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Women's views about a free breast pump service: an online survey to inform intervention development.

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KEY MESSAGES

- Little is known about the rates of expressing breast milk and the use of breast pumps after birth
- The high response rate to this on-line survey demonstrates the importance of breast pump service provision to recent mothers, most of whom had experience of trying to express breast milk.
- A free breast pump hire (rental or loan) service, providing choice of high quality electric pumps and skilled professional support is preferred to provision of a free pump worth £40 to keep, with vouchers for either proposed to maximize choice.
- To inform the development of a free breast pump service intervention prior to future evaluation: women raise concerns around the impact on feeding outcomes, professional support, hygiene for hired pumps, and costs.
- A free breast pump service is as an acceptable incentive strategy which could be further developed and tested for effectiveness and impact on health inequalities

Abstract

Improving breastfeeding outcomes is a global priority, however, in the UK continuation of breastfeeding remains low. Growing empirical evidence suggests a free breast pump service might be an acceptable and feasible incentive intervention to improve breastfeeding outcomes and reduce heath inequalities.

To inform intervention development we conducted an on-line survey with women recruited via social media using snowball sampling. Data were analysed descriptively (closed questions) with qualitative thematic analysis (free text).

The survey was completed by 666 women, most of whom had recently breastfed and used a breast pump. Participants agreed that free pump hire (rental/loan) (567 women; 85.1%) or a free pump to keep (408; 61.3%) should be provided. Free text comments provided by 408 women (free pump) and 309 women (free hire) highlighted potential benefits: helping women to continue breastfeeding, express milk; overcome difficulties; and pump choice. Concerns are possible effect on breastmilk supply, reduced breastfeeding, pumps replacing good support for breastfeeding and pump hire hygiene. Personal and societal costs are important issues. Some suggested a pump service should be for low-income mothers, those with feeding difficulties or sick/preterm infants. A one-size service would not suit all and vouchers were proposed. Some suggested fees and deposits to prevent waste.

To our knowledge this is the first study reporting views about the acceptability of providing a free breast pump hire service. Mothers support and wish to have a say in breast pump service development. Future evaluations should address impact on feeding outcomes, professional support, hygiene for hired pumps, and costs.

Up to 6 key words

Breastfeeding; expressing; breast milk; breast pump; inequalities; survey

Introduction (article = 6741)

Improving breastfeeding rates is an international and national priority for infant and maternal health (World Health Organisation (WHO), 2014; Rollins et al, 2016; Scottish Government 2017). The WHO recommends exclusive breastfeeding for the first six months of life (WHO, 2003); however in the UK less than 1% of mother-infant dyads meet this goal (Health & Social Care Information Centre (HSISC), 2012). Breastfeeding rates in Scotland are amongst the lowest in Europe and have been relatively resistant to change since 2001/2. The most recent data (Information Services Division (ISD), 2017a) indicate a decline in exclusive breastfeeding and an increase in mixed (breast and infant formula) feeding at 10 days after birth but small increases in mixed or exclusive breastfeeding at 6-8 weeks. New initiatives are therefore required particularly in the early days after birth.

Breastfeeding women want choices in how to feed their babies and many also choose to express breast-milk or give infant formula. These choices are not equal in terms of accessibility and outcome. Health inequalities are evident because mixed feeding is socially patterned and associated with shorter overall breastfeeding duration (HSISC, 2012). Choices can be subject to health service rules about the 'right' way to feed (Hoddinott et al., 2010), which frequently lack high quality evidence and can undermine women's feeding decisions. For example, in the UK hand expressing is recommended for mothers wishing to express for a health term infant in the early days (https://www.unicef.org.uk/babyfriendly/) but there is insufficient good quality evidence to support this as randomized controlled trials in term infants have been small (Becker et al., 2016, Meier, 2016). Many women prefer to use a pump (Clemons & Amir, 2010; Rasmussen & Geraghty, 2011; Labiner-Wolfe et al., 2008) and find hand expressing unpleasant or difficult to master (McInnes & Chambers, 2006).

Studies in Australia and USA report increasing prevalence of expressing breast milk (Binns et al, 2006; Clemons & Amir, 2010) and the use of breast pumps appears common (Rasmussen & Geraghty, 2011;

Labiner-Wolfe et al., 2008). However, others challenge this perception due to lack of high quality data from actual measurement of rates of expressing breast-milk (Johns et al., 2013). A study in the USA showed that around 85% of USA breastfeeding mothers had expressed breast-milk in the first 4 months in 2005-07, mainly using electric pumps (Labiner-Wolfe et al., 2008). An Australian study found that 47% of infants had received expressed breast-milk in the first 2 days of life and that 48% of primiparous mothers had acquired a breast pump before birth (Johns et al., 2013). Qualitative research in Scotland (Hoddinott et al., 2010) illustrates that expressing milk and breast pumps are important issues and that women are dissatisfied with current health service support for expressing breast-milk. Importantly, the UK prevalence for expressing breast-milk and pump use is currently unknown

Previous research by our team includes a systematic review of seven studies evaluating the effects of a free breast pump on breastfeeding rates with various comparators, which had inconclusive findings (Moran et al., 2015). The studies in the review were all based in the USA and varied considerably, e.g. type of pump, stage of recruitment (pregnancy, post birth, returning to work), control group (e.g. other childbirth related items, infant formula) and outcomes (measurement points and how reported) (Moran et al., 2015). There have been no UK based studies of breast pump provision therefore the effects on breastfeeding outcomes in this context are unknown. Surveys of Early Years Health Professionals and of the UK public investigated the acceptability of different incentive strategies to improve breastfeeding outcomes. The surveys found that NHS provision of a free breast pump worth £40 was more acceptable than shopping voucher for mothers who prove they are breastfeeding, but there were mixed views on the acceptability (Crossland et al., 2016).

