

# BMJ Open Approaches to supporting lactation and breastfeeding for very preterm infants in the NICU: a qualitative study in three European regions

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## ABSTRACT

**Objectives:** To explore differences in approaches to supporting lactation and breastfeeding for very preterm infants in neonatal intensive care units (NICU) in 3 European regions.

**Design:** Qualitative cross-sectional study carried out by means of face-to-face semistructured interviews. Verbatim transcripts were coded using a theoretical framework derived from the literature and supplemented by data-driven concepts and codes.

**Setting:** 4 purposively selected NICUs in each of 3 European regions in 2010 (Ile-de-France in France, Lazio in Italy, and the former Trent region in the UK).

**Participants:** NICU staff members (n=22).

**Results:** Policies and practices for managing mother's own milk for very preterm babies differed between regions, and were much more complex in Ile-de-France than in the Trent or Lazio regions. Staff approaches to mothers to initiate lactation differed by region, with an emphasis on the nutritional and immunological value of human milk in the Trent region and on the 'normalising' effect of breastfeeding on the mother-child relationship in Lazio. French and English staff expressed conflicting opinions about the use of bottles, which was routine in Italy. Italian informants stressed the importance of early maternal milk expression and feeding, but also mentioned discharging infants home before feeding at the breast was established. In Ile-de-France and Trent, successful feeding from the breast was achieved before discharge, although this was seen as a factor that could prolong hospitalisation and discourage continued breastfeeding for some women.

**Conclusions:** Targeted health promotion policies in the NICU are necessary to increase the number of infants receiving their mother's milk and to support mothers with transfer of the infant to the breast. Integrating knowledge about the different approaches to lactation and breastfeeding in European NICUs could improve the relevance of recommendations in multiple cultural settings.

## INTRODUCTION

Very preterm infants born before 32 weeks of gestation—about 1.5% of total births in Europe<sup>1</sup>—are at high risk of respiratory,

## Strengths and limitations of this study

- By exploring lactation and breastfeeding practices in neonatal units in diverse cultural settings, our study raises questions about the success of current strategies for ensuring successful lactation and breastfeeding during the baby's hospitalisation and after discharge.
- We used the same interview guide, a common code book and coding cross-checks to reduce the differences in the interpretation of our results related to our multicultural samples. Thus, despite linguistic and cultural differences, our qualitative study was able to reveal similarities and differences in policies and attitudes.
- Our informants were actively involved in lactation and breastfeeding promotion and support at the bedside, and their views may be different from those of other staff members. However, we hypothesised that our informants could accurately describe the policies and practices in their unit.

gastrointestinal and neurodevelopmental complications in the neonatal period<sup>2–4</sup> and childhood.<sup>3–5</sup> Human milk is widely recommended as the best way to feed these infants,<sup>6–9</sup> as it meets most of their nutritional requirements, reduces the risk of infection, necrotising enterocolitis and allergies, and may have a positive effect on cognitive development.<sup>9–11</sup> Very preterm infants also benefit from the skin-to-skin contact with their mothers during breastfeeding, as shown by better physiological stability.<sup>12</sup> Further, milk expression and breastfeeding present an opportunity for parents, particularly mothers, to be actively involved in their child's care during prolonged hospitalisation in the neonatal intensive care unit (NICU).<sup>13–14</sup>

A previous area-based study, the MOSAIC study,<sup>15</sup> aimed at comparing medical practices and organisation of care for very

preterm infants in Europe, found wide variations in very preterm infants receiving human milk at discharge from the NICU in 2003.<sup>16</sup> Rates ranged from 70% (18% exclusively human milk) in the Lazio region in Italy, to 35% (29%) in the former Trent region in the UK, and 24% (14%) in the Ile-de-France region in France. Other single-country studies confirm the variability in human milk feeding rates for infants at discharge home from the NICU. Data from neonatal networks showed rates of 66% in Italian high-risk infants,<sup>17</sup> and of about 50–60% in the USA<sup>18–19</sup> with important variations between NICUs (20–90%), and across gestational ages and birth weights (30–70%). Population-based data from Sweden showed higher rates: 86% of very preterm infants received human milk feedings at 2 months postnatal age and 60% at 6 months.<sup>20</sup>

