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Parent-Infant Closeness, Parents' Participation, and Nursing Support in Single-Family Room and Open Bay NICUs

Bente Silnes Tandberg, MNSc, RN; Kathrine Frey Frøslie, PhD, MSc; Renée Flacking, PhD, RN; Hege Grundt, RN; Liisa Lehtonen, MD, PhD; Atle Moen, MD, PhD

ABSTRACT

This was a prospective survey study, comparing parent-infant closeness, parents' perceptions of nursing support, and participation in medical rounds in single-family room (SFR) and an open bay (OB) neonatal intensive care units. Nurses' assessments of provided support were also measured. In total, 115 parents of 64 preterm infants less than 35 weeks' gestational age and 129 nurses participated. Parents recorded the presence and skin-to-skin care. Parents were sent 9 text message questions in random order. Nurses answered corresponding Internet-based questions. SFR mothers were more present, 20 hours daily (median) versus 7 hours ($P < .001$), initiated skin-to-skin contact (SSC) at 4 versus 12 hours ($P = .03$), and preformed SSC 180 min/24 h versus 120 min/24 h for mothers in the OB unit ($P = .02$). SFR fathers were also more present, 8 versus 4 hours ($P < .001$), initiated SSC at 3 versus 40 hours ($P = .004$), and performed SSC 67 min/24 h versus 31 min/24 h ($P = .05$). SFR parents rated participation in medical rounds and emotional support higher than OB parents. Parental trust was rated higher by nurses in the OB unit ($P = .02$). SFR facilitated parent-infant closeness, parents' participation in medical rounds, and increased support from nurses.

Key Words: family-centered care, open bay unit, preterm infant, single-family room unit, skin-to-skin care

Author Affiliations: Department of Paediatric and Adolescent Medicine, Drammen Hospital, Vestre Viken Hospital Trust, Drammen, Norway (Drs Tandberg and Moen); Department of Clinical Medicine, University of Bergen, Bergen, Norway (Ms Tandberg); Norwegian Resource Centre for Women's Health (Dr Frøslie) and Department of Neonatology (Dr Moen), Oslo University Hospital Rikshospitalet, Oslo, Norway; School of Education, Health and Social Studies, Dalarna University, Falun, Sweden (Dr Flacking); Department of Pediatrics, Haukeland University Hospital, Bergen, Norway (Ms Grundt); and Turku University Hospital, University of Turku, Turku, Finland (Dr Lehtonen).

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Bente Silnes Tandberg conducted the research presented in this article, analyzed the data, and wrote the paper. Kathrine Frey Frøslie, advised about and contributed practically to statistical analysis and participated in discussion of results and interpretations; she also critically read and assisted in formulating the main text. Renée Flacking, contributed to designing and developing the project and actively participated in data analysis and writing of the paper. Hege Grundt, managed inclusion and data collection in Bergen, critically read the main text, and participated in discussion of the results. Liisa Lehtonen, initiated and developed the SCENE multicenter collaboration and the study design and actively contributed to analysis and writing of the paper. Atle Moen took an active part in designing the project, analyzing the data, and writing the paper.

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Corresponding Author: Bente Silnes Tandberg, MNSc, RN, Department of Paediatric and Adolescent Medicine, Drammen Hospital, Vestre Viken Hospital Trust, Dronninggt 28, Drammen 3004, Norway (btandb@vestreviken.no).

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Preterm birth is a distressing experience for both parents.[1–4] To manage the situation and provide care for their infants, parents need emotional and practical support, information, and close proximity to their infants. Parents also have rights and needs to be involved in caretaking and decision making.[5–7] They can develop their parenting skills by interacting with their infants and by receiving support and guidance from the staff.[5,8] Organization of care, leadership, and the design of the unit may explain why parents experience the neonatal intensive care unit (NICU) as a learning and facilitative environment.[9,10]

However, there are also reports from parents on inconsistencies in healthcare team communication and provider practices, limited emotional and practical support, and unmet needs for involvement in decision making.[11] Sufficient space and a welcoming atmosphere are essential for parental presence. The physical facilities of the unit and the way parents' needs are maintained throughout the patients care are of importance and could influence the parent-infant dyad.[11] Parental visitation and closeness have demonstrated improved neurobehavioral outcome in preterm infants.[12]

BACKGROUND

In a single-family room (SFR) unit, an infant and his or her parents are staying in private room, with space and equipment for treatment and care of the infant together with facilities for parents to stay 24/7. In the open bay (OB) unit, there are several infants in the same room and no space for parents to continuously stay with their infants. Parents are welcomed at all times but because of lack of space and facilities, their presence will usually be somewhat limited.[13] SFR units facilitate closeness during hospitalization by providing parents not only with a bed to sleep into their infant's room but also more privacy and a less noisy and stressful physical environment.[14,15]

Parental presence and physical closeness are associated with increased physiological stability, better organized sleep, and diminished stress in infants, as well as a better provision of breast milk by mothers.[16,17] By encouraging and supporting parents to be present at the NICU, family-centered care (FCC) in SFR could contribute to parental involvement and an overall satisfaction[18–21] compared with care in traditional OB units. Skin-to-skin contact (SSC) in terms of the infant being situated frontally skin-to-skin on the mother's or father's bare chest is an important aspect of FCC.[22] Both early physical contact[23] and longer duration of daily SSC[24] lead to earlier initiation of breastfeeding and higher rates of breastfeeding at discharge.[25] SSC provides positive and restorative experiences for parents by relieving emotional suffering, but, conversely, it may also be an enervating experience.[26,27]

The same way SFR unit design itself has its pros and cons; parents may feel isolated in SFR units[28] or become stressed over increased pressure to care for their infants.[29] Opportunities for parents to talk, interact, and learn from other parents during their infant's hospitalization are reduced in SFRs. Potentially such an unwanted "side effect" of SFR challenges the parent-staff relations in SFR.[15] Nurses need to acknowledge not only the positive but also challenging aspects of parental involvement, as their attitudes are crucial for promoting parents' participation and closeness with their infants.[20] Parents need to be perceived positively by the nursing staff,[8] since parent-staff relations may directly impact the parent-infant relationship.[30]