Earlier research (Hoddinott et al., 2012; McInnes et al., 2014) showed that women's feeding decisions were driven by the goal of family wellbeing rather than goals for the duration or exclusivity of breastfeeding. Pivotal points occur after birth where feeding changes in order to try to restore family

wellbeing, such as the introduction of infant formula, expressing breast-milk or stopping breastfeeding completely. UK survey data show that over 30% of new mothers supplement with infant formula while in hospital (HSCISC, 2012). Mothers highlighted two stages or reasons for expressing or using a pump: firstly to overcome breastfeeding difficulties in the first 1-2 weeks; and secondly to enable them to meet their own feeding and family well-being goals such as 'time out' or involving others in baby feeding (Hoddinott et al., 2010; McInnes et al., 2014, Crossland et al.,2016).

Complex interventions, such as those designed to change infant feeding behaviour, require involvement of the target population who the intervention seeks to benefit. The aim of the study was to find out women's views about providing a free breast pump service as a first step towards informing the design of a complex intervention for future testing. It builds on the knowledge gained from our previous study that investigated incentive strategies for breastfeeding (Morgan et al., 2015; Crossland et al., 2016) by asking new questions about the acceptability of a free breast pump hire service and women's experiences of using a breast pump. The term breast pump hire is used in this article because when this survey was conducted, the options available for parents of healthy term infants in the UK who choose to use a breast pump were either to buy their own pump or to hire a pump. In other countries a hire service is referred to as a rental service. A free hire service would also be the equivalent of a loan of a breast pump at no cost to the woman, with the expectation that it would be returned at a later date.

Methods

The study method was an on-line survey that aimed to elicit opinions on breast pump interventions, breast pump use and expressing breast milk as well as information on individual experience of expressing, health service support and participant demographics. The survey introduction page invited invited women who self-identified as having given birth in the past 5 years to participate.

Survey design and piloting

The survey tool was informed by our previous qualitative and mixed methods research with families (Hoddinott et al., 2010; Moran et al., 2015; Morgan et al., 2015; Crossland et al., 2016). Questions relating to the acceptability of a service providing a free breast pump, worth around £40 (around US$53) and demographic questions were worded similarly to the Benefits of Incentives for Breastfeeding and Smoking cessation (BIBS) study surveys (Crossland et al., 2015). In the BIBS study, the survey was designed by synthesising evidence from systematic reviews, acceptability surveys of the UK public and early years health professionals, and qualitative interview data with pregnant and recent parents and early years health professionals. Input from members of two mother and baby groups, both in disadvantaged areas, informed all aspects of the design and conduct of the BIBS study (Morgan et al., 2016).

For our survey, new questions were added to the BIBS study questionnaire to ask about the acceptability of a breast pump hire service, experiences of expressing breast-milk and pump use, pump preference, timing and any health service support received. The survey was piloted for acceptability and face validity with mothers of a local breastfeeding group that had not been involved in the BIBS study, who had agreed to provide feedback.

The final survey tool comprised 16 closed questions with the opportunity to comment in optional free-text boxes. A copy is available via supplementary files. The survey was hosted by the Bristol on-line platform (https://www.onlinesurveys.ac.uk/). Survey architecture aimed to minimise participant burden through the use of Yes/No answers, tick boxes, Likert type scales and bypassing non-applicable questions. Provision of demographic data was optional and the survey was designed to take around 10-20 minutes to complete, depending on the number of free-text comments.

Population and context

The survey was targeted at women who live and had given birth in the UK within the previous 5 years. Within this setting women can buy their own pumps or pay to hire pumps via a range of retail or charitable organisations, such as the National Childbirth Trust (NCT: https://www.nct.org.uk/). The cost of a buying a breast pump depends on type and quality; for example buying a hand pump from an online retailer could cost from around £10-170 while an electric pump might cost from £26-£340 (double or single options) [all prices correct on 02/03/18]. The cost of pump hire also varies depending on source, type of pump and inclusion of collecting sets; for example two retail outlets charge from £47-65 for an initial period (2-4 weeks) and a similar 30-day fee thereafter [correct on 02/03/2018]. Similar costs were noted for hiring through the NCT (£44-£48 for first month and £26 per month thereafter). In the NHS in Scotland, free or low cost pump hire is available for some women (e.g. mothers of infants in neonatal units) in some Health Board areas, but this service varies considerably in terms of number of pumps available, pump type, eligibility, duration of loan and cost (e.g. sometimes a small charge or deposit is required). The potential for health inequalities in access to a breast pump are a concern (Morgan et al., 2015).

Data Collection, Sample and Recruitment

The survey was open from 15/01/2016 until 21/06/2016. Snowball sampling (Noy, 2008) was used where the survey link was posted and reposted on a number of social media outlets including Netmums, University portals and distributed to mother and baby groups via infant feeding networks in Scotland and the north of England. Respondents were encouraged to share the link with their family and friends in the target population. Participants were invited to opt in to a prize draw for one of four shopping vouchers worth £50 (vouchers could be exchanged for goods in a range of local shops or on-line). Participation in both the survey and the prize draw were voluntary.

Analysis

All survey responses were exported to an Excel spreadsheet and were analysed descriptively. This included women's infant feeding practices and opinions about the proposed breast pump incentive interventions. Free text data for the responses to the two service options (Free Pump and Free Hire) were imported into NVivo where the comments were read and categorised according to content. Most, but not all, comments were short, comprised lists or were in the format of 'a great idea but……'. Categories of data were then grouped into the key themes. Data on the free pump were initially analysed by one author (RM) and themes discussed and agreed with a second (NG). Then data on the pump hire were analysed by the second author (NG) and reviewed by the first author (RM). Both authors then discussed the similarities and differences in the themes arising from both data sets. As our team has already published views on provision of a free breast pump (Morgan et al., 2015; Crossland et al., 2016), the analysis focused on new emergent themes and views about a free breast pump hire service. Findings from the survey were presented to the wider team for comment and further discussion, which were then used to inform our analysis and this paper. Illustrative quotes for the key themes are included in the results section. Quotes are transcribed verbatim, with the respondents' punctuation and emphasis e.g. capital letters. Short quotes within the text are in italics and longer quotes are followed by a number, which relates to the participant's survey response and whether they were commenting on the free pump or free hire question

Ethics

Ethics approval was granted by the University of Stirling Ethics committee (SREC 15/16- Paper no 44 approved 9th December 2015) and the principles of good research governance were followed. The email addresses provided for the prize draw had the potential to identify individuals. The draw was

administered by an independent person separate from the research team and downloaded data for the draw was destroyed on completion. No other identifying data were collected.