These differences may reflect maternal and infant clinical and sociodemographic characteristics<sup>16–18–20</sup> as well as the country's cultural context. For example, the MOSAIC study found a correlation between NICU rates of human milk feeding and overall breastfeeding rates at the country level.<sup>16</sup> However, differences may also relate to the degree of promotion and support by NICU staff and to unit policies to facilitate lactation and breastfeeding.<sup>21–22</sup> Providing mother's own milk to very preterm infants is challenging for both mothers and healthcare personnel. As very preterm babies initially do not have the ability to suck from the breast, their mothers must start expressing soon after birth and pump many times a day for weeks to provide their milk and maintain lactation before the infant can be put to the breast.<sup>21–22</sup> They may face difficulties initiating lactation, because their ability to produce milk may be compromised by the preterm birth itself,<sup>23</sup> or by its association with obstetric (multiple birth, caesarean delivery) or maternal (eclampsia, admission to intensive care) complications.<sup>16–18</sup> In addition, the introduction of oral feedings for these infants is complex as the sucking capabilities of the very preterm infants are not comparable with those of term infants until the 33rd or 34th week of post-menstrual age.<sup>24</sup> Most very preterm infants need to be initially fed via a nasogastric tube, then gradually introduced to sucking feeds, by bottle or alternative techniques (cup, syringe or finger-feeding). This process may be further complicated for infants with severe health complications.

Current recommendations for lactation and breastfeeding promotion and support in the NICU<sup>25–29</sup> include: specific staff training, information about the benefits and challenges of provision of mother's milk and breastfeeding, avoiding mother-infant separation, promoting skin-to-skin care, encouraging the use of bottle substitutes, helping mothers to initiate milk expression early after birth, and facilitating access to breast pumps.

A few qualitative studies have investigated the opinions of NICU staff on lactation and breastfeeding and found that supportive unit policies, as well as the availability of

breast pumps, educational material, lactation consultants and staff training, were viewed as facilitators, while inconsistent or insufficient support from colleagues<sup>30</sup> and the need to monitor milk intakes<sup>31</sup> were viewed as barriers.

We aimed to explore to what extent differences in health professionals' attitudes and practices about lactation and breastfeeding in neonatal units may contribute to the wide variation in rates of human milk feedings across European regions. This qualitative study sought to investigate barriers and facilitators for practices supporting the provision of human milk, lactation and breastfeeding of very preterm infants in neonatal units in three regions in France, Italy and the UK, which had different rates of human milk feedings at hospital discharge, according to the MOSAIC study findings.<sup>16</sup>

## METHODS

### Study population

A purposive sample of four neonatal units was selected in each of three European regions: Ile-de-France in France, Lazio in Italy and the former Trent region in the UK. The selection aimed to ensure geographical variability (city and suburbs), maternal sociocultural diversity (based on data on maternal age, parity, percentage of foreign mothers and census tract characteristics), and variation in human milk feedings at discharge from the neonatal unit within each region based on the results of the MOSAIC study.<sup>16</sup> An invitation letter was sent to the head of each unit to inform them about the study and ask for permission to approach health professionals within the unit. All invited units agreed to participate in the study.

### Interviews

Semistructured, face-to-face interviews were carried out with the healthcare professionals deemed by the head of the unit to have the most knowledge about lactation and breastfeeding. Grouped interviews were carried out when more than one person by unit was assigned.

The interview guide (see online supplementary file S1) was organised chronologically from antenatal counselling to discharge from the NICU and covered routine procedures during the various stages of the process leading to breastfeeding in the very preterm infant. The interviewer prompted items in each section if not mentioned spontaneously by interviewees. Before starting the interview, respondents were told that all questions concerned very preterm infants. Respondents also completed a unit description sheet detailing the structural characteristics of the unit and its policies related to lactation and breastfeeding. Data collection instruments were pretested in three NICUs.

The interviews were performed in local languages in the NICUs between March and July 2010 by MB in Ile-de-France and the Trent region, and by EF and MB in Lazio. They lasted 1–2 h, and were audiotaped and

transcribed verbatim. Filed notes were made after the interview.

Ethics committee approval and written informed consent were obtained in the Trent region. This was not required in Lazio or Ile-de-France.

### Data analysis

The interview transcripts were analysed using the framework approach,<sup>32</sup> which makes it possible to take into account a priori issues and research questions linked to the progression of stages from antenatal counselling to transfer of the baby to the breast. This approach is increasingly used in applied healthcare policy research when specific a priori questions have to be explored.<sup>33</sup> It is also well suited to mixed methods research when quantitative data are also available.

MB transcribed the interviews from Ile-de-France and the Trent region, and EF those from Lazio. The two researchers then read and reread all the transcripts to become familiar with the data collected. A working analytical framework was identified using codes and categories derived from the study main research questions as included in the interview guide. The framework was further enhanced by a review of the literature regarding lactation and breastfeeding promotion programmes,<sup>34–37</sup> maternal<sup>13 21 26</sup> and staff<sup>30 31</sup> views on lactation and breastfeeding the very preterm infant, as well as barriers and facilitators related to decision-making in clinical practice.<sup>38</sup> New codes and categories emerging from the data were added during the coding of the interviews, while some of the initial codes were modified in an iterative process.