Nurses have to balance use of technological and specialized nursing care and at the same time facilitate the infants' right to positive experiences and relationships with its parents. A variety of factors such as level of the NICU, the physical surroundings, competence, nurse-to-patient ratio, norms, and culture within each unit shape the everyday life of nurses. The pathways of these processes toward FCC in NICUs are not known and may differ between units. The physical environment of the SFR and OB units also influence nurses' job satisfaction and their communication with parents.[30,31] Institutional power is decreased and the role of a nurse may be more akin to that of a facilitator or tutor in SFR compared with a more task-orientated role of nurses in an OB unit.[9] Nurses have reported less stress and anxiety[29,32] when working in an SFR unit; however, nurses also report fewer opportunities to communicate with colleagues in the team.[19]

Greater privacy and less stressful environment associated with SFR design tend to show positive outcomes for both infants and parents, but knowledge is still limited.[20,33] Although principles of FCC, for example, parental access, SCC, breastfeeding support, and sleep protection, are approved and evident in the NICU,[22] knowledge is needed about how to implement those principles in different clinical and physical settings. A multicenter prospective survey, the International Closeness Survey (ICS), was conducted in 11 NICU centers to benchmark similarities and differences across countries in Europe.[34,35] Results revealed a wide variation in parents' presence and amount of SSC between the units. The opportunity to stay overnight in the NICU affected the parent-infant closeness positively.[35]

This study aimed to prospectively measure and compare parent-infant closeness as parental presence and SSC. Parental participation in decision making, daily care, and medical rounds and support from nurses were measured through parental experiences concerning information, guidance, and emotional support by self-reports. Furthermore, this study measures and compares nurses' perceptions of the support they provide for parents in both the SFR and OB units.

METHODS

Design

The study comprised a prospective survey design in which data from 1 SFR and 1 OB unit in 2 different hospitals in Norway were collected and compared. This study was part of the ICS.[34,35]

Setting

Both units participating in the study were located in maternity hospitals and provided care until discharge. The preterm infants included represent the eligible cohort of pre-term-born infants from 2 hospital catchment areas in Norway. The SFR unit provided care from birth for infants with a gestational age (GA) of 28.0 weeks or more and had an average admission rate of 450 infants per year and 17 beds. The SFR unit offered single rooms to all families, and parents were encouraged to stay both day and night. All meals were provided for both parents. At the time of the study, parents had access to a psychologist at the unit and to weekly parent meetings. The OB unit was part of a university hospital and provided care from birth for infants with GA of 23.0 weeks or more, with an average admission rate of 460 infants per year. In this unit, there were 2 to 8 infants per room ($n = 21$ beds), and no facilities were offered for parents to stay overnight inside the unit. Mothers were offered accommodation in another building after discharge from the maternity ward, and meals were provided only for mothers. A psychologist was available upon special request.

Although the facilities available for parents to room-in were different, both units allowed parents unlimited access to their infants around the clock, and SSC was encouraged in both units (the OB unit had armchairs available for parents by every incubator/cot). Both units promoted and offered guidance via lactation consultants for early breastfeeding. Norway has extensive social rights related to pregnancy and birth, with a publicly funded full insurance healthcare system covering all citizens. Parents are allowed full leave with full compensation of salary during hospitalization with their infant.[36]

Population/sample

Parents of all preterm infants born less than 35 weeks' GA regardless of their diagnosis were invited to participate in the study. Families were excluded from the study if (1) the family did not understand Norwegian or English, (2) the infant was one of a set of triplets or more, or (3) if the infant was born with congenital malformations or suffered from severe complications with a high risk of severe morbidity or mortality.

Families were not approached if anticipated hospital stay was shorter than 1 week or if the infant was transferred to another hospital. All families meeting the criteria were consecutively included from September 2013 through April 2014. In total, 115 parents (of 64 infants) were followed for 2 weeks after inclusion in the study or until discharge if before 14 days. Thirty-three infants from 29 families in the SFR unit and 31 infants from 29 families in the OB unit participated in the study (see Figure 1).

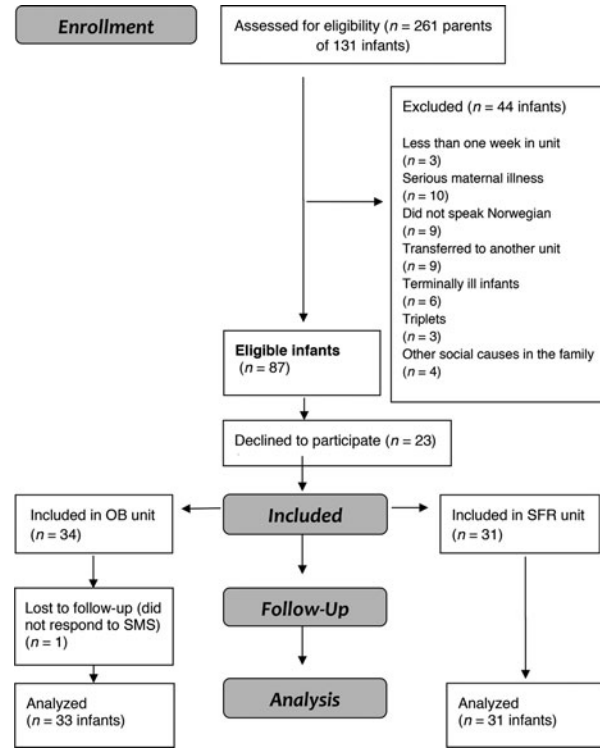

Figure 1. Flow diagram of participant recruitment. OB indicates open bay; SFR, single-family room; and SMS, short message service.

All nurses ($n = 129$) in the 2 units were invited to participate. Sixty-two nurses (the number of nurses working on a weekday was approximately 25) in the SFR unit and 67 nurses (the number of nurses working on a weekday was approximately 33) in the OB unit participated anonymously. The nurses consented to participation by answering the questions. Recruitment of nurses and patients started at the same time, but to achieve the sufficient number of patients, the recruitment of nurses lasted longer. Written informed consent was obtained from all parents prior to inclusion. The study was approved by the Norwegian Regional Committee for Medical Research Ethics.