Results

Table 1 presents the characteristics of the 666 women who completed the survey. Sixty-nine completed the pilot survey between August-September 2015 and 597 completed the survey between January–July 2016. As no changes were made to the survey after the pilot phase, the results are included with the main survey results. Full demographic data were provided by 99% of participants and indicated that the sample over-represents older (70% aged over 31 years) and more educated women (78% were still in full time education at the age of 19). Around half the participants were from Scotland, half had one baby and only four had never breastfed. The majority of women completing the survey had expressed breast-milk and used a breast pump (>97%). Table 1 and 2 also present sample characteristics by response to agreement on an offer of a free pump or free hire service.

Table 1: Sample demographics

Experience of using a breast pump

Of the 649 women who had used a pump, 50% had experience of both electric and manual pumps; 37% had only used an electric pump and 14% had only used a manual/hand pump. The majority of women who used a breast pump had healthy infants born at term (n=587, 90.5%). Women indicated a range of time points after birth when they started using a breast pump with around 45% (n=295) beginning within the first week of their baby's life, Table 2.

Table 2: Time point and circumstances of first breast pump use, N=649 (%)

Many of the mothers reflected on their own experience and highlighted their perceptions of the importance of access to a pump in the early days to '*help to preserve milk supply*':

> *Definitely, a good breast pump can make all the difference in the early days.*
> (Participant 14057443 - commenting on Pump Hire)

In relation to early access to pumps women wanted easy access and health professional involvement for example *'shown how to use it correctly*' or '*given to mum before leaving hospital and given instructions on how to use it*'.

> *… but there shouldn't be hurdles in the way (e.g. mums shouldn't have to PROVE there is a problem)* (11272119 – Pump Hire)

In response to the question, thinking about the advice or help that you received when you first tried to use a breast pump, 46% (n=295) had received no help. The 354 women who reported that they had received advice or help rated this on a scale of 1 (very unhelpful) to 10 (extremely helpful) and responses were evenly distributed (see web supplement: Fig 1).

Some women had very positive experiences of health service help: '*Help in maternity suite for first 7 days was outstanding'*. Sometimes women didn't ask for help or they did not receive help because they started pumping after leaving hospital. However, others were shown once then '*left to get in with it'* or '*had to figure it out myself*'. Others described *'conflicting advice'* or *'not enough realistic information'*. Some mothers sensed that the health professionals didn't '*approve'* of pumping or '*expressing was discouraged'*. Overall the comments indicated a lack of consistency of support for mothers to use pumps. There was a suggestion that health professionals lacked knowledge or expertise about pumps and pumping. Mothers described receiving help from a range of voluntary or non-health professional groups, friends and family members.

*I have yet to meet an nhs professional that has any competent knowledge of breast pumps or expressing breast milk (*14004650 general comment about breast pumps*).*

At the end of the survey participants were invited to add 'other comments or opinions about health service provision of breast pumps, or advice and help with expressing breast-milk'. In this section there were strongly expressed opinions that a pump hire service should be provided with face-to-face support and/or further information, and several respondents commented on the importance of continued or improved provision of breastfeeding support for both pump hire and a free pump to keep.

Breast pumps can be useful when required ie premature baby, engorgement, mastitis etc but this needs to come with correct information from a trained professional (14010576 - Free Pump)

Agreement with a free breast pump hire compared to providing a free breast pump to keep

Women were introduced to the topic with a statement: 'A recent poll of people in the UK found that provision of a free breast pump worth £40 was an acceptable incentive for breastfeeding women. We are interested in hearing your views on this'. They were then invited to respond to the question: 'Do you agree or disagree that a free breast pump, worth around £40, should be made available to breastfeeding women for free on the NHS?' Net agreement with the provision of a free breast pump was 61.3% (408/666) and net disagreement was 23.7% (158/666), Fig 2. Women were then invited to respond to: 'Some areas have a breast pump hire service for more expensive electric pumps. Do you agree or disagree that a free hire service should be available for breastfeeding women for free on the NHS? Net agreement was 85.1% (567/666) and net disagreement was 8.4% (56/666). In the UK context a free hire is the same as a free rental or loan. The question asking about a free breast pump was derived from the BIBS study (Morgan et al., 2015; Crossland et al., 2016).

Figure 2: free breast pump hire service compared to providing a free breast pump worth around £40

There were 408 and 309 free text comments to questions asking what participants thought about a free pump or a free breast pump hire service respectively and these indicated a range of complex opinions. There was general agreement for both the free pump and free pump hire service in principle (Fig 2) but agreement was more mixed for providing a free pump to keep. Some preferred a hire service to a free pump, some had the same agreement for both, with free text comments stating shared benefits or concerns for both options. The comments relating to the two breast pump services, with a focus on new findings relating to pump hire, are grouped into key themes: Potential for benefit; Risk and safety; Service features; and Affordability, which are presented in the next section.

Potential for benefit

Many positive comments for both the pump hire and the free pump service were framed around '*anything which helps a breastfeeding mother*' or more generally a '*great idea*', '*invaluable service' and 'I've never thought about it. It could be a good idea for mums who are struggling to feed*'. More specifically a free pump might help a mother keep breastfeeding if she is having difficulties, for example, poor weight gain, a baby not latching or might enable her to have more time to herself and involve others in baby feeding.