Charting data into the framework matrix focused on the principal barriers and facilitators categories related to the attitudes and practices of health professionals. Interpretation of data involved identifying differences and similarities between the regions, finding associations within themes and subthemes, and identifying links that

could explain the findings of the quantitative data from the MOSAIC study.<sup>16</sup> Key concepts were illustrated using the respondents' own words (translated into English by professional translators), as advocated as a mean of staying 'true' to the data.<sup>32</sup> Contextual information about structural factors and unit policies related were also abstracted from the interviews.

Coding cross-checks were performed by double coding of one interview from each region and by secondary reviews of all interviews by another coauthor (JZ for the Trent Region, BB for Ile-de-France, MC for Lazio). Discrepancies between authors were solved through consensus agreement. NVivo software V.9 (QSR International, Australia) was used for data coding and charting.

We then selected barriers and facilitators that differed in at least two of the regions, including the interpretation of evidence, views about the patients' role in decision-making and their own self-efficacy, as well as environmental factors such as resources and organisational constraints. We grouped them into 11 subthemes related to lactation initiation (2 themes), management of human milk (2), lactation maintenance (4), and organisational factors (3). Online supplementary table S2 provides the framework classifications for the subthemes.

### RESULTS

Table 1 shows the interviewees' profile and the characteristics of the units included in the study. A total of 22 professionals participated. Nurses (N=8) participated in interviews in all regions; lactation experts (N=7) (lactation consultant or infant feeding coordinator) were interviewed in Ile-de-France and the Trent region, and physicians (N=7) in Lazio. All units were tertiary-level units, except one level II unit in the Trent region. In the participating units, the proportion of infants receiving human milk at discharge in 2003

**Table 1** Interviewees' profile and unit characteristics

	Ile-de-France (4)	Trent (4)	Lazio (4)
Interviewee professional background			
Nurse/family care coordinator	4	2	2
Lactation expert*	2	5	0
Paediatrician or obstetrician	0	0	7
Characteristics of the units			
Tertiary level unit	4	3	4
Number of neonatal units with more than 300 admissions/year	4	3	3
More than 50% of infants breastfed at discharge in 2003	0	0	4
More than 50% of infants breastfed at discharge in 2009	Not available	1	4
Personnel, accreditation and protocols			
Number of units with a lactation expert*	2	3	1†
BFHI commitment or stage 1 (year of accreditation)	0	3 (2010)	1 (2007)
Written protocols for human milk use or breastfeeding in very preterm infants	1	1	2

\*Lactation consultant or infant feeding coordinator.

†One lactation expert available in the hospital.

BFHI, Baby Friendly Hospital Initiative.

varied from less than 35% in Ile-de-France, to less than 50% in the Trent region, and more than 55% in Lazio. In 2009, the same units continued to have similarly high or low rates of human milk feedings when compared with other units within their region. Rates did not overlap between regions. Three units in Trent and one unit in Lazio had started the accreditation process for the Baby Friendly Hospital Initiative label.

The following sections report results with supporting quotations where barriers and/or facilitators related to initiation of lactation, management of human milk, lactation maintenance and organisational factors differed in at least two of the regions. Online supplementary table S3 provides a summary of these results.

### Initiation of lactation

The timing and approaches used to inform mothers about lactation and breastfeeding differed by region. Health professionals in Ile-de-France and the Trent region reported that they had deliberated about the best time to discuss lactation and breastfeeding with the mother after delivery. This was perceived as a potential barrier, as it could delay the provision of information to the mothers, as remarked below by an English lactation expert:

Some staff will encourage [early human expression], some will wait till the mother feels a little bit better. (lactation expert, UK)

French professionals also appeared to be concerned with allowing maternal choice and avoiding guilt should the mother decide not to breastfeed, as illustrated below:

[giving advice about breastfeeding] bothers me enormously because when you give advice, you may seem pushy: do this, do that. So, I just give them the information and then they make their decision. (lactation expert, France)

In contrast, English respondents emphasised the value of human milk for the preterm infant, and reported efforts to convince mothers about the benefits of human milk and persuade them to start expression:

Here we are successful getting mums to express... because the medical team and the nurses work together to emphasize the fact that [human milk expression] is the best thing they can do for their baby. (nurse, UK)

In Lazio, respondents placed less emphasis on discussing the decision to express or breastfeed with the mothers, and showed a strong expectation that all women would breastfeed because of its importance for strengthening the maternal role and the mother-infant relationship:

The idea of having this task, of at least expressing and bringing the milk, makes [the mothers] feel important to their baby. (doctor, Italy)

The discussion of expression and breastfeeding with the mother after delivery was perceived positively, both for the mother and the health professional:

This is perhaps the only time, when you can give pleasant information...It is quite rewarding for those who give the information, because otherwise all the other information is a bit...challenging. (doctor, Italy)