Measurements

Presence and physical closeness

Parents recorded physical closeness prospectively in a closeness diary (scheme registration) in which they indicated (1) the amount of time they spent in the NICU (presence) and (2) the duration of SSC. Diary entries were made daily for the first 14 days following inclusion in the study (or until discharge, if before 14 days). Parents reported hour by hour during these 14 days. The diaries were kept in a closed folder next to the infants' bed. Presence was defined as parents being

within the NICU unit, whereas SSC was defined as the infant wearing only a diaper and being situated frontally in an upright position on the mother's or father's bare chest.

Participation and support

Short message service (SMS) questions for parents and a dedicated Web site for nurses were developed specifically for the ICS. The content validity of the questions was based on the published literature,[30,37] and an expert panel was formed by the members of the multidisciplinary SCENE research group. The SMS and Web questions were based on the core elements in FCC: parental presence, individualized support, respect, information, collaboration, and empowerment.[6,38] The SMS and Web questions were developed in English. The translation process from English to Norwegian proceeded according to the following guidelines for translation and cultural adaptation: (1) preparation, (2) forward translation, (3) reconciliation, (4) back translation, (5) harmonization, and (6) cognitive debriefing.[39] The SMS questions were sent to parents' mobile phones through a protected Web site. The parents received 1 SMS question on their phones every evening at 9 PM during the duration of their infant's hospital stay or until they stopped responding. If the parent did not respond, they received 1 reminder the next evening. If this SMS also was unanswered, they received no more messages. Nine different questions were repeatedly sent in random order. The 9 questions focused on parents' participation in their infant's care and on their evaluation of the support they received from the nursing staff. The following aspects of care were covered: (1) parents being heard, (2) parents participating in care, (3) guidance provided by nurses, (4) the degree to which parents' opinions were considered in decision making, (5) parents trusting nurses, (6) nurses trusting parents, (7) participation in medical rounds, (8) individualized information, and (9) emotional support from nurses.

Similarly, nurses were asked corresponding questions in random order, except for the question about participation in medical rounds, which was excluded from the nurses' questions. The parents in the study responded to the questions with regard to their infant. The nurses made an overall assessment of their provided nursing care for the infants and families that they had cared for at each working shift during the study period.

Each nurse was asked to answer the question available at the time at the Web site link on an iPad after his or her work shift. After an answer was provided, a new question appeared for the next nurse. The nurses' measures were not linked to specific parents. They answered the questions anonymously. The survey continued for a 3-month period. Questions were formulated so that nurses would assess the support they had offered to parents during that day.

Both parents and nurses responded on a scale from 1 (not at all) to 7 (very much); a response of "0" indicated that a parent was not in the unit or that a nurse had not worked with parents due to responsibilities other than direct patient care (eg, simulation training, certification of new employees, preparation of guidelines or procedures). The 0 responses were excluded from data analysis. Among parents in the SFR unit, the percentage of 0 responses was 10% among mothers and 32% among fathers. In the OB unit, the percentage of 0 responses was 6% among mothers and 23% among fathers. For nurses, the percentage of 0 responses was similar in both units: 21% in the OB unit and 19% in the SFR unit.

Statistics

Descriptive statistics are given as means and standard deviations, medians and quartiles (Q_1, Q_3), or frequencies (percentages) according to the type and distribution of the data. The groups (SFR and OB) were compared by bivariate analyses, that is, 2-sample *t* tests, Mann-Whitney tests, or Pearson's χ^2 tests.

However, because of the observational design of the study, several considerations of adjustments of the estimated difference between the SFR and OB units concerning parents' presence and SSC were done. Baseline characteristics were unequally distributed in the groups. If these characteristics are assumed to affect the outcomes studied, the effect estimates may be biased. For instance, it is generally accepted that an infant's morbidity and gestation can affect both the infant's outcome of treatment and care[40] and thus potentially affect the parents-infant dyads. Furthermore, it is possible that the circumstances and type of delivery as well as multiples and family relationships such as siblings may affect the outcomes. Hence, the differences in the presence and SSC between the groups were also estimated using multiple regression analyses. In these analyses, the main explanatory variable was the unit (SFR or OB), and GA at birth, mode of delivery (vaginal or caesarean delivery), firstborn (yes or no), and multiple births (yes or no) were included to adjust for potential confounding.

Some families participated longer than other families and thus responded to questions more than once. Accordingly, answers to the repeated SMS questions were summarized as mean scores for each question for both the mother and the father in each family. The Mann-Whitney test was used to compare mean scores of the SFR and OB groups due to their skewed distributions. Answers given by nurses from the SFR and OB units were compared by cross tables and Pearson's χ^2 tests.

Because there were very few responses on the lower part of the scale (76% of nurses' responses were from 5 to 7 on the 7-point Likert scale), responses from 1 to 4 (24%) were merged. A P value .05 or less was considered statistically significant.

RESULTS

The parents in the 2 groups did not differ in their demographic characteristics (see Table 1). Detailed characteristics for the study group have been presented previously.[34,35] There were no significant differences between participants and nonparticipants, nor was parents' presence in the NICU or their SMS responses associated with their education, previous experience in the NICU, or socioeconomic or cohabitation status.[34,35] No infants in the study were included later than their fifth day of life, with a median of the third day of hospitalization. GA at birth was on average 1.6 weeks lower in the OB unit than in the SFR unit (see Table 1).