Support for the hire service related to the pump being a high quality hospital grade electric pump, which was considered to be effective for managing early breastfeeding difficulties, maintaining milk supply in the early days and weeks and helping women to continue breastfeeding once they returned to work. The benefits from the hire service were often couched relative to a manual pump, which was considered to be inferior:

*Manual breast pumps are ineffective (or at least in my experience) you pump for 20 minutes for literally 10ml of milk which is exhausting. Access to the electric ones for all would be so much better. (*14039244- comment about Pump Hire)

Others stated that they might have breastfed for longer or had a better feeding experience if a free pump (to keep or hire) had been available and others who had obtained a pump (either through hire or been given one) said it had '*saved their breastfeeding'* or 'they '*would have been lost without this service'*. There was some support for the proposal that a free pump (keep or hire) might encourage women to think about breastfeeding and so increase breastfeeding initiation. However, there were more suggestions that it might increase continuation by helping women who were already breastfeeding but '*find establishing breastfeeding a challenge'* or were struggling with '*real feeding issues'* and might '*help eliminate the need for formula top ups'*.

Risks and safety

Risks and safety themes fell into three broad areas: pump provision would discourage health professionals from helping women to breastfeed directly from the breast; the potential for adverse consequences on breastfeeding outcomes; hygiene and misuse concerns

Dis-incentivising health professional support

Perception of risk varied in response to whether the respondent preferred the pump hire or the pump to keep. The main risk identified with both options was that it might '*disincentivise health professionals from effective treatment of feeding issues'* as pumps could potentially be used to attempt to fix problems which would be better managed by good professional support. Furthermore many respondents suggested that any service to support breastfeeding should focus on providing actual face to face support.

Women need support and ACCURATE advice on breastfeeding, not a device to encourage bottle feeding! (14032410 –Free Pump)

Anxieties and confidence

Adverse consequences related to concerns about using a free [hand] pump too soon and the effect on women's confidence particularly if pumping was difficult or ineffective. Many of the mothers highlighted concerns about early pumping stating that that pumping is not recommended until baby is 6 weeks.

Thus will encourage pumping too early and may cause oversupply issues which can then be very difficult to manage and have painful consequences such as blocked ducts and mastitis (14004776 –Free Pump)

The potential effect on the mothers breastfeeding confidence of pumping only small amounts or none at all or not '*get(ing) on with all or some brands of pumps'* was noted, particularly in relation to a manual pump:

Pumping unnecessarily can cause a mum to doubt her production, to question their milk supply, cause nipple confusion, cause introduction to bottle unnecessarily and generally hinder a good breastfeeding journey. (14070509 – Free Pump)

Other perceived risks included pressure on mothers to express, expressing replacing breastfeeding or increased bottle feeding and pumping being exhausting.

Breastfeeding/expressing doesn't suit everyone. This might put more pressure on those who feel they can't breastfeed. (14005732 – Free Pump)

Hygiene and misuse concerns

Concern about shared equipment was raised with respect to the pump hire service. A '*pump that maybe someone else has used'* or '*concerns about hygiene'* might make the service unpopular.

> *'I wouldn't even consider it unless a new pair of shields and tubes was given to every mum because even sterilising parts of a breast pump doesn't get it clean'* (14210270 –Pump Hire)

There were concerns about the potential for misuse of both the free pump and the hire service, including mothers taking a pump but not using it or '*selling pumps on EBay'* (global on-line marketplace). Hire pumps might not be looked after, returned damaged or not returned at all. Free pumps would contribute to landfill. Some suggested that a deposit should be taken to ensure return.

Pump service features

Included in this section are opinions on what might make a pump service more acceptable such as targeting certain population groups, recommendations about pump type and vouchers.

Target population:

Some women felt that all women and babies could benefit from a free pump to hire or keep. Other respondents had fairly consistent views over who should be able to access a free pump, mainly women who either couldn't afford a pump or who had a clinical need for a pump, for example a sick mother or baby, '*mums who are having breastfeeding problems or have babies in SCBU [neonatal unit]'*.

> *Perhaps not available to everyone but definitely to those on a lower income. My breast pump cost in the region of £100 which not everyone can afford*. *(*14005388 - Pump Hire)

The suggestions about targeting specific people was sometimes founded on concerns that a universal service could be interpreted as indicating that a pump was essential for breastfeeding.

BUT! I worry that if it was simply given as standard, it would give the impression that breastfeeding REQUIRED a pump and this is just not the case. Breastfeeding should be seen as easy and not requiring all the "stuff" that bottle feeding requires. (14015484 - Free Pump).

Respondents also thought that later access to the service might help prolong breastfeeding when mothers returned to work. There was less support for pumps being used to enable social activities, such as '*nights out*'.

Personal choice, quality of the pump and cost

Many mothers had concerns about a single pump option and suggested that women should be offered choice, as '*one size doesn't fit all*'. Others suggested that a pump hire service might provide an opportunity to *have a few different pumps for women to try before purchasing one*, which several related to their experience of trying several pumps before they found one that suited.

The costs of the different types of pump was often mentioned in relation to quality and personal choice Opinions about providing a £40 free pump varied: for some it was too expensive and others thought it was too cheap, would be of poor quality and ineffective. Comparisons between manual and electric suggested that £40 might not get a good electric pump but might be enough for a hand pump. For feeding sick/preterm neonates or more long-term pumping there was support for a more expensive 'hospital grade' electric pump such as might be provided through the hire service.

It really depends on the type and quality of the breastpump. Good quality ones are easier and more effective to use. If they're not mums tend to give up on them more quickly. A breast pump loan scheme/bank might work better. (14029919 – Free Pump)

In agreeing with a breast pump hire service many respondents highlighted concerns about the cost of either purchasing or hiring a good quality pump. Although some respondents suggested that purchasing

or hiring a pump was inexpensive and cheaper than the cost of infant formula in the long run, most indicated that breast pumps are expensive to buy or hire. Some had spent over £200 on a pump and high quality pumps may be unaffordable for many:

> *I got a second hand one from eBay as I couldn't afford a brand new one! (*14068719 – Pump Hire)

Some women related their own experiences where they had bought a cheap pump which had broken or had spent a lot of money on a good quality pump but had given up breastfeeding soon after. Hiring a pump was also '*quite expensive'* especially for those who ended up expressing for some time. Given the expense some mothers suggested that the hire service would provide an opportunity to try '*a few different pumps for women to try before purchasing'* either to help with choice or to find out if pumping was going to work for her.