Thus, Italian respondents emphasised the need to start expression of mother's own milk as soon as possible, and early feeding:

Because the crucial point is to very soon tell the mother to start stimulating the breast and expressing milk as soon as possible. (doctor, Italy)

### Management of human milk

The differences in unit policies for human milk management are summarised in table 2. In Ile-de-France, units used pasteurised milk or, if using fresh milk, performed systematic human cytomegalovirus (HCMV) testing and bacteriological analyses, and only allowed storage for less than 48 h. In the Trent region, all units used fresh or frozen-thawed human milk and stored human milk up to 48 h. No unit in this region used systematically pasteurised milk, checked for maternal HCMV serology, or performed systematic bacteriological analysis of the milk. Practices in Italy varied between units. French health professionals appeared more concerned with the risks of infection transmitted via human milk than professionals in the other two regions:

We can't just give fresh milk like that, without any bacteriological testing. (nurse, France)

In contrast, English and Italian informants relied primarily on making sure mothers followed hygiene recommendations for pumping and transporting their milk, reporting no systematic policies for infection screening. Bacteriological analyses were carried out on the milk only in case of suspected infection.

All French units had access to pasteurised milk. This was perceived as a resource that allowed more infants to be fed human milk, either because donor milk could be used if the mother was not expressing or because the mother's own milk could be pasteurised in the unit:

If she [the mother] doesn't want to give her milk, it doesn't matter that much because we have the milk bank. (nurse, France)

Donor milk was not available in the English units included in this study, and its access was limited in the Italian units. Donor milk was seen as positive in the one Italian unit with access to a milk bank, where donor milk was used mainly when the mother's own milk was not available.



**Table 2** Structural and policy factors related to lactation and breastfeeding practices in neonatal units

	Number of units		
	Ile-de-France (4)	Trent (4)	Lazio (4)
<i>Use of fresh, frozen-thawed or pasteurised mother's own milk</i>			
Use of fresh milk for infants less than 32 weeks			
Yes	2	4	3
No—only pasteurised milk	2	0	1
Use of frozen-thawed milk	0	4	2
Storage fresh milk up to 48 h	0	4	1
Systematic HCMV screening of all mothers	4	0	1
Type of milk given if positive HCMV screening			
Pasteurised milk	4	0	0
Frozen-thawed milk	0	0	1
Systematic bacteriology analysis of fresh milk	4	0	0
Regular access to pasteurised milk			
Milk bank	4	1	1
On-site pasteurisation unit (for mother's own milk only)	2	0	1
Maintenance of lactation and transfer to the breast			
Use of cup/syringe feeding	4	4	0
Transfer to breast starts before 33 weeks	1	2	4
Pumping/breastfeeding room	4	4	2
Role of units' policies			
Visiting hours 24/24	4	4	0

BHFI, Baby Friendly Hospital Initiative; HCMV, human cytomegalovirus.

### Lactation maintenance and transfer to the breast

Maintenance of lactation during the infant's hospitalisation in the neonatal unit was recognised as challenging by the French and English informants. In Ile-de-France, health professionals were concerned that unit policies aimed at preventing the transmission of infections, such as pasteurisation of mother's own milk, could be interpreted by mothers as an indication that their milk was tainted, or that they themselves were in some way at fault:

[mother's pasteurized milk] takes a long time to obtain. During this time, the baby receives donor milk or formula. It's very discouraging for the mothers...they have the feeling that their milk has to be purified. (lactation expert, France)

In the Trent region, our informants highlighted difficulties in helping mothers to maintain their milk supply, and the need to improve follow-up of mothers who initiate milk expression:

Making sure that the mother does it better in the long term rather than just focusing on that first week to ten days. We need to be more proactive. (nurse, UK)

In contrast, Italian informants did not express concerns about mothers maintaining milk supply.

The use of alternatives to bottles to support the successful establishment of breastfeeding was also mentioned. All units in Ile-de-France and the Trent region appeared to favour the use of cups or syringes to feed infants until the infant was feeding at the breast, and

staff expressed concerns about the use of bottles when the mother had decided to breastfeed:

the problem of the bottle is double-edged, because the parents realize that the baby will take larger quantities, swallow faster, and afterwards it's really an obstacle to putting the baby to the breast. (lactation expert, France)

We are trying to encourage more cup feeding because once you introduce that bottle then...it is easier to move on to formula, isn't it? With the cup they don't tend to think about formula, they will think about breast milk in a cup. (nurse, UK)

However, opinions about bottles were mixed in these regions. Some informants expressed doubts about the existence of teat-nipple confusion among very preterm infants. Bottle feeding was also viewed as reassuring for the mothers and the health professionals, because it allowed them to quantify how much milk the infants were receiving.

