

Understanding the current and future usage of donor human milk in hospitals: An online survey of UK neonatal units

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Abstract

The use of donor human milk (DHM) where there is a shortfall of maternal milk can benefit both infant and maternal outcomes but DHM supply is not always assured. This study aimed to understand current DHM usage in UK neonatal units and potential future demand to inform service planning. An online survey was disseminated to all UK neonatal units using Smart Survey or by telephone between February and April 2022 after development alongside neonatal unit teams. Surveys were completed by 55.4% of units (108/195) from all 13 Operational Delivery Networks. Only four units reported not using DHM, and another two units only if infants are transferred on DHM feeds. There was marked diversity in DHM implementation and usage and unit protocols varied greatly. Five of six units with their own milk bank had needed to source milk from an external milk bank in the last year. Ninety units (84.9%) considered DHM was sometimes ($n = 35$) or always ($n = 55$) supportive of maternal breastfeeding, and three units (2.9%) responded that DHM was rarely supportive of breastfeeding. Usage was predicted to increase by 37 units (34.9%), and this drive was principally a result of parental preference, clinical trials and improved evidence. These findings support the assumption that UK hospital DHM demand will increase after updated recommendations from the World Health Organization (WHO) and the British Association of Perinatal Medicine. These data will assist service delivery planning, underpinned by an ongoing programme of implementation science and training development, to ensure future equity of access to DHM nationally.

KEYWORDS

donor human milk, equity, neonatal unit, operational planning, service planning

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1 | INTRODUCTION

Donor human milk (DHM) describes milk that is collected from screened donors, heat-treated and screened microbiologically before being dispatched to end users in hospitals or in the community. DHM is used as a temporary bridge to breastfeeding, usually for extremely vulnerable premature infants at high risk of necrotising enterocolitis (NEC) where early feeds are preferable but there is a shortfall in maternal milk supply (Quigley & McGuire, 2014; Quigley et al., 2019). Recent "World Health Organization (WHO) recommendations on the care of preterm or low birth-weight infants" recommend with moderate certainty that DHM should be available for all preterm infants where there is insufficient maternal milk (WHO, 2022). When UK DHM use was last examined, a report by the British Association of Perinatal Medicine (BAPM) on the provision of human milk banking (HMB) services in the United Kingdom in 2016 recommended that more research would be needed before national recommendations on the planning and funding of nationally equitable human HMB services could be made (BAPM, 2016). Since then, new avenues of research have established that, when used in the context of optimal lactation support, DHM can be supportive of the establishment of maternal lactation, improved parental well-being, maternal psychological health and infant outcomes (Brown & Shenker, 2022; Kantorowska et al., 2016; Merjaneh et al., 2020; Mondkar et al., 2022; Ponnappakkam et al., 2021). DHM availability may also have positive impacts on infant and maternal health beyond the preterm population (Bramer et al., 2021; Brown & Shenker, 2022; Hoban et al., 2020; McCune & Perrin, 2021).

During 2022, a BAPM Framework for Practice working group developed new recommendations for the use of DHM within UK hospitals (BAPM, 2023). Research continues into the efficacy of DHM availability alongside lactation support for the above outcomes beyond its traditional use in neonatal intensive care units. Ongoing studies include work on post-natal wards, transitional care units caring for late and moderately preterm infants, those with other health issues such as cardiac or neurological pathologies, and full-term healthy infants where mothers face the primary or secondary failure of lactogenesis, or where the choice to breastfeed is not possible.

DHM demand from neonatal units (NNUs) can fluctuate markedly, leaving NHS milk banks occasionally unable to meet the demand. Increasing uncertainties and risks in recent years, including the coronavirus disease 2019 (COVID-19) pandemic, fuel shortages and cost of living increases, have made the operation of smaller services difficult both in the United Kingdom and globally (Shenker et al., 2020, 2021). Indeed, national reductions in milk donor numbers and increased demand from hospital NICUs in the final quarter of 2021 led to six NHS milk banks running out of DHM stock (personal correspondence, UKAMB 2022), including large milk banks that supply regionally. As well as understanding drivers of demand spikes, gaps in knowledge exist on individual NNU practices including DHM guideline use, eligibility criteria, and how neonatal teams predict the use of DHM will change in the future. An online

Key messages

- Updated recommendations from World Health Organization (WHO) and British Association of Perinatal Medicine (BAPM) are likely to increase demand for donor human milk provision from human milk banks, but there have been no recent data collected on baseline usage criteria, enteral feeding guidelines and anticipated future use.
- This national survey of UK neonatal units highlights the variability in donor human milk (DHM) provision and reasons for demand spikes that will be helpful for modelling future services. Almost 85% of neonatal units responded that DHM availability was supportive of maternal lactation support. Responses highlighted that DHM demand is likely to increase further in the next 2 years.
- Understanding demand variability will help in planning nationally equitable human milk bank services and support the development of robust national service continuity planning. The study also highlights the variability in practice, often in single regions, raising concerns related to health equity, staffing limitations and uncertainty in DHM implementation.

survey was designed to investigate causes of demand fluctuation, current guidelines for DHM and the likelihood of DHM demand increasing or decreasing in future. This study, the first national survey of DHM use since 2015 (Zipitis et al., 2015), aimed to assist future UK HMB service planning.