Access: vouchers, fees and deposits

The importance of choice and flexibility for accessing a free pump was reflected in several suggestions of providing a voucher that the mother can use towards buying a pump or pump hire.

> *Good pumps cost money so perhaps a voucher towards a pump may be better? Then mum has a choice over which pump she can have.* (14067463 – Free Pump)

In contrast, some respondents who rejected a universal free service suggested that pump hire access should be via a deposit, or small fee or that some form of subsidy should be provided. This seemed to be based on a consideration of the expense of either purchasing or hiring an electric pump and the cost of buying infant formula. Specific circumstances as highlighted above (financial or medical need) should qualify for a free pump but there was support for other mothers being able to have access for a small charge or donation:

> *I don't think this should be a free service. Available at a small hire cost would be acceptable to most.* (14378299 – Pump Hire)

Wider affordability and implications

Comments about the wider societal costs of providing a free pump or pump hire service were stated in relation to, the costs to the NHS of supplying a service and potential environmental impact.

Respondents expressed a range of views regarding the cost implications for the NHS relating this to their perception of the general affordability of buying or hiring a pump. Many respondents observed that the NHS was '*already in a bad financial situation'* and would not '*have the resources for this'* while others thought that this should be provided as money would be saved elsewhere '*as in the long run increasing breastfeeding rates will save the NHS money*'. One respondent questioned why money should be spent on some things but not on others.

> *I've had difficulty with BF and only continued through use of free hospital quality pump without it I couldn't afford the monthly fee. - smokers can get free patches on NHS to help them heroin addicts get methadone to help them so why can't we get pumps to help us!!* (14064532 - Free Hire)

Several suggested that rather than providing pumps, *'spending the money on better support networks would be more beneficial*'. Some of the discussion around NHS funding related to a consideration of whether a breast pump was essential to breastfeeding and opinions on this were contradictory. Some respondents suggested that *'pumping is not an essential and the NHS needs to spend it's money on essentials*.' However, others argued that pumps were essential '*for women who is struggling* '.

Discussion

Both a free breast pump to keep or a free pump hire service are agreeable interventions to an on-line sample of women who have recently breastfed and have experience of using a breast pump. Being able

to access a free pump has the potential to prolong breastfeeding by helping women manage feeding challenges. Some women may not be able to afford to buy a pump and a pump could enable an infant to be fed breast-milk while maintaining mothers' milk supply. This could provide the option for women to continue to breastfeed for longer than they might have done if they could not access a free pump. However, there were a number of concerns including free pumps displacing professional support, a pump being viewed as a necessity and anxieties about the practicalities including hygiene. There were contrasting views about how a service might be provided: to maximise choice and flexibility through providing vouchers for pump hire or purchase; restricting access to those most in need; a subsidised service with fees and deposits. The cost of a high quality pump was seen as prohibitive and some women wanted to try a pump prior to buying in case it did not suit them.

Support for free access to breast pumps was based on the assumption that this will enable more women to breastfeed for longer and so in the long run save the NHS money. However, while increasing breastfeeding would improve health and save the NHS money (Renfrew et al, 2012) there is no good evidence for the impact of pumps on breastfeeding rates among healthy term infants. In order to gain the robust evidence required, there would be a trade-off for countries where health services are publicly funded, like the UK NHS, as the public would be paying up front for the pump service but would also reap any benefits if the service is effective at improving breastfeeding and health outcomes. Few studies have evaluated the effects of providing a free pump (Moran et al., 2015) or of expressing breast milk (Becker et al., 2016) on breastfeeding initiation or duration among mothers of term healthy infants. There is some evidence associating exclusive expressing with shorter breastfeeding durations (Pang et al., 2017; Keim et al., 2017, Jiang et al., 2015). However, the evidence for the effect of combining direct breastfeeding and breast milk expressing is inconsistent (Geraghty et al., 2012, Jiang et al., 2015, Winn et al., 2006) with variable impact depending on the age of the baby (Schwartz et al., 2002), frequency of

417 expressing or the reasons for expressing (Felice et al., 2016). For example, many women use pumps or
418 infant formula supplements to deal with feeding difficulties (Forster et al, 2015; Felice et al., 2016). In
419 our study women said that pumps resolved difficulties and 'saved their feeding' or access might have
420 helped them to breastfeed longer, confirming findings from our earlier study on the acceptability of
421 breast pumps as an incentive for breastfeeding (Crossland et al., 2016). It would be important to include
422 reasons for pump use in future evaluations of a free pump service.

423 Mothers' experience of being advised to avoid pumps before six weeks reflects guidance for current
424 practice for hand expressing in the early days for mothers of term healthy infants (UNICEF), however
425 there is no strong evidence to underpin this (Becker et al., 2016; Johns et al., 2013; Forster et al., 2015).
426 Mothers of preterm or sick infants in neonatal units are offered electric pumps immediately to maximize
427 the health benefits of early breast milk provision (UNICEF, NICE, 2006) which had the potential to give
428 mixed messages to women, especially those who had personal or vicarious experience of this. The
429 difference in effectiveness of different pumps at different stages of lactation requires further
430 investigation.
431