The median presence for mothers was 13 hours more per day in the SFR unit compared with the OB unit ($P < .001$). For fathers, the median presence was 4 hours more per day in the SFR unit than in the OB unit ($P < .001$). There were significant differences between the units on the time before SSC directly after birth by mothers, with a median difference of 8 hours in favor of the mothers in SFR ($P = .03$) and 37 hours by fathers ($P = .004$). Despite the initial difference, the difference in the total time of SSC per 24 hours the first 2 weeks was less, by mothers' median difference of 60 minutes ($P = .02$) and by fathers' 36 minutes more in the SFR unit than in the OB ($P = .05$) (see Table 1). Multiple regression analyses did not alter the main findings. To enhance clarity and transparency of the analysis, we explored each potential cofounder

Table 1. **Clinical and demographic characteristics, parental presence, and skin to skin care**[a]

Variable	SFR unit	OB unit	*P*
Families	29	29	
Parents, *n*	57	58	
Age			
Mothers' age, mean (SD), y	33 (6)	32 (5)	.08
Fathers' age, mean (SD), y	32 (5)	33 (5)	.11
Marital status			
Single, *n* (%)	1 (4)	0	.49
Married/cohabitant, *n* (%)	28 (96)	29	
Education level			
Mothers			
Elementary/high school, *n* (%)	6 (21)	9 (31)	.22
College/university, *n* (%)	23 (79)	20 (69)	
Fathers			
Elementary/high school, *n* (%)	8 (29)	11 (38)	.51
College/university, *n* (%)	20 (71)	18 (62)	
Infants, n	33	31	
Gender (female), *n* (%)	16 (48)	17 (55)	.61
Twins, *n*	10	2	**.01**
Siblings, *n*	12	17	.21
Gestation weeks at birth, mean (SD)	33.0 (1.7)	31.1 (3.0)	**.03**
Birth weight, mean (SD), g	1889 (473)	1643 (679)	.10
Cesarean delivery, *n (%)* of patients	19 (58)	9 (29)	**.02**
Gestation weeks at discharge, mean (SD)	36.0 (1.7)	35.6 (3.0)	.22
Amount of time parent present per 24 h first 14 d of hospitalization			
Mothers' presence per 24 h, median [Q_1, Q_3], h	20 [18, 22]	7 [5, 8]	**<.001**
Fathers' presence per 24 h, median [Q_1, Q_3], h	8 [6, 17]	4 [3, 5]	**<.001**
Hours before SSC after birth			
Mothers, median [Q_1, Q_3], h	4 [0, 12]	12 [0, 28]	**.03**
Fathers, median [Q_1, Q_3], h	3 [1, 9]	40 [20, 53]	**.004**
Total of both parents' SSC per 24 h first 14 d of hospitalization			
Mothers' SSC per 24 h, median [Q_1, Q_3], min	180 [60, 300]	120 [60, 180]	**.02**
Fathers' SSC per 24 h, median [Q_1, Q_3], min	67 [11, 100]	31 [0, 60]	**.05**

Abbreviations: OB, open bay; SFR, single-family room; SSC, skin to skin contact.
[a]Groups were compared by the *t* test, Mann-Whitney test (continuous variables), and Pearson's χ^2 test (categorical variables).

as shown in Supplementary Digital Content Material (available at: http://links.lww.com/JPNN/A10). Exploring mothers' SSC per 24 hours revealed that adjustment for type of delivery would attenuate the difference between mothers' SSC in SFR and OB by those having a cesarean delivery. Type of delivery did not seem to affect fathers SSC per 24 hours to the same extent (Boxplot number 3 + 6 in Supplementary Digital Content Material, available at: http://links.lww.com/JPNN/A10).

The response rates to the SMS questions were similar in the 2 units: 65% (594 responses) in the SFR unit versus 68% (589 responses) in the OB unit. Compared with mothers in the OB unit, mothers in the SFR unit gave significantly higher scores for participation in decision making and medical rounds. They also reported higher scores for support from nurses, including guidance, information, and emotional support. Detailed information is provided in Table 2. Parents in the SFR unit reported significantly higher scores for "participation in medical rounds" and "emotional support" compared with parents in the OB unit. No significant differences were found between mothers and fathers within the SFR unit. In the OB group, mothers gave higher scores than fathers for "nurses trust parents."

The response rate for nurses was 67% (1432 Web responses) in the SFR unit and 61% (1151 Web responses) in the OB unit. The only significant difference in nurses' scores was for the item "parents trust nurses"; the nurses in the OB unit gave higher scores on this item than the nurses in the SFR unit (see Table 2).

DISCUSSION

There were 3 key findings. First, parents in the SFR unit were significantly more present and initiated SSC significantly earlier than parents in the OB unit. The early SSC was especially evident among the SFR fathers. Second, parents in the SFR unit gave significantly higher ratings for their participation in medical rounds and for support from the staff than parents in the OB unit. Finally, nurses' own assessments of the support they provided did not differ between the units, with the exception of a significantly higher rating in the OB unit for parental trust of nurses.

More presence and earlier initiation of SSC in the SFR unit

There was a significant difference between families in the SFR and OB NICUs insofar as parents spent more time in the SFR unit. The European ICS study reported wide variation in parents' presence in NICUs. Also in this context, the SFR unit excelled as one of the 3 units, with the highest degree of presence by parents in Europe.[35] Various external factors can affect the parents' presence in the NICU, such as distance to the hospital, siblings at home, or regulation by the employees. The Norwegian social rights prevent negative economic consequences for the family to stay in hospital may explain this results in this study. Nevertheless, still some NICUs refuse parents access for some part of the day. The fact that parents actually are welcomed unrestricted access 24 hours a day should be considered a necessary prerequisite for parental presence. SSC was initiated earlier in the SFR unit than in the OB unit, and fathers in the SFR unit started preforming SSC 37 hours sooner and had twice as much SSC time per day. It has been shown that early initiation of SSC by fathers generates more SSC time in total throughout hospitalization.[41] Early SSC by fathers after birth could potentially jumpstart the paternal bonding process and thus act as motivation for provision of SSC throughout the hospital stay. Early initiation of SSC may positively affect infant development and dyadic parent-infant interaction[42] and may also enhance a father's ability to play a more caring role in his infant's life.[43]

Physical closeness, in terms of presence and SSC, could be perceived as necessary for early bonding[44] and increase involvement with the infant hospitalization.[42] Physical closeness also contributes to an embodied recognition of emotional closeness.[7] Emotional closeness is expressed in several ways, such as spending time together, bonding as a family, and feeling engaged in day-to-day care.[7] Although parents in both units in this study had the opportunity to be present, the conditions for SSC and participation in care were different. In the OB unit, parents were never alone with their infants. Privacy is highly appreciated by parents.[45] Still much can be achieved even with OB architecture. Good reclining chairs for parents besides the incubator/cot may have contributed to the good results for both parental presence and SSC in the OB unit. In an OB unit, performing SSC is one of the few opportunities for undisturbed, one-on-one time with infants. In an SFR unit, parents experience closeness more privately and at an individual pace for each parent.