No Italian unit used techniques to avoid bottles. In this region, bottles were seen as helpful for feeding high-risk infants, and were often used before babies were put to the breast:

when we see sucking-swallowing coordination we start with the bottle and then afterwards with the breast... Because the breast is a bit trickier. (doctor, Italy)

In all regions, the importance of viewing support to lactation and breastfeeding as part of professional duties was highlighted. However, French and English

professionals reported worries that healthcare staff, in particular neonatal nurses, while very good on the technical aspects of infant care, were less attentive to milk supply and breastfeeding:

Even after being made aware, being trained, it is still necessary to have a real desire to support these mothers and devote time to them. (nurse, France)

They [nurses] are very good at their job but...what's missing is making sure that the mum is still expressing well and that there's still milk coming out. (nurse, UK)

In contrast, in Italy, physicians presented the promotion of lactation and breastfeeding in general as a central part of the nurses' job and even of their own job:

We always bear in mind the issue of nutrition. When we provide news about a baby and we say it is doing fine etc... is he/she feeding? your own milk, I recommend you that you keep expressing... it is important that you bring [own milk]. And this is what the nurses do a lot. (doctor, Italy)

French and English professionals brought up a range of difficulties encountered when putting infants to the breast, including difficulties in assessing the infant's ability to feed at the breast and the quantities of milk the infant was receiving. They also identified delays in transferring infants to the breast, reporting that this often occurs after 33 weeks postmenstrual age when most very preterm infants have sucking capabilities comparable with term infants:

We could propose that [the mothers] put the baby to the breast, but, at that level, we still have a lot of work to do...because, in my opinion, we start putting babies to the breast too late. (lactation expert, France)

Staff sometimes don't have the confidence to know when they can reduce that top up and reassure the mother that her baby is getting enough milk from her breast. (lactation expert, UK)

In both these regions, informants described cases where mothers expressed milk to feed their very preterm infant, without the intention of putting the infant to the breast.

In contrast, Italian interviewees emphasised putting the infant to the breast as soon as possible and the 'normalising' effect of breastfeeding on the mother-child relationship after a preterm birth. Health professionals focused on the mother's wish to feed from the breast:

The mothers tend to have a strong desire to get the baby to latch on to the breast. They ask you, "but, doctor, when I can start breastfeeding?" (doctor, Italy)

However, staff suggested that mothers may establish feeding at the breast after discharge:

They [staff] tell the mothers "start in the morning [to put the baby at breast], when you are home, during the feed in which you have more [milk], try to get your baby to latch on, gradually." (doctor, Italy)

### Organisational factors

Visiting policies differed by regions. While in all French and English units parents could visit at any time during the day or the night, Italian units had limited visiting hours (table 2). Restrictive policies were justified by lack of space for health professionals to perform clinical procedures or medical rounds while parents are by their infant's cot. In these units, visiting hours were often based on the feeding schedule of the infants, although regular exceptions were made and mothers could stay longer for breastfeeding or skin-to-skin care. These exceptions appeared to be considered by the Italian health professionals as a bonus and an indication of being sensitive to the needs of mothers and infants.

All French and English units had a designated breastfeeding or pumping room, whereas this was the case in only two of the four Italian units (table 2). Absence of privacy for using breast pumps, or while breastfeeding, was seen as a potential barrier in the French and English units, but was not mentioned by our Italian informants:

If they wish to tuck behind the screen, they can; so we do hopefully give them a bit of dignity. (nurse, UK)

French and English informants commented that infants were discharged home only after they had attained adequate and independent oral feeding, and that this discharge strategy could discourage breastfeeding since bottle-fed babies became independent sooner:

We would introduce the bottle because it makes it possible to accelerate discharge from the hospital. (nurse, France)

[the mother] goes down to the bottle because that's what she wants to do and that baby will go home sooner than if she stresses at the end of breastfeeding. (nurse, UK)

This issue was not mentioned in Italy, as most of the infants were fed by bottle during hospitalisation, and might be discharged home before breastfeeding was completely established.

### DISCUSSION

Professional practices and approaches related to lactation and breastfeeding in the neonatal unit varied in European regions, and this variation may contribute to differences in rates of human milk feedings observed in the literature at discharge from the NICU. We identified barriers and facilitators that differed between at least two of the three regions in our study, including the ways that professionals approached mothers about initiating lactation, the assessment of the benefits and risks associated

with use of fresh versus pasteurised human milk, opinions about the use of bottles for breastfed infants, and unit visiting and discharge policies. These results enrich our understanding of variations in rates of human milk feedings in participating regions, and shed new light on key debates surrounding lactation and breastfeeding practices for very preterm infants.