432 Some of the appeal of a pump hire service was the potential to access a high quality hospital grade
433 electric pump, which was seen as more likely to be effective and reliable when compared to cheaper
434 electrical or manual pumps. This reflects findings from a longitudinal qualitative study of milk expression
435 in the US, which found that mother's preferred high quality electric pumps as these enabled quick and
436 efficient expressing compared to manual pumps which were viewed as slow, ineffective and potentially
437 wasteful (Felice et al., 2017). However, there is limited evidence to support the need for a hospital grade
438 pump. The most recent Cochrane Review (Becker et al., 2016:p2) concluded that 'low cost interventions
439 including … low cost pumps may be as effective, or more effective, than large more costly electric

pumps for some outcomes'. Our findings fit with those of Meier (2016) and the Cochrane review (Becker et al., 2016) who recommend that the method of expressing and choice of pump should be tailored to the mother's reasons for expressing, degree of pump dependency and stage of lactation or age of infant. Thus a completely pump-dependent mother (e.g. very preterm infant or choice to exclusively pump) would require a hospital grade electric pump for effective milk removal and maintaining milk supply. In addition, a hospital grade pump may be important during the crucial initiation phase in other situations such as late preterm infant or health problems (Meier, 2016). The use of manual pumps during the early postnatal period was highlighted as a concern as in our earlier study (Crossland et al., 2016). Although the majority of our survey respondents had healthy term babies, there was a preference for high quality electric pumps and this may explain why hire was preferred over a £40 pump to keep. It should be noted that most research around expressing and pump use focuses on sick or preterm infants and may not fully translate to mothers of healthy term infants who were the main group responding to our survey. A further limitation of the evidence is that some studies declare conflicts of interest, in that they have been funded by pump manufacturers.

Health inequalities due to the expense of buying a breast pump for women with reduced income, in addition to the costs associated with a new baby, have been highlighted (Crossland et al., 2016). In our study this concern extended to the ability of the NHS to afford to provide a free pump hire service. This is likely to reflect current perceptions and media coverage relating to the scarcity of NHS resources, and some argued that the NHS should only provide essential items. Conversely others recognized the potential to extend breastfeeding through providing more choices or resources and the subsequent health benefits and cost savings that may ensue (Renfrew et al 2012). In our survey women suggested ways to offset cost including limiting the target population or charging women either a small fee or

donation. Concerns about gaming any incentive system e.g. selling on eBay are consistent with those reported in the BIBS study (Morgan et al, 2015, Crossland et al, 2016).

STRENGTHS AND LIMITATIONS

This on-line survey recruited mothers who are interested in expressing breast-milk and using breast pumps. To our knowledge this is the first reported data on women's perspectives on a proposed breast pump hire service. The larger than expected sample for an on-line survey disseminated via social media and high volume of free text comments demonstrates the importance and interest in the topic of developing a breast pump service to meet the needs of women. The rich free text comments improve our understanding or women's perspectives. However, the snowball sampling method via social media (Noy, 2008) is likely to recruit women with similar opinions and is more likely to reflect the views of mothers with a particular interest or perspective in the topic (Waters, 2015). The sample was older than the general population of women giving birth in Scotland (ISD 2017b) and did not include women who provided no breast milk to their infants, or who breastfed but did not express or use a pump. It is therefore not representative of the mothers from lower socio-demographic groups who are also least likely to breastfeed. The nature of an on-line survey, like any other survey, doesn't indicate who actually completed the forms. It is possible that some women may have completed the survey more than once, although this is unlikely to have occurred often, due to the observed diversity of responses and free text comments. We did not collect data on actual age of infants/children and relied on women reading the eligibility statement at the start of the study. Neither did we collect data on how much time had elapsed since women's last experience of using a pump. This could be relevant as the choice of pumps available has increased rapidly in recent years. We did not ask about how the service would be funded as our previous study found that the offer of a free breast pump was more acceptable to the tax paying general public than shopping voucher incentives for breastfeeding (Morgan et al,2015). Sensitive data on

income and employment status was also not collected, as it was considered a risk to recruitment in the UK context at the time of the survey. Our intention was to keep the survey short and focused on women's views to maximize response rate. The option to target paper copies at specific groups was beyond the resources we had available. The aim was to inform the design of a complex intervention to provide free pump access, which in theory could address important health inequalities evident in the women who choose and succeed with breastfeeding. However, the potential impact of a free breast pump service on younger women and less privileged women who are known to be less likely to breastfeed remains uncertain.

SUMMARY AND RECOMMENDATIONS

A free breast pump service is an agreeable intervention for women who have experience of breastfeeding and using a pump, and women would support further service development. Preference was for access to a free pump hire (rental or loan) service provided flexibly according to women's need, with a choice of pumps alongside good quality woman-centred help and support from health professionals. The differing opinions on perceived risks and benefits highlight the importance of involving mothers in service development. It is clear that a "one size suits all" approach to service provision may not be acceptable. Further study is needed to determine the impact of timing and use of pumps on breastfeeding duration in term infants. Current services are not providing effective or satisfactory help and advice for women who wish to use pumps. There are also conflicting views about baby feeding that do not fit with current evidence or women's wishes. Development of a free pump service with women in the target population should address the issues raised in this survey. A new free breast pump service is a potentially acceptable intervention to help women to continue to breastfeed for longer.

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WEB SUPPLEMENTS

Figure 1: How did you rate the advice or help received from the health service when you first tried to use a breast pump

Figure 2

Figure 2: free breast pump hire service compared to providing a free breast pump worth around £40

Table 1: Sample demographics *(N=666 unless stated otherwise, % expressed for the Total sample (column 2) and by characteristic (remaining columns)*

		Agreement with free pump		***Agreement with free hire***	
	Total	***Agree***	***Disagree***	***Agree***	***Disagree***
	n (%)	***n=408 (61%)***	***n=158 (24%)***	***n= 567 (85%)***	***n=56 (8%)***
Age (n=665)					
<20	3 (0.5)	1 (33)	2 (66)	2 (66)	1 (33)
21-30	194 (29)	122 (63)	43 (22)	161 (83)	18 (9)
31-40	429 (64.5)	255 (59)	105 (24.5)	379 (88)	31 (7)
41-50	39 (6)	29 (83)	8 (20.5)	33 (85)	4 (10)
Age when left full time education					
16 or under	26 (4)	17 (65)	6 (23)	24 (92)	3 (11.5)
17	42 (6)	21 (50)	11 (26)	32 (76)	6 (14)
18	80 (12)	54 (67.5)	18 (22.5)	67 (84)	5 (6)
19 or over	518 (78)	316 (61)	123 (24)	452 (87)	40 (8)
Country where baby born					
Scotland	391 (59)	241 (62)	92 (23.5)	342 (87.5)	32 (8)
England	182 (27)	103 (57)	49 (27)	153 (84)	17 (9)
Wales	18 (3)	11 (61)	4 (22)	14 (78)	2 (11)
N. Ireland	61 (9)	42 (69)	11 (18)	54 (88.5)	1 (2)
Other	14 (2)	11 (79)	2 (14)	12 (86)	2 (14)
Parity					
1	353 (53)	220 (62)	88 (25)	311 (88)	23 (6.5)
2	226 (34)	139 (61.5)	56 (25)	191 (84.5)	20 (9)
3	65 (10)	35 (54)	20 (31)	49 (75)	9 (14)
4 or more	22 (3)	7 (32)	5 (23)	16 (73)	0 (0)
Infant Feeding Experience					
Ever breastfed or	662 (99)	405 (61)	156 (24)	565 (85)	56 (8.5)