Parental involvement and support

Parents in the SFR unit reported significantly higher participation in medical rounds and better support from nurses. The increased participation in medical rounds in SFR may be an effect of having a facilitative environment that enables privacy when discussing the infant. Hence, issues of confidentiality or lack of privacy may reduce opportunities to involve parents in medical rounds in the OB unit. Furthermore, the design may be a proxy for culture in the units. It is likely that the process of moving an OB to an SFR working environment could contribute to culture and physical/architectural

Table 2. **Parents' and nurses' responses to study question**

Question	SFR unit: Mothers Median [Q_1, Q_3]	SFR unit: Fathers Median [Q_1, Q_3]	*P* within unit	OB unit: Mothers Median [Q_1, Q_3]	OB unit: Fathers Median [Q_1, Q_3]	*P* within unit	*P* between units ♀	*P* between units ♂
Parents								
Q1. To what extent did the staff listen to you today?	7 [6.0, 6.7]	6.5 [6.3, 6.8]	.74	6 [5.1, 6.3]	6 [5.0, 6.4]	.70	.12	.11
Q2. To what extent did you participate in your baby's care today?	6 [5.3, 6.3]	6 [5.0, 6.4]	1.00	6.8 [5.6, 6.6]	5 [4.6, 5.8]	.05	.17	.18
Q3. To what extent did the guidance provided by the staff meet your needs today?	7 [6.3, 6.8]	6.5 [5.7, 6.7]	.57	6 [5.2, 6.3]	6 [5.5, 6.5]	.53	**.02**	.53
Q4. To what extent was your opinion considered in decisions made about your baby today?	7 [6.4, 6.9]	7 [6.1, 6.9]	.54	5.8 [5.0, 6.2]	6 [5.5, 6.6]	.68	**.04**	.21
Q5. To what extent did you trust the staff in the care of your baby today?	6.7 [6.1, 6.7]	7 [6.4, 7.0]	.06	7 [5.8, 6.8]	7 [6.2, 6.8]	.53	.71	.72
Q6. To what extent did the staff trust you in the care of your baby today?	7 [6.3, 6.9]	7 [6.3, 6.9]	.72	7 [5.9, 6.8]	6.5 [4.7, 6.8]	**.01**	.50	.36
Q7. To what extent did you participate in discussions during the doctor's round/doctor's visit?	5.5 [4.7, 6.1]	5 [4.2, 5.9]	.27	2 [2.0, 4.1]	2.8 [1.9, 4.3]	.46	**<.001**	**.01**
Q8. To what extent did the information provided by the staff meet your needs today?	7 [6.0, 7.0]	6.5 [5.7, 6.5]	.46	6 [5.3, 6.4]	6 [5.7, 6.6]	.96	**.04**	.64
Q9. To what extent did the staff offer you emotional support today?	6 [5.0, 6.3]	7 [5.9, 7]	.49	5 [4.2, 5.5]	4.5 [3.2, 5.3]	.33	**.05**	**<.001**

	Median [Q_1, Q_3]	Median [Q_1, Q_3]	*P* between units
Nurses			
Q1. To what extent did you listen to parents today?	7 [6.1, 6.4]	7 [6.2, 6.5]	.84
Q2. To what extent did you make it possible for parents to participate in the care of their baby today?	6 [5.9, 6.3]	6 [5.9, 6.3]	.88
Q3. To what extent was the guidance you provided adapted to meet the individual needs of parents' today?	6 [5.5, 5.9]	6 [5.7, 6.0]	.27
Q4. To what extent did you consider parents' opinions in decisions concerning their baby today?	6 [5.7, 6.0]	6 [5.8, 6.3]	.13
Q5. To what extent did parents trust you in the care of their baby today?	6 [5.9, 6.2]	7 [6.3, 6.6]	**.02**

(*continues*)

Table 2. **Parents' and nurses' responses to study question (*Continued*)**

Question	SFR unit			OB unit				
	Mothers Median [Q_1, Q_3]	Fathers Median [Q_1, Q_3]	*P* within unit	Mothers Median [Q_1, Q_3]	Fathers Median [Q_1, Q_3]	*P* within unit	*P* between units ♀	*P* between units ♂
	Median [Q_1, Q_3]			Median [Q_1, Q_3]			*P* between units	
Q6. To what extent did you trust parents in the care of their baby today?	6 [5.8, 6.2]			7 [6.1, 6.5]			.12	
Q7. To what extent was the information you gave adapted to meet the individual needs of parents' today?	6 [5.6, 5.9]			6 [5.8, 6.1]			.13	
Q8. To what extent did you offer parents emotional support today?	6 [5.3, 5.6]			6 [5.3, 5.7]			.71	

[a] *P* values from the Mann-Whitney test (parents) and Pearson's χ^2 test (nurses).

facilities that mutually affect each other. This process may result in a culture of care that recognizes and takes advantage of the benefits and possibilities of an SFR design. Accordingly, we measured parents' daily experiences, which are likely to reflect how actual nursing care is operationalized on a day to day basis. One of the most important predictors of patient satisfaction is retained patient-reported experiences with nursing services.[46] Parents' reports can thus provide essential information about the quality of care. Parents have reported greater satisfaction with care in SFRs,[18] especially if they had experience with both types of unit designs.[28] Although both types of units give parental support, the SFR unit signals through the design and layout that parents play an important role in their infant's care and that their own needs as parents are important. Thus, by having an SFR design, the parents' process of *becoming parents* is facilitated from the start, which, in turn, makes the support by the staff easier to provide and more accessible by parents.[15] The recognition of parents as real participants in decision making is also related to cultural norms, interdisciplinary collaboration, and staff attitudes.[9]

The study design did not allow us to conclude whether the differences observed arose from the design of the unit, from cultural norms, or from both. It was not the intention of this study to demonstrate a cause-effect relationship between NICU design and increased participation or perceived nursing support. The results reflect only parents' responses in these different settings. However, one should neither underestimate how the setting and design may influence the development of a more or less supportive culture. Different cultural norms may result in different perceptions about how to achieve honest dialogue and empowerment of parents. They could also influence parents' perception of their role as capable decision makers. The expectation that parents participate in medical rounds is an expression of a more advanced form of involvement than participating only in infant care, and being a participant is not the same as having real decision-making authority. The goal of shared responsibility[37] could be more easily obtained with participation in daily discussions about care. We do not know why participation in medical rounds occurred more in the SFR unit, but it might be related to different cultural norms concerning the extent of parents' participation. The attitudes of the physicians and also interdisciplinary collaboration between nurses and physicians may have influenced participation.