In the two regions with higher rates of human milk feedings, Lazio and the former Trent region,<sup>16 39 40</sup> health professionals highlighted the importance of breastfeeding for the mother-child relationship and the benefits of fresh human milk; they also stressed early human milk expression, and used less complex practices for managing maternal milk. In Italy this approach may well contribute to the relatively high 'any' human milk feeding rates, but the existence of restricted visiting hours and routine use of bottles prevented exclusive mother's own milk feeding, and feeding from the breast at discharge from NICU. In Trent, highly motivated personnel engaged in promoting the benefits of human milk and the simplicity of procedures for human milk use may have contributed to the higher rates of exclusive human milk feedings. In contrast, personnel in the French region, where rates were lowest, were more attuned to the potential risks of infections associated with human milk feeding, had more complex procedures for the management of human milk, and expressed more concerns about the difficulties of mothers who expressed their milk or breastfed.

None of the models described in this study appeared to guarantee mother's own milk feedings and breastfeeding at discharge for the majority of infants. Policies that promote milk expression do not appear to be sufficient in the long term to help mothers maintain lactation through their infant's hospitalisation and after discharge. Similarly, current practices did not appear to be sufficient to achieve breastfeeding in the NICU before discharge, and this even in places where breastfeeding is generally supported, as in the Italian region.

The variability that we observed in practices for managing mother's own milk is in line with other studies<sup>41-44</sup> reporting differences between European countries and between neonatal units within countries. Evidence to back up the use of fresh or pasteurised milk for very preterm infants remains inconclusive regarding the risk of infection transmission,<sup>45 46</sup> or modification of the milk's nutritional and immunological properties.<sup>47 48</sup> While adopting a risk-averse stance may seem reasonable in the absence of clear evidence, our results suggest that some procedures for managing mother's own milk may have a negative impact on the general use of human milk use in the neonatal units. Our French respondents expressed concern that procedures for the use of mother's own milk negatively affected mothers' motivation to express by making them feel that their milk needed to be 'purified'. These procedures might also affect their capacity to provide their milk, since short storage times require parents to visit the neonatal unit several times a day. Also, the waiting time for

bacteriological results or for pasteurisation of milk was reported to increase the use of formula in some circumstances. In addition, in France, historic problems with blood banks and infection transmission<sup>49</sup> have shown a long-lasting influence on health professionals and authorities as regards the application of the precautionary principle when using biological products, including fresh human milk.

Health professionals' attitudes and practices related to initiation and maintenance of lactation may be influenced by the availability of pasteurised human milk and milk banks. Milk banks undoubtedly increase use of human milk for infants admitted to neonatal units, especially as exclusive human milk feedings. A recent study in Italy has shown that the presence of a human milk bank in the hospital is associated with higher breastfeeding rates in the NICU,<sup>6</sup> suggesting that it can positively reinforce the culture of breastfeeding. However, the effect of human milk banks might differ in other cultural settings. Our results suggest that the wider use of donor human milk reported in Ile-de-France appeared to function as a replacement when mothers decided not to express, rather than as a temporary solution when mother's own milk was not available. Availability of donor milk may also negatively affect the French health professionals' motivation to actively encourage women to start expression soon after delivery. In contrast, health professionals in Trent and Lazio were more proactive, as they needed to persuade women to express if their infants were to receive human milk.

Our study raises questions about the role of lactation experts in the NICU. They can certainly help mothers to successfully achieve lactation and breastfeeding and to disseminate knowledge and skills among professionals, particularly in those units where doctors and nurses do not have the expertise, time or motivation to help mothers through lactation and breastfeeding. However, the influence of lactation experts might be more important in contexts where breastfeeding is not the norm and where healthcare professionals do not consider lactation and breastfeeding as part of their role, as illustrated by the Ile-de-France and Trent regions. Their presence might be felt less necessary in units with a different approach, where all staff categories are supposed to support the mothers, as reported in Lazio. Reverse causality cannot be excluded, however, and the availability of lactation experts may lead to delegating lactation and breastfeeding support, with loss of interest and commitment by the rest of the staff.

Finally, we found that transferring very preterm infants to the breast remains a challenging task in all the study regions, although approaches differed. This issue was clearly mentioned by health professionals in the French and English regions, and is consistent with findings from previous studies.<sup>30</sup> In Italy, some babies seemed to be discharged home before transition to the breast was fully established, which, together with the more liberal use of bottles, may be related to the restrictive visiting policies<sup>50</sup> that in

many units limit the time that mothers can spend with their babies.<sup>51</sup> An Italian study showing that only a small percentage of mothers (3%) feed very preterm babies directly at the breast at discharge from hospital<sup>17</sup> corroborates our findings. Improving procedures for putting babies to the breast is important as this has been found to increase exclusive breastfeeding at discharge from the NICU.<sup>52</sup>

Our results raise questions about the specific support for maintenance of lactation in the NICU and its continuation postdischarge. In particular, postdischarge breastfeeding interventions will depend on how successful mothers are at maintaining established lactation through to discharge from the NICU. Recent recommendations highlight the importance of preparing parents for breastfeeding after hospital discharge and of ensuring access to professional or lay peer counsellors in the community,<sup>27</sup> but data on breastfeeding practices and maternal experiences after their infant's discharge from the NICU are scarce. This is an important area for future research.

