40) "...as a whole the unit does not feed on CPAP but may make the decision to feed on HFNC with or without a SLT assessment" (Speech and Language Therapist, female, 37)
There is case-by-case decision-making	"...this can be discussed on a case-by-case basis and the Wolf and Glass proforma can be used to help with decision making" (Speech and Language Therapist, female, 57)
The infants' "readiness" is an influencing factor	"If an infant can't achieve homeostasis without the need for this level of support, they're generally not ready to feed" (Speech and Language Therapist, female, 55) "As a senior nurse on the unit I often will assess the babies readiness to feed..." (Nurse, female, 52)

Table 7 Risk of aspiration suggested by the evidence-base and local SLT team don't allow it

Quotes illustrating Themes 2 & 3	
Theme	Example quotes
Risk of aspiration suggested by the evidence-base	"High risk of aspiration for oral feeds based on research" (Speech and Language Therapist, female, 30) "Limited evidence of safety" (Nurse, female, 40)
Local Speech and Language Therapy team don't allow it	"From one fluoroscopy trial of about 30 babies, the risk of aspiration is overstated by speech and language therapist who have now banned any oral feeding on non-invasive respiratory support regardless of the clinical stability, baby's neuro behaviour states" (Medical Staff - respiratory, female, 51)

Theme 4: Continuum of Conflict Related to Orally Feeding Infants on Non-invasive Ventilation

A continuum of conflict, relating to orally feeding infants on NIV, was established from the data. Some respondents ($n=17$) commented that healthcare professionals agree while others ($n=13$) reported a difference of opinion. Variation in opinion was also highlighted in the thematic analysis with some respondents referring to decisions being 'discussed mindfully as an MDT' and others commenting that

recommendations and advice were contradictory (Table 8). Disagreement was also noted within the same discipline as one respondent stated, "It depends which medical staff or nursing staff are on shift as they all hold different opinions about oral feeding on HFNC" (Table 8).

Table 8 Continuum of conflict related to orally feeding infants on NIV

Quotes illustrating Theme 4: Continuum of conflict related to orally feeding infants on non-invasive ventilation	
Subthemes	Example quotes
Agreement within the Multidisciplinary team	<i>"I am frequently engaging in conversations with consultants to help support consistency in management..."</i> (Speech and Language Therapist, female, 33) <i>"In our unit these decisions are discussed mindfully as an <u>mdt</u> with equal parts in decisions"</i> (Speech and Language Therapist, female, 43)
Conflict within disciplines	<i>"It depends which medical staff or nursing staff are on shift as they all hold different opinions about oral feeding on HFNC"</i> (Speech and Language Therapist, female, 35)
Conflict between disciplines	<i>"My SLT recommendations often contradicts their medical advice/plans"</i> (Speech and Language Therapist, female, 33) <i>"Neonatal nurses who look after babies for 12 hours each shift and parents are more in tune with a baby rather than speech and language therapists who spend once or twice a week with the baby..."</i> (Medical staff - respiratory, female, 51)

Table 9 Parental experience of feeding decision-making

Quotes illustrating Theme 5: Parental experience of feeding decision-making	
Subthemes	Example quotes
Limited parental input in feeding decision-making	<i>"Most parents want to be more cautious and the main feedback we get is that they feel 'pushed' to feed by the consultants who want their baby to feed orally while on nCPAP or HFNC"</i> (Speech and Language Therapist, female, 55) <i>"Parents are rarely included in decision-making"</i> (Speech and Language Therapist, female, 30)
Parents are in tune with their baby	<i>"Parents are often most in tune with the SLT view and their babies readiness"</i> (Speech and Language Therapist, female, 49) <i>"Neonatal nurses...and parents are more in tune with a baby"</i> (Medical staff - respiratory, female, 51)

Theme 5: Parental Experience of Feeding Decision-making

'Parents' were mentioned 14 times throughout the data (Table 5), in relation to parental experience in decision making and parental attunement with their baby. SLTs described a lack of parental input with parents being "pushed to feed" and "rarely being included in decision-making" (Table 9). All disciplines (nurses, medical staff and SLTs) agreed that parents were in tune with their baby and play an important part in the feeding journey.

Discussion

The object of this study was to investigate current practice amongst healthcare professionals when deciding to offer oral feeds to infants receiving nCPAP and HFNC in the UK. This study provides a novel contribution to the field by being one of the first to use a mixed-methods survey design to explore oral feeding practices for infants receiving nCPAP and HFNC. It also provides the first UK specific description of current approaches to feeding infants on nCPAP and HFNC, addressing an important gap in the literature and offering context specific insights to inform clinical practice.