Emotional support and participation in decision making were perceived with a lower score than other areas of FCC by mothers and especially fathers in the OB unit. Gender differences and factors contributing to increased involvement remain limited. The same applies for research on how fathers' participation manifests during their infant's hospitalization.[47] Increased presence of fathers could eventually change the expectations of health professionals regarding the importance of a father's role. It is noteworthy that mothers and fathers reported similar levels of received support and participation in both units.

Nurses' assessment of care

The higher scores reported by parents in the SFR unit were not reflected in the nurses' responses. Nurses reported similar levels of provided care in both NICUs,

with one exception: nurses in the OB unit reported a significantly higher score on the item "parents trust nurses." This is in line with scores reported by the majority of other nurses in the ICS study, who also rated this item highly.[34] Nurses in the OB unit may perceive greater parental trust because infants are left in their care without parents present more often, and this could be interpreted by the staff as an expression of confidence. Whether parents leave because they are tired of a crowded and stressful environment and "need a break" or whether there are unspoken messages from the staff that support parents' absence is unknown. This question could not be answered from our study. Mothers express that they are "parenting with permission" from the nurses.[45] Increased participation by parents in medical rounds may transfer control and "ownership" of infants to parents, which may increase both presence and parent-staff interaction. In the OB unit, nurses are rarely alone with parents. This may affect the relationship between nurses and parents as well as the amount of perceived support from the former.

Although SFRs have a positive impact on parents' participation and perceived level of support, we should emphasize the importance of a person-centered approach in everyday clinical practice. Parents have different cognitive and emotional needs, and by using person-centered communication, parents will be supported in the way that suits them best.[48] The core elements in a person-centered communication is mutual trust and understanding, respect of parent's rights, and holistic individualized supportive care.[49] The ICS study found that nurses rate their ability to provide emotional support as low.[34] Yet, emotional support is important and training in communication skills for health personnel and nurses in particular is recommended.[31,50–52] All staff members continuously have to consider their attitudes in meetings with families and assure that they are empathetic and are empowering parents.

Limitations

There were some noteworthy differences between the SFR and OB unit groups: Caesarean delivery was more common in the SFR group, whereas GA was lower in the OB group. However, the potential confounding effect of these differences was explored via multiple regression analyses and explorative analysis, and only a minor influence on the results was demonstrated. In addition, we did not collect data on morbidity. As only 5 infants in this study were born before 28 weeks, it is likely that most infants were relatively healthy. Hence, one should be careful when applying the results of the present study to families with severely ill infants.

This study was based on self-reports from parents about their presence, duration of SSC, and participation in infant care as well as self-reports from NICU nurses on nursing support. It would have been beneficial if we had also explored the physicians' views on their support. Another limitation was that the questionnaires used were developed specifically for the ICS, and the SMS and Web questions were not psychometrically tested. The validity, in terms of whether the questions represent the core values of FCC, needs to be further explored. A Delphi survey obtaining judgment from an expert panel about validity could be useful. The construction of the questions implies that domains might have some overlap. It is also reasonable to assume that replies would be somewhat consistent between mothers and fathers within a single family. Accordingly, a formal correction for multiple testing was not conducted. If a correction procedure had been used, the difference in presence, hours before SSC for fathers, mothers' perceived participation during physicians visits, and fathers' perceived emotional support would still persist. Hence, the main conclusions of the article would be the same.

A limitation is that nurses made an overall assessment of their nursing care during a day, including all infants and families they cared for. This may reduce differences they have experienced with different families. Furthermore, the large number of responses from nurses necessarily included all types of work shifts. As the nurses participated anonymously, no information was available about who answered which questions and how many answers were provided by a single nurse. Consequently, we were not able to control for group differences regarding nurses' competence levels and formal qualifications. Because of this lack of information, there may also be interesting correlations between high/low responses from the parent and nurse groups missed out.

Future perspectives

The study provides new knowledge on the impact of NICU facilities on parent-infant physical closeness and parents' experiences with participation and nursing support in a Nordic setting. Because of a modest socioeconomic inequalities of the population and extensive social security in a publicly financed healthcare system, the effects, if any, of social and economic factors on parental presence and their experience of hospitalization can be considered small. Studies in more heterogeneous populations with larger variation in the socioeconomic status would be of interest. Also, more knowledge about how NICU design affects fathers in particular is needed. Other aspects related to parental participation that have not yet been sufficiently explored are how participation in medical rounds contributes to parental role attainment and psychological stress? By allowing parents to play a more active role in

caretaking, conflicts among nurses, who may fear a loss of control, may arise.[30] By asking for and following up on parents' feedback, we can gain important insights into topics important to parents, including their experiences with hospital support. With such knowledge, we can develop new methods to better integrate parents in all aspects of their infant's care and to systematically evaluate these methods over time.

CONCLUSIONS

We found that parental contact with their infants was less restricted in the SFR unit and hence SFR units facilitate parent-infant closeness in terms of parental presence, SSC, and parental participation in medical rounds. Both mothers and fathers in the SFR unit reported considerably more presence. Also, earlier initiation of SSC and more SSC were found among parents in the SFR unit, especially evident among SFR fathers. Although nurses' assessments of the support they provided did not differ between the 2 types of units, parents reported better emotional support from nurses in the SFR unit in comparison with parental reports from the OB unit. SFR parents' significantly higher scores for participation in medical rounds and support from nurses suggest that they were able to participate in their infant's care more fully and confidently than parents in the OB unit. More equal collaborative nurse-parents relationship can emerge in SFR and thus contribute to the establishment of positive parent-infant dyads.