Although the inclusion criteria for the key informants were the same for all units, the professional qualifications of the interviewees differed by region as a result of differences in the organisation of care for supporting lactation and breastfeeding in each region. However, we used the same interview guide across these different contexts, a common code book, and coding cross-checks to reduce the differences in the interpretation of our results related to our multicultural sample. Our study had limitations, however. Our informants were actively involved in promotion of lactation and breastfeeding and support at the bedside, and thus their views may be different from those of other staff members. In the absence of a designated lactation consultant, the head of the unit chose the informant(s) and might have chosen people with a more supportive attitude towards lactation and breastfeeding. However, we hypothesised that our informants could accurately describe the policies and practices in their unit. Our study was not designed to capture the differences in opinion between health professionals within units, and since we had a relatively small sample of units in each region, we could not compare interviewees' views across the same professional categories. Our focus was on themes that differed across regions and not those that emerged from interviews in all regions, such as the importance of having updated knowledge about lactation processes, the training of personnel, antenatal information of the mothers, and the practice of skin-to-skin care and peer-to-peer support. All informants also made some reference to the inconsistent and conflicting advice given to mothers by different staff members, lack of breast pumps and personnel time to support mothers who were expressing or breastfeeding. Finally, our study focused on the views of health professionals, and we cannot assess how maternal attitudes and experiences differed between the regions, and their role in shaping human milk provision and breastfeeding practices and rates.

## CONCLUSION

Attitudes and practices about lactation and breastfeeding in the NICU varied in the three European regions in our study. An understanding of these varied approaches to lactation and breastfeeding provides a starting point for the development of effective recommendations for the use of mother's own milk and promotion of breastfeeding that apply to multiple cultural settings. Our research identified salient differences in approaches to mothers about their decision to initiate lactation and breastfeeding, the perception of risks and benefits of mother's fresh milk, donor milk availability, the role of lactation experts, the use of bottles and discharge policies. However, none of the models described in this study appeared to guarantee breastfeeding for the majority of infants during their hospital stay and after discharge.

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## **S1. INTERVIEW TOPIC GUIDE**

### **BREASTFEEDING FOR VERY PRETERM BABIES: QUALITATIVE STUDY OF THE MOSAIC PROJECT**

#### **Interviewee details**

DATE OF INTERVIEW :  
NAME:  
JOB TITLE:  
HOSPITAL:  
LOCATION:  
ADDRESS:  
PHONE:  
E-MAIL:  
INTERVIEWEE:

#### **Introduction to interview**

Thank-you for agreeing to take part in this interview. In this study we are interested in breastfeeding in neonatal units. In the MOSAIC study, we found a large variation in breastfeeding rates for very preterm babies at discharge between the regions and units (show poster). This suggested that European units had different management strategies for breastfeeding. Our aim is thus to identify the strategies used for breastfeeding in European maternity and neonatal units.

We would like to ask you about the routine procedures for women who wish to breast feed their babies in your neonatal unit (particularly very preterm infants), the support that is available for women who experience difficulties as well as your opinions about the factors which contribute to successful breastfeeding.

I am going to structure the interview around an interview guide. I will ask general questions in chronological order, from arrival of the baby in your unit to discharge. The interview itself will be open ended and I will prompt about items that you do not mention spontaneously.

Your responses are confidential. I would like to tape recording the interview so that I can have an accurate and detailed record of the interview. If anything you say is used in a publication then it will be anonymous. Do you mind if I record this interview?

The interview should take about 2 hours. After the interview I would like to visit your unit and if it possible I will take some pictures of places designated for pumping and feeding.

## **Section 1: Initiating and maintaining lactation**

What are routine practices to feed babies in the unit?

How mothers initiate lactation (in neonatal unit, in maternity ward)? Time, counseling, access to breast pumps,..

How do you approach mothers before birth?

What are recommendations given to mothers who pump? Frequency, volume, access to breast pumps

What do you do if mothers don't want to breastfeed? To pump?

What do you do if delayed or decreasing milk supply? If mothers are having problems pumping?

What do you do if mothers want to stop pumping?

What do you do if mothers can't rent/buy a pump?

What types of human milk do you use? Raw milk, frozen milk, pasteurized milk, lactarium

How do you feed babies? Methods (bottle, cup, spoon, finger,...), time to feeding

What kind of support is given to parents?