We found that oral feeding occurs more frequently on HFNC than on nCPAP and that most respondents ‘always’ consider medical complexity, gestational age, flow rate, feeding readiness cues, route of oral feeding and the existence of pre-existing feeding difficulties when deciding to orally feed an infant on nCPAP or HFNC. This supports the RCSLT position paper: Feeding on Non-invasive Respiratory Support [16] which identifies nine clinical considerations when deciding to initiate oral feeding on non-invasive respiratory support, including the five identified by our respondents.

The most common reason for not orally feeding an infant on nCPAP or HFNC was because ‘the risk of aspiration was unclear’. Most respondents stated that if they did decide to orally feed, they would monitor the infants physiological state, use oral preparation, and monitor for clinical signs of aspiration. The most used terms by SLTs to indicate clinical indicators of aspiration and laryngeal penetration were ‘increased respiratory rate’, ‘oxygen desaturation’ and ‘disorganised suck-swallow-breath pattern’. Although frequently used in clinical practice, it is important to remember that these clinical features are not specific to aspiration and may also reflect suck–swallow–breathe discoordination or oesophageal dysmotility [6].

The variability we observed in clinicians’ use of terminology to describe signs of aspiration and laryngeal penetration echoes that described by Barnes et al. (2025) [23], who highlighted inconsistent documentation practices. Together, these findings emphasise the need for greater standardisation in both terminology and documentation processes to ensure clearer communication and more reliable clinical decision-making.

Oral feeding observation assessments tools were used by respondents. Most used the UNICEF Breastfeeding Assessment Tool; followed by the Infant Driven Feeding Scale, NOMAS, NNS Scoring System, EFS and NeoEAT. Whilst the Infant Driven Feeding Scales was highlighted by Canning et al., (2020) [14]; other studies referred to the use of algorithms including the Supporting Oral Feeding in Fragile Infants (SOFFI) [24] and the Safe Individualized Nipple-Feeding Competence (SINC) [25] algorithms. The use of evidence-based assessment tools may enhance the reliability and validity of clinical assessments, support communication between disciplines, and assist monitoring of change over time. Promoting accuracy and consistency within and between disciplines is important for patient care, and such tools may support clinicians to interpret feeding behaviours more reliably.

Respondents reported using three key strategies when orally feeding an infant on nCPAP or HFNC. These strategies: monitoring physiological state [26], oral preparation [27], and monitoring for clinical signs of aspiration [28] are

all supported within the literature. However, it is important to remember that this survey represents a snapshot of current UK practice. Feeding practices continue to evolve and therefore caution and context are required when interpreting the results.

The results of our study are similar to Canning et al. (2020) [14], who carried out a survey of practice investigating oral feeding practices for infants and children receiving nCPAP and HFNC in Australia and New Zealand. Both studies found units/respondents ‘sometimes’ orally fed infants/children receiving HFNC. However, they differed with regards to nCPAP as Canning et al. (2020) [14] found most units ‘sometimes’ orally fed infants/children and our study showed respondents mostly ‘never’ fed infants. With regards to guidelines, Canning et al., (2020) [14] found 80% of their units did not have them compared to 58% of respondents in our study. This suggests the need for guidelines has been identified and that teams are developing them with the aim of improving patient care [29].

When considering the qualitative findings, it is possible that the decision not to allow oral feeding on NIV (Theme 3) was influenced by the perceived evidence base, as many of the comments referring to risk of aspiration suggested by the evidence base (Theme 2) were made by SLTs. The interpretation of risk may, in turn, have contributed to the conflict surrounding oral feeding for infants on NIV, as described in Theme 4. Variation in SLT roles and the level of SLT involvement across neonatal units may contribute to this conflict. In units where SLTs have limited presence, opportunities for therapeutic and proactive management of oral feeding in infants receiving NIV may be reduced. Greater and more consistent SLT involvement across neonatal units may therefore support more collaborative decision-making and promote more positive feeding outcomes for this population.

Themes identified through both the frequency count and qualitative analysis of this study were also evident in Murphy et al., (2018) [30]. Both papers highlighted the complexities of clinical decision-making when feeding infants receiving NIV and highlighted the role of the MDT in shaping these decisions. Additionally, each study emphasised key clinical considerations and the value of assessment when evaluating an infant’s readiness to orally feed. Some respondents in this survey perceived parents as having a lack of input regarding feeding decision-making (Theme 5). This aligned with findings from Chan et al., (2025) [31], who reported that caregivers felt their views were not really listened to and that more collaborative discussions could have been facilitated.