2 | METHODS

An online survey was developed that included both closed and open-ended questions by a team of experts across neonatology (M. T. and J. S.), milk banking (G. W., J. H. K.) and academia (N. S.), and was piloted by eight NNUs by phone. The survey was based on prior work to understand current DHM provision in the UK (Zipitis, 2015), with further questions added with the aim of capturing an understanding of the usage criteria, future anticipated provision and broad-ranging impacts of DHM availability beyond the prevention of complications of prematurity, including breastfeeding outcomes. The survey was then disseminated by email to all 195 UK NNUs online via an Imperial College London Qualtrics license (Qualtrics^{XM}). Three follow-up email reminders were sent and phone reminders where possible in the study period from February 2022 to May 2022.

Data were exported into Excel (Microsoft Excel). Descriptive statistics were calculated as percentages and responses to open-ended questions regarding the future anticipated use of DHM on NNUs were collated and categorised thematically.

3 | RESULTS

3.1 | Responses

Of the 195 NNUs, responses were submitted from 137 units (70.2%) with full responses suitable for analysis returned for 108 units (55.4%). Two responses included data for more than one unit, and for the purposes of analysis, these were treated as a single unit ($n = 106$). Of these, 18 (17.0%, 211 cots) were Level 1 units, 47 Level 2 (44.3%, 920 cots) and 41 Level 3 units (38.7%, 1313 cots). There were regional disparities in response rates, from 27.8% of all units responding from the Yorkshire and Humber Operational Delivery Network (ODN) to 100% of units responding in the Southwest ODN (Supporting Information: Table 1). Responses were completed by a range of health care professionals, reflecting the range of input into infant feeding decisions and responsibility in different units, with 74% of respondents identifying as having responsibility for the infant feeding guideline in their hospital (Table 1).

3.2 | Infant feeding leads and guidelines

Forty-five units reported having a dedicated infant feeding specialist (infant feeding lead, IFL) on their unit (42.9%), 35 (33.3%) had an IFL whose workload was shared with maternity and/or paediatric services, 17 (16.2%) had no IFL but reported maternity and/or paediatrics departments did, and 8 (7.6%) had no IFL within the Trust. Overall, 102 (96.2) units had an enteral feeding guideline, of which 72 (67.9%) units had updated within the last 3 years. Fifty-six (58.9%) units had a specific DHM use guideline (45 updated within the last 3 years), and 71 (67%) units had a specialist neonatal dietician. Most guidelines were adapted from the unit's ODN guidelines ($n = 60$,

TABLE 1 Professional background of individuals completing the survey, and whether or not they had specific responsibility for infant enteral feeding.

	No. responses (%)	Specific infant feeding responsibility (% of responses)
Neonatal nurse	31 (29.2)	21 (67.7)
Infant feeding lead	20 (18.9)	20 (100)
Ward manager	20 (18.9)	12 (60)
Neonatal dietitian	15 (14.2)	14 (93.3)
Consultant neonatologist	14 (13.2)	9 (64.3)
Consultant paediatrician	5 (4.7)	1 (20.0)
Paediatric registrar	1 (0.9)	1 (100)
Total	106	78 ^a

Note: Only 78 responses included whether the individual responding had specific responsibility for infant feeding.

^aOnly 78 responses included whether the individual responding had specific responsibility for infant feeding.

56.6%), with a further 33 units (31.1%) use a guideline written by individual Trust staff. Thirteen responses (12.3%) were unsure how their Trust guideline had been developed.

3.3 | Use of DHM

Of the 106 units that responded, 97 (91.5%) used DHM. Five (4.7%) reported only using DHM if an infant was transferred while being fed with DHM, and four (3.8%) did not use DHM at all. Of the indications for DHM within unit enteral feeding guidelines, the commonest were infants under a specified gestational age (87/102, 85.3%), use for infants under a specific birthweight (77/102, 75.5%; Table 2).

Forty units used DHM for additional indications, including to support maternal efforts to establish breastfeeding, parental preference, maternal HIV, bilateral mastectomy, if a twin, triplet or quadruplet was receiving DHM for another indication, maternal medication contraindicated to breastfeeding, and consultant discretion. One unit reported using DHM outside of the protocol if the use-by-date of the DHM was approaching. Five units reported using DHM in the context of a research trial. Several respondents reported that parental preference was not included in the current guidance but would be included in the next.