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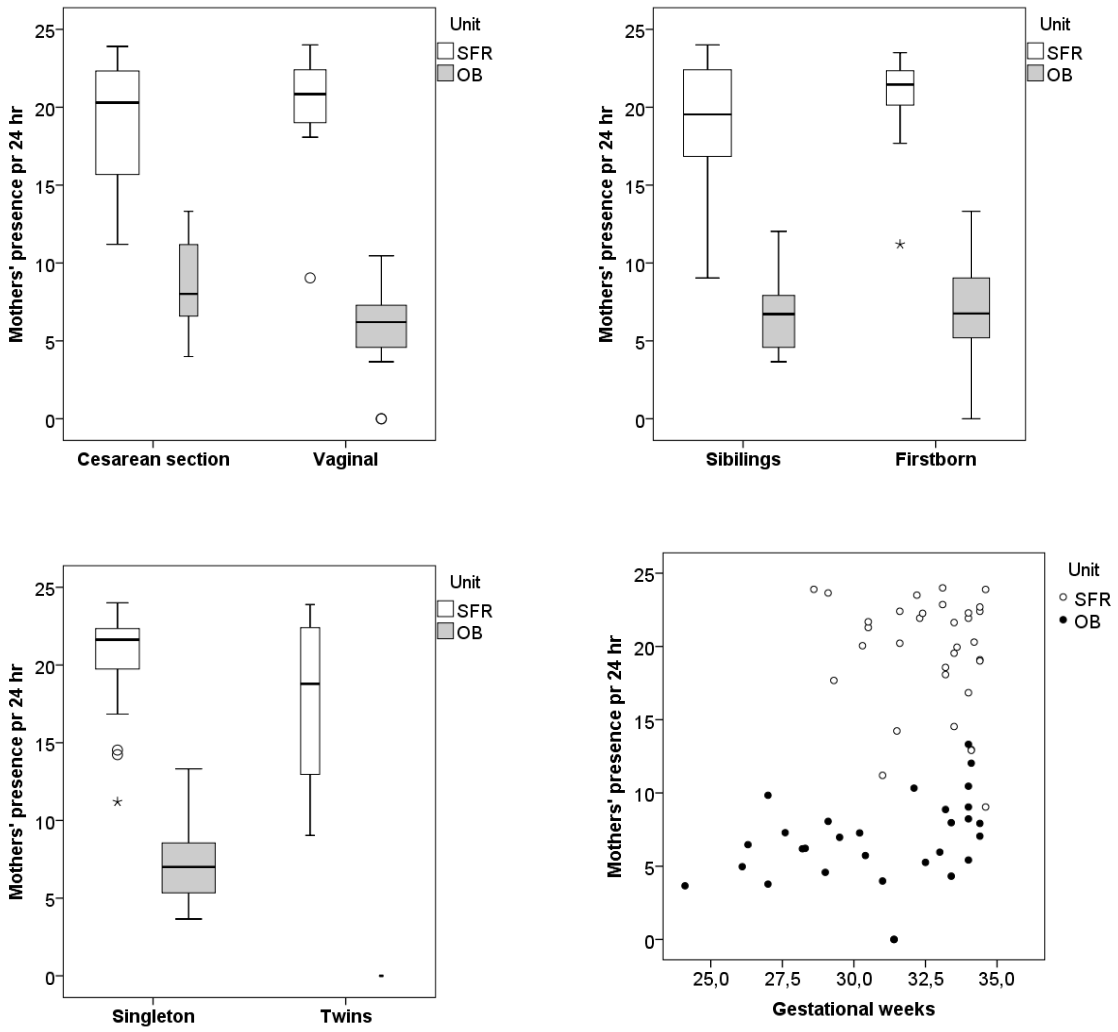
1. Mothers presence pr 24 hours

Unadjusted difference in medians	SFR unit	OB unit	p value
Mothers' presence pr 24 hr, median (Q1,Q3)	20 (18, 22) hr	7 (5, 8) hr	< .001