Response rate is a known limitation for survey research. However, we felt our sample was representative of the UK as we received responses from all 13 neonatal Operational

Delivery Networks (ODN), which cover every geographical area of neonatal care. Each ODN had an average of 6 respondents (minimum 2, maximum 13) except for one ODN which had 27. Most respondents worked in a NICU (Level 3) or Local Neonatal Unit (Level 2) which felt appropriate as this is typically where nCPAP and HFNC is administered. The first author is a neonatal SLT which may have contributed to the higher number of SLTs responding (50%), however we feel we had good representation from nurses (25%) and medical staff (22%). Future studies may benefit from engaging senior professionals from other disciplines to support survey dissemination.

Although the survey was not formally validated, it was based on the published survey by Canning et al., (2020) [14] and reviewed by a stakeholder group with demographics like those of the target population. While broadly informed by Canning et al., several adaptations were made: this study focused exclusively on the NICU (rather than both NICU and paediatric intensive care), examined fluids only (excluding food textures), and included questions on the use of formal and informal assessments, as well as terminology used to describe clinical signs of aspiration or laryngeal penetration. Likert scales and qualitative data were used to assess frequency across domains such as feeding strategies, readiness indicators, and multidisciplinary working, rather than a “tick all that apply” format. A limitation is that the Likert scale descriptors (never, rarely, sometimes, often, always) were not explicitly defined; however, free-text boxes were incorporated throughout to allow respondents to expand and provide detail where needed. The robustness of this study could have been enhanced using a formal research protocol to underpin the design and methods as advocated by Campus et al., 2020 [32]. Such protocols also support the handling of patient-safety issues, which is pertinent despite no reports of poor practice being identified in the present survey.

The variation in oral feeding practices for infants receiving nCPAP and HFNC identified in this survey reflects a wider lack of consensus across UK neonatal units. Such inconsistency may contribute to delays in the introduction of oral feeding until respiratory support is withdrawn, despite evidence linking delayed feeding to adverse medical and neurodevelopmental outcomes [12, 33] including longer hospital stays, increased risk of persistent feeding difficulties, and potential disruption to early parent–infant bonding [34]. Conversely, early introduction of oral feeding may carry risks, including a persistent inflammatory state and potential longer-term respiratory sequelae [15]. The lack of consensus and limited, often conflicting, data means clinicians must balance these risks - weighing the potential consequences of delaying oral feeding against the risks of

introducing oral feeding whilst an infant receives non-invasive respiratory support.

Conclusion

This survey shows that uncertainty related to oral feeding of infants receiving nCPAP or HFNC remains and that oral feeding for infants receiving nCPAP in the UK is limited. A continuum of conflict related to orally feeding infants on NIV was highlighted. Most respondents agreed that parents are important, however acknowledged that they currently have limited input in the decision-making around orally feeding infants on nCPAP and HFNC. This is likely due to the current lack of robust, objective evidence to support clear clinical decision-making around oral feeding on nCPAP and HFNC. Consequently, a cautious approach is recommended, given the absence of clear evidence on both the potential safety and the potential risks. Further research should track adverse effects related to orally feeding infants receiving nCPAP and HFNC. Empirical studies using instrumental assessment of swallow safety and clinical case series examining the introduction of oral feeding in infants receiving nCPAP and HFNC is recommended to guide clinicians and parents / carers with their decision-making.

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Data Availability City St George’s, University of London is the sponsor, and the data controller of this UK based study. The only people at City St George’s who have access to respondents’ identifiable information are Rebecca Murphy, Professor Madeline Cruice and Dr Nicholas Drey. City St George’s will keep data from this study for 10 years after the study has finished.

Declarations

Conflict of interest The authors have no conflicts of interest to declare.

Ethics Approval Ethical approval was granted by City St George's, University of London School of Health & Psychological Sciences Research Ethics Committee on 9/02/2024 (reference ETH2324-1320) prior to commencement of data collection. Completion of the survey was voluntary and informed consent was sought before participants could proceed. Participants were asked (1) if they consented to their anonymised free text answers being used when sharing the results (2) if they understood that their data could not be withdrawn once submitted and anonymised and (3) if they understood that their anonymous data would be made open access and so could be used for secondary analysis in future projects.

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