The survey further asked whether the availability of DHM was in general supportive of lactation and breastfeeding on their neonatal unit. Overall, 55 units (53.9%) responded it was always supportive,

TABLE 2 Indications for DHM within unit enteral feeding guidelines, showing the number of units that include this indication for DHM use in their enteral feeding guideline from 102 neonatal unit responses.

Enteral feeding guideline indication for DHM	No. units (%)
Under a specified gestational age (weeks)	87 (85.3)
Under a specific birthweight (g)	77 (75.5)
Reversed or persistently absent end diastolic flow	56 (54.9)
Postmedical NEC	53 (52.0)
Postsurgical NEC	52 (51.0)
Parental preference	23 (22.5)
Congenital bowel anomaly e.g., gastroschisis	23 (22.5)
Cardiac anomaly	23 (22.5)
Top up (bridging) feeds	22 (21.6)
Haemodynamically unstable/inotropic support	19 (18.6)
HIE	17 (16.7)
PDA	12 (11.8)
Parental allergies	2 (2.9)
Other	40 (39.2)

Abbreviations: DHM, donor human milk; HIE, hypoxic-ischaemic encephalopathy; NEC, necrotising enterocolitis; PDA, patent ductus arteriosus.

35 units (34.3%) felt it was sometimes supportive, eight units (7.8%) were unsure and three units (2.9%) reported it frequently undermined maternal breastfeeding. Overall 90 units (88.2%) felt DHM was supportive of breastfeeding.

In the last year, 88 units had sourced DHM from an external milk bank, and six only used DHM from a milk bank within their Trust. Of these, five had needed to source milk externally because of a lack of supply from their milk bank (information about individual milk bank provisions in Supporting Information: Table 3).

Participants were asked to estimate the requirement for DHM over the next 2 years. Thirty-seven units (34.9%) felt that their requirement would increase, 33 units (31.3%) predicted usage would stay the same, and four units (3.8%) reported usage would decrease. Twenty-eight responses were unsure. Factors that underpinned these responses are reported in Table 3, with the lead cause for the DHM requirement increasing being a change in the criteria for patients eligible for DHM, followed by increasing admissions and parental requests. The major cause of decreased use would be reduced availability of DHM, and increased breastfeeding rates. Additional written explanations described increased staff awareness of the role of DHM in supporting the health of premature infants and greater parental awareness of the benefits of both maternal milk provision and DHM supplementation. Respondents concerns commonly included lack of assured supply, milk banks running out, and the need for neonatal infant feeding leading to embed systems, guidelines and unit cultural change.

4 | DISCUSSION

This study was an online survey of DHM usage on neonatal units in the United Kingdom. The major findings are that DHM is used in the majority of units that responded, which increased from those reported previously (Battersby et al., 2018; Zipitis et al., 2015). Most units anticipated continuing to use DHM at current or increasing volumes, and DHM requirements would increase as rationing reduced, contingent on availability. The survey highlights demand spikes and supply issues related to a range of issues, including increased birth rates, births of multiples, engagement by neonatal

units in clinical trials requiring additional DHM and broadening of DHM use criteria.

While not the primary purpose of the survey, the results highlight widespread variability in DHM use, eligibility criteria, guidelines and staffing to support appropriate use in the context of optimal lactation support. These results are consistent with the Neonatology GIRFT Programme National Specialty Report (Neonatology., 2022), which reported differences in access to DMH between Trusts in the same ODN, and marked variability between ODNs. As supported in this survey, only one ODN does not support the use of DHM at all.

Operationally, this survey highlights some of the needs of NNUs that could be reflected in optimal milk bank service provision. Ensuring an adequate use-by date would reduce wastage from discarded DHM, and while some milk banks guarantee a minimum use-by-date of 8 weeks, this is not a widespread practice. Nine responses reported that DHM use would increase as further clinical trials were implemented, and five responded that the FEED1 clinical trial, examining the impact of early feeding on infant outcomes (Mitchell et al., 2022), had increased DHM usage on their unit. Early and comprehensive communication and planning between trial teams and milk banks are necessary to ensure intervention provision can be guaranteed. The response from five units that DHM was not always available from their own Trust or regional milk bank highlights the need for strengthened services. HMB services need to be able to guarantee assured provision to meet increased demand from national and global recommendations, ensuring clinicians can confidently advise parents and caregivers. To ensure service resilience, appropriate consideration is also needed of service-specific risks and the design and implementation of an HMB-specific risk register and full-service continuity plans (Hogan, 2022).