breast-milk fed					
Ever expressed breast-milk	651 (98)	402 (62)	152 (23)	559 (86)	51 (8)
Ever used a breast pump (n=651)	649* (99.7)	402 (62)	151 (23)	559 (86)	51 (8)

626 *****% of those who expressed

627 ***Table 2: Time point and circumstances of first breast pump use, N=649 (%)***

		Agreement with free pump		***Agreement with free hire***	
	Total (%)	**Agree n=402 (62%)**	**Disagree n=151 (23%)**	**Agree n=556 (86%)**	**Disagree n=52 (8%)**
Baby in Neonatal Unit*	91 (14)	48 (53)	32 (35)	78 (86)	6 (7)
Baby preterm (<37 completed wks)	62 (10)	37 (60)	14 (22.5)	48 (77)	8 (13)
Age of baby when first using pump					
0-2 days	140 (22)	81 (58)	38 (27)	124 (89)	12 (9)
3-7	155 (24)	93 (60)	28 (18)	137 (88)	11 (7)
8-14	67 (10)	43 (64)	14 (21)	59 (88)	4 (6)
15 days -1 month	66 (10)	55 (83)	8 (12)	60 (91)	4 (6)
1-2 months	117 (18)	70 (60)	33 (28)	90 (78)	11 (9)
Over 2 months	104 (16)	60 (58)	30 (29)	92 (88.5)	9 (9)

**Neonatal unit includes special care baby unit or neonatal intensive care unit*

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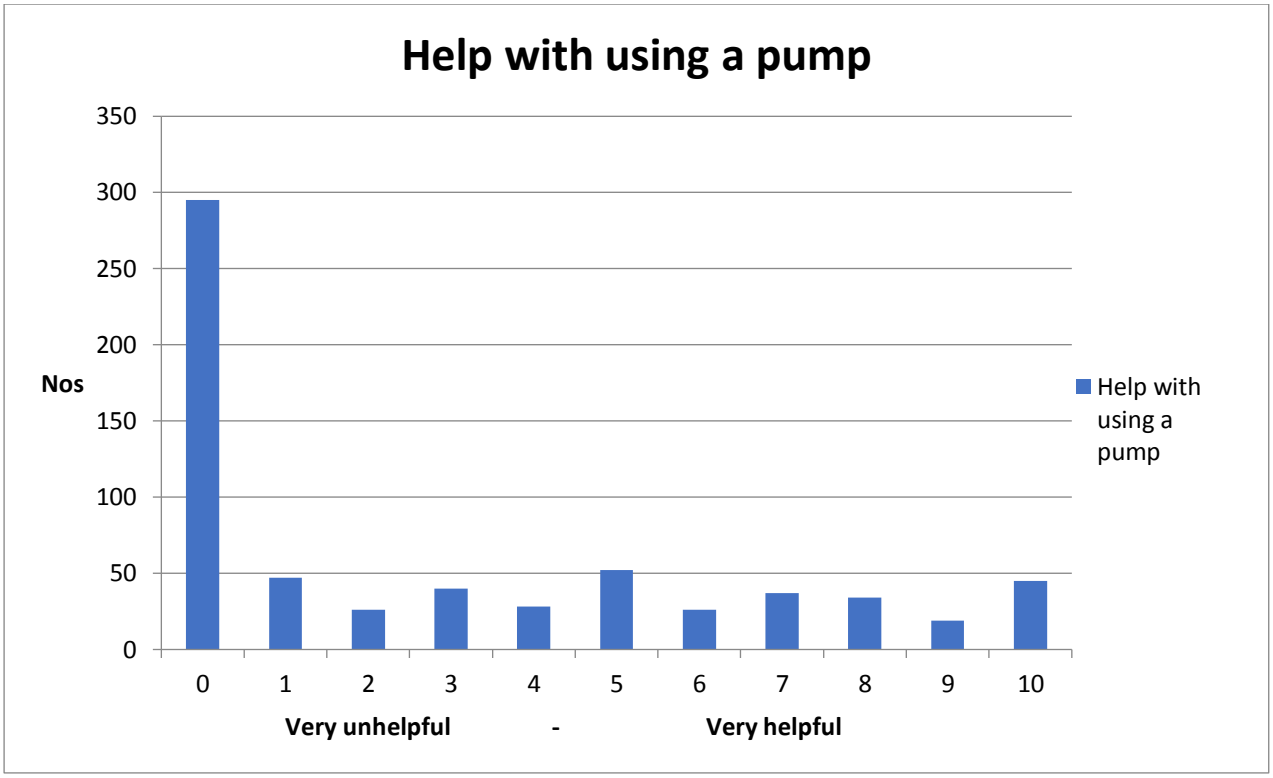

Figure 1: How did you rate the advice or help received from the health service when you first tried to use a breast pump (0=no help, 1 very unhelpful to 10 very helpful)