How do you adapt to the following situations: multiparous mothers, tiredness, infants with health complications, home-unit distance and parent's difficulties to come to the unit, foreign women

## **Section 2: Transfer to breast**

How do you put babies at breast?

What do you do if mothers don't want to put their babies at breast?

What do you do if baby is not taking the breast?

## **Section 3: Discharge home**

What are feeding criteria for discharge?

What kind of support receives mothers after babies discharge?

## **Section 4: Education and support for/from health care givers**

Are there education session organise for health care givers? Starting year, type, health care givers targeted, content,...

How is work organized between units (neonatal, NICU, maternity unit)? Between teams (day,night,WE)?

### **Section 5: General information**

I would like to finish asking you:

What are factors / practices that favors/discourage breastfeeding in your service?

How do you think breastfeeding could be increased in your service?

### **Section 6: Updating data on breastfeeding and obtaining information about structural/organizational characteristics of the unit**

We would like to update data on breastfeeding practices if available: breastfeeding rates, pumping rates, delay to initiation of lactation. If no data are collected we will ask the interviewee: Do you think that breastfeeding intention/rates have change since 2003? Increase? Decrease?

We would like to obtain some information about maternity and neonatal units size (number of births, number of very preterm births, number of admissions number, of very preterm admissions), number of lactation consultants, practices that might favour breastfeeding ( BFHI, NIDCAP, Kangorou care or skin-to-skin).

### **Section 7: Visit of the unit**

We would like to describe the neonatal unit. We will also take pictures and/or draw a floor plan of the unit to enrich the observations.

### **Closure of the interview**

We will ask the interviewee if it be alright to contact her/him if we have any more questions.



**Table S2. Themes, sub-themes and framework categories**

<b>Themes and sub-themes</b>	<b>Framework categories describing barriers and facilitators</b>
<b>Lactation initiation:</b>	
1. Timing of discussion with mothers	Patients' role in decision-making
2. Informing mothers about lactation and breastfeeding	Patients' role in decision making Interpretation of evidence; Self-efficacy
<b>Human milk management :</b>	
1. Evaluation of risk-benefits of fresh human milk	Interpretation of evidence
2. Access to pasteurized milk	Resources
<b>Lactation maintenance and transfer to the breast:</b>	
1. Maintaining milk supply	Self efficacy
2. Use of bottles	Interpretation of evidence
3. Breastfeeding as part of infant's care	Self-efficacy
4. Transfer to the breast	Self efficacy Patients' role in decision making
<b>Organizational factors:</b>	
1. Visiting policies	Organizational constraints
2. Privacy	Resources
3. Discharge from neonatal unit	Organizational constraints

**Table S3. Differences between at least two regions in practices and approaches to lactation and breastfeeding very preterm infants in the NICU**

Themes	Subthemes	Region		
		Ile-de-France	Trent	Lazio
Initiation of lactation	Timing of discussion with mothers	Concern with finding the right time to approach the mothers	Concern with finding the right time to approach mothers	Timing not mentioned, portrayed as positive
	Informing mothers about lactation and breastfeeding	Respect mother's decisions because breastfeeding is difficult	Encourage expression because of nutritive qualities of human milk.	Have strong expectations that all mothers will breastfeed because of importance for mother-infant bonding
Management of human milk	Evaluation of risk/benefits of fresh mother's own milk use	Concern about risks associated with infection transmission	Less concern with risks	Less concern with risks
	Access to pasteurized milk	Pasteurization of mother's own milk or donor milk allows more babies to receive human milk	Limited access to donor milk, not mentioned	Donor milk is useful to initiate breast feeding when mother's milk is not available. Use of donor milk is complicated
Lactation maintenance and transfer to the breast	Maintaining milk supply	Milk management practices affect maternal motivation	Follow-up of mothers after expression initiation not well organized	No mention of problems with lactation maintenance
	Use of bottles	Cups are better, but bottles have benefits	Cups are better, but bottles have benefits	Bottles are not a problem
	Breastfeeding as part of the infant's care	Some nurses do not consider breastfeeding as part of their job.	Some nurses do not consider breastfeeding as part of their job	Breastfeeding is part of the infant's care.
	Transfer to the breast	Process can be difficult, staff not always confident about the move to breast	Process can be difficult, staff not always confident about the move to breast	Mothers demands to put babies at breast
Organization	Visiting policies	Open visiting policies	Open visiting policies	Restrictive visiting policies but mothers can enter for feeding or skin-to-skin
	Privacy	Mothers need privacy	Mothers need privacy	Privacy not mentioned
	Discharge from neonatal unit	Bottle-fed babies go home sooner	Bottle-fed babies go home sooner	Accept establishment of breastfeeding at home