The majority of respondents (88.2%) reported that they were confident that the use of DHM was supportive of lactation and breastfeeding on their NNU. One of the key arguments against the use of DHM has been that its availability could reduce the motivation of mothers to establish their own milk supply (Williams et al., 2016). Randomised control trials in India (Mondkar et al., 2022), along with observational findings from the United States (Kantorowska et al., 2016; Merjaneh et al., 2020; Ponnappakkam et al., 2021), India (Adhisivam et al., 2017) and Europe (Brown & Shenker, 2022; Wilson et al., 2018),

TABLE 3 Factors contributing to changed DHM use over the next 2 years.

	Increasing	Staying the same	Decreasing	NA	No response
No. patients admitted to NNU	19	58	1	20	8
Changing mix of patients, e.g., unit being regraded to a higher service level	14	52	4	26	10
Criteria for patients eligible for donor milk changing	29	48	4	17	8
Number of parents or carers requesting donor milk	17	53	1	28	7
Availability of donor milk	16	55	10	17	8
Change in funding for donor milk	1	66	1	29	9
Involvement in clinical trials or quality improvement studies	9	31	0	50	16

Abbreviations: DHM, donor human milk; NNU, neonatal unit.

published since this systematic review have confirmed that when used in the context of optimal lactation support, DHM can be additionally supportive of lactation. This consistent finding could be explained in part by the psychological stressor of trying to avoid formula use and with the widely known risks of increased NEC and other complications of prematurity, which may negatively impact the physiological ability of mothers to establish lactation (Brown & Shenker, 2021, 2022; Kair et al., 2015). Secondary lactogenesis depends on an increase in prolactin and oxytocin, mediated by the hypothalamic–pituitary axis. The stress hormone cortisol is a negative inhibitor of prolactin release (Borski et al., 2001), and among the stress of preterm birth and NICU stay, the additional stressor of being responsible for producing a full feed requirement immediately, particularly if the mother is unwell herself, may undermine maternal milk production. A limited qualitative study from the United States with 35 participants highlighted that women felt DHM offered a bridge to breastfeeding, allowing time to overcome short-term hurdles, while the introduction of infant formula compounded their feelings of personal failure (Kair & Flaherman, 2017). In a recent sample of 105 parents whose infants have received DHM within the last year, responses suggest increased parental well-being (Brown & Shenker, 2022), though further studies are needed to understand how widely these perceptions may be in the general population.

Study strengths included a high response rate, particularly for Level 2 and 3 NNUs, but also a good geographical spread that was representative of each neonatal ODN. Over 55% of NNUs responded, which exceeds the typically accepted threshold of 50% for service evaluations. Given the extreme pressure on delivering neonatal services within the last few years, it was heartening that so many responses were gained. The data collected were from every ODN in the United Kingdom, with a representative range of unit size and service level. However, the sample may have excluded units facing more extreme staffing pressures, which could have limited their ability to respond. Future follow-up work by other groups that could increase the response rate further, perhaps with a more limited survey, would be welcomed.

The study also included responses from a high proportion of health care professionals with responsibility for infant feeding on the NNU ($n = 78, 74\%$), giving confidence in the accuracy of the data collected. This study was limited by the nature of the design as an online questionnaire, meaning more work is needed in interviews to understand the barriers and motivations behind the increased use of DHM on neonatal units. A further programme of implementation research is ongoing, which aims to capture information around the acceptability and scalability of DHM use in NNUs and other settings, including attitudes and perceptions, as well as outstanding training and infrastructure needs.

In conclusion, demand for DHM on hospital neonatal units is increasing and is predicted to increase further in the majority of units over the next 2 years. Indications vary markedly between units, and nationally agreed recommendations are urgently needed to reduce inequities in access to DHM. This study supports the findings from previous studies that have established the impact on breastfeeding rates on the discharge of combined lactation support and DHM availability, as well as overall parental well-being, with over 88% of responses reporting that DHM availability was supportive of

breastfeeding. Enhanced lactation interventions and parental wishes are likely to play a key role in the increased demand, and use of DHM should decrease as breastfeeding support increases, meaning broadened use criteria for high-risk infants could be considered. Further work is needed to understand demand estimation, optimal models for donor milk provision and clinical trials to determine the efficacy of use in a wide range of clinical scenarios.

AUTHOR CONTRIBUTIONS

Natalie S. Shenker and Gillian Weaver conceived the study. Natalie S. Shenker, Gillian Weaver and Merran Thomson developed the questionnaire, and Judith Simpson approved contents. Jonathan Hamill-Keays and Natalie S. Shenker conducted data collection. Natalie S. Shenker conducted data analysis. All authors contributed to manuscript writing and interpretation of results. All authors approved the completed manuscript before submission.

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CONFLICT OF INTEREST STATEMENT

Gillian Weaver and Natalie S. Shenker are cofounders of the Human Milk Foundation, a charity dedicated to supporting donor milk provision and facilitating research in the sector.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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