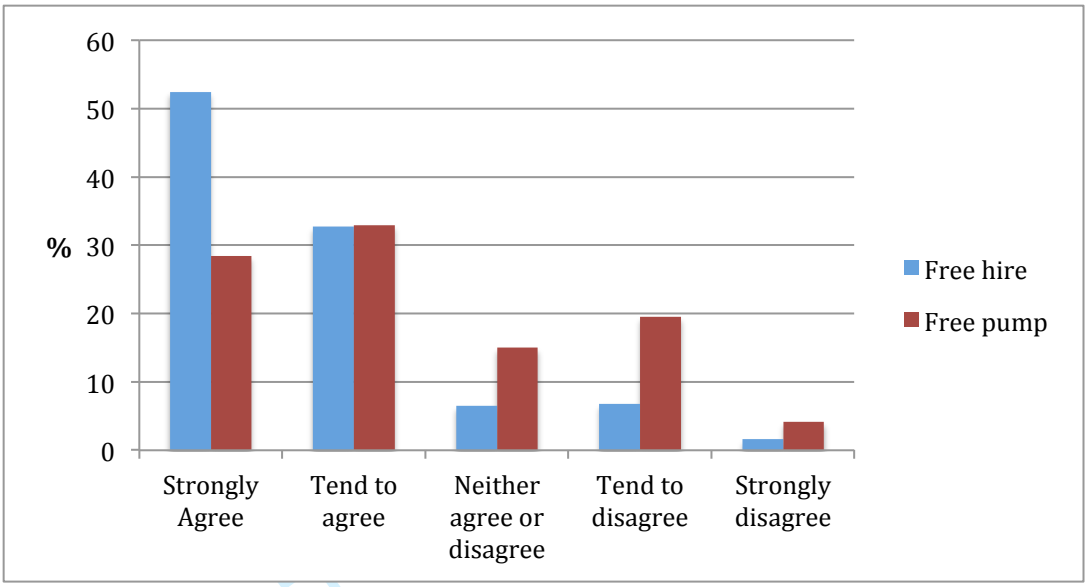

Figure 2: free breast pump hire service compared to providing a free breast pump worth around £40

Additional online file

SURVEY TOOL

A recent poll of people in the UK found that provision of a free breast-pump worth £40 was an acceptable incentive for breastfeeding women. We are interested in hearing your views on this. We are also interested in hearing about your experiences of feeding your baby.

1. Do you agree or disagree that a free breast-pump, worth around £40, should be made available to breastfeeding women for free on the NHS? Required

- Strongly agree
- Tend to agree
- Neither agree nor disagree
- Tend to disagree
- Strongly disagree

Please add any comments or opinions that you have on this idea

2. Some areas have a breast pump hire service for more expensive electric pumps. Do you agree or disagree that a free hire service should be available for breastfeeding women for free on the NHS? Required

- Strongly agree
- Tend to agree
- Neither agree nor disagree
- Tend to disagree
- Strongly disagree

Do you have any comments or suggestions about this?

Additional online file

Additional online file

3. Have you ever expressed breast-milk for your baby? Required

- Yes
- No

[Anyone answering No is routed to Question 10: About You]

[NEW PAGE]

4. Have you ever used a breast pump? Required

- Yes
- No

[Anyone answering No is routed to Question 10: About You]

5. What type of breast pump do/did you use? Required

- Hand operated / manual pump only
- Electric pump only
- Both hand/manual and electric pumps

5a. Could you tell us the reasons for your choice of pump(s)

5b. Please name the pump(s) you have used or are currently using?

6. How old was your baby when you first used a breast pump? (If you have used a breast pump for more than one of your children, please answer for the most recent child) Required

- 0 to 2 days old
- 3 to 7 days old
- 8 to 14 days old
- 15 days up to a month old
- 1 to 2 months old
- Older than 2 months

Additional online file

6a. Was this baby ever in a neonatal unit or a special baby care unit Required

- No
- Yes

6b. Was this baby born prematurely (ie before the end of 37 weeks of pregnancy)? Required

- No
- Yes

7. Please tell us which breast pump you would recommend to a friend for use in the first few weeks after birth and why

8. Thinking about the advice or help that you received from the health service when you first tried to use a breast pump, please tell us how helpful it was on a scale between 1 (extremely unhelpful) and 10 (extremely helpful). If you did not receive any advice or help please answer 0. [Please select one answer only] Please don't select more than 1 answer(s) per row. Please select exactly 1 answer(s). Having trouble with the format of this question? View in tableless mode

9. Do you have any comments or suggestions about the health service advice or help you received?

About you

10. How old are you? Optional

- under 20

Additional online file

- 21-30
- 31-40
- 41-50
- 51 or over

11. How old were you when you left full-time education? *(School or college, whichever you last attended full time)*

- 16 or under
- 17
- 18
- 19 or over

12. How many children do you have in total? *(Please exclude stepchildren or foster children.)*

- 0
- 1
- 2
- 3
- 4 or more

12a. How many of your babies have EVER been given breast milk (via syringe, bottle or cup etc) or put to the breast, even if this was only once?

- 0
- 1
- 2
- 3
- 4 or more

12b. What is the longest you have breastfed or breastmilk fed any of your children?

- 0 - 2 days
- 3-7 days

Additional online file

- 8-14 days
- 14 days - 1 month
- More than 1 month - 2 months
- More than 2 months - 4 months
- More than 4 months - 6 months
- More than 6 months - 1 year
- Over 1 year
- Other

If you selected Other, please specify:

13. Which country did you live in when you had your baby? (Please answer for your most recent child)

- Wales
- Scotland
- Northern Ireland
- England
- Other

If you selected Other, please specify:

Additional online file

Views

14. We are interested in hearing your views and/or experiences of expressing breast-milk. We would like to hear about different experiences so whether you or a family member found expressing easy, difficult, impossible, unpleasant or useful or if you never tried to express please tell us about it.

15. We are also interested in hearing your views and/or experiences of using a breast pump. We would like to hear about different experiences so whether you or a family member chose to use a pump or not please tell us about your decision and how you found it.

Comments

16. If you have any other comments or opinions about health service provision of breast-pumps, or advice and help with expressing breast-milk please feel free to add them below.