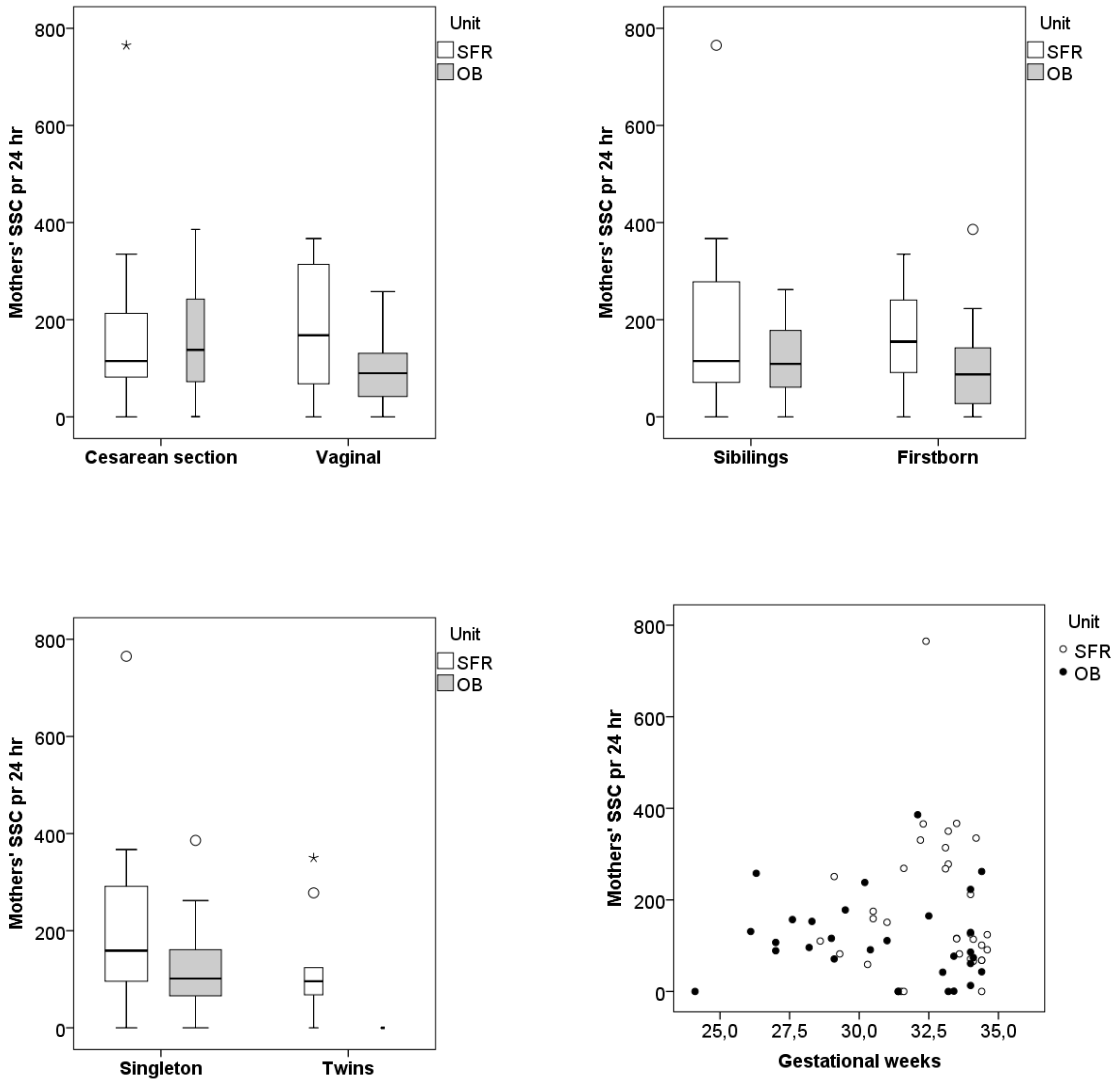


Explorative statistics showing the distribution of mothers'presence according to four possible confounders, that is, Cesarean section/vaginal delivery (upper left), Siblings/Firstborn (upper right), Singleton/twins (lower left) and Gestational weeks (lower right).

Comments: The small numbers in the subgroups and skewness of the distributions makes it unfeasible to do a formal adjustment of the difference, but the plots show that the difference between the SFR and OB persists within all subgroups, and that formal adjustment for any of these confounders would not affect the result substantially.

2. Mothers SSC pr 24 hours

Unadjusted difference in medians	SFR unit	OB unit	p value
Mothers' SSC pr 24 hr, median (Q1,Q3)	180 (60, 300) min	120 (60, 180) min	.02



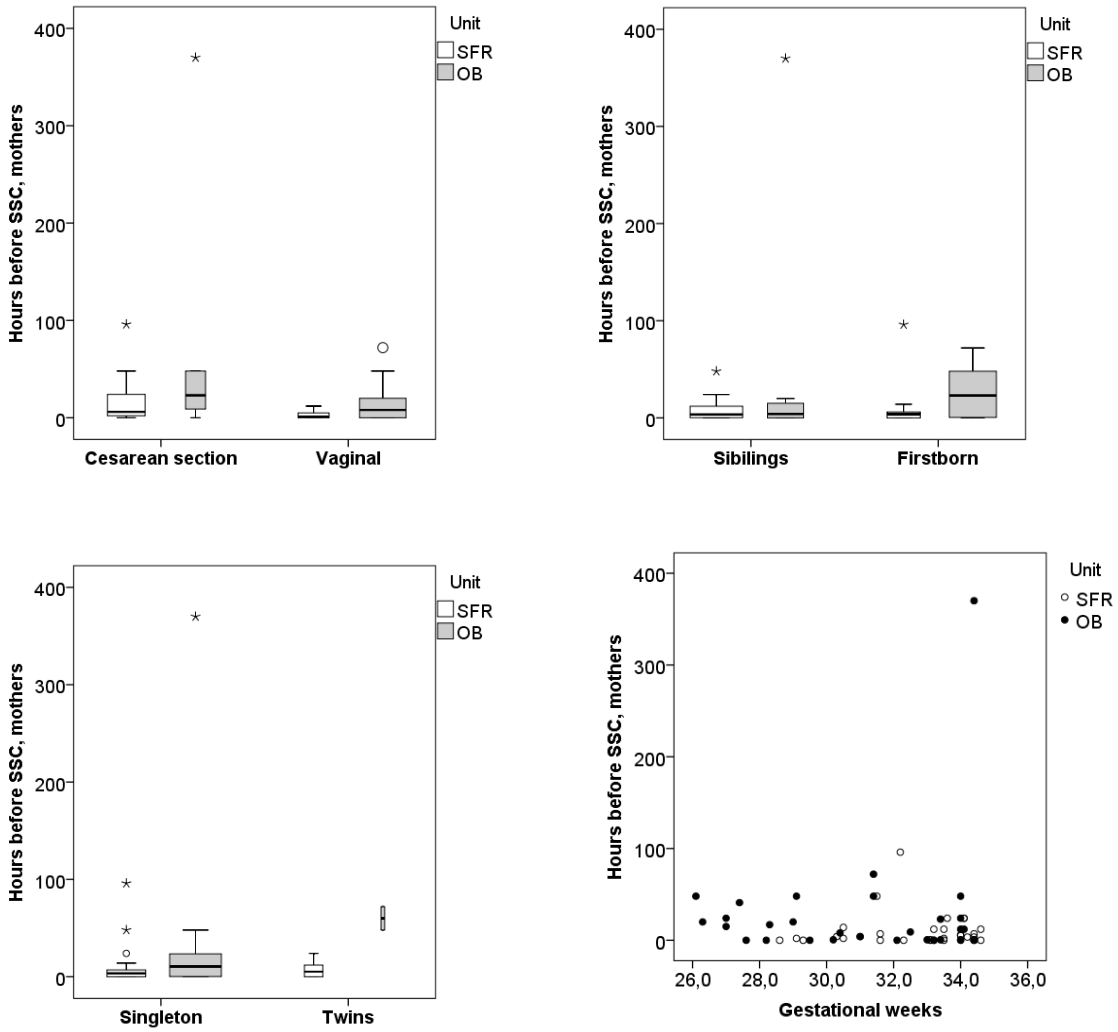
Explorative statistics showing the distribution of mothers' SSC time according to four possible confounders: Cesarean section/vaginal delivery (upper left), Siblings/Firstborn (upper right), Singleton/twins (lower left) and Gestational weeks (lower right).

Comments: The small numbers in the subgroups and skewness of the distributions (partly due to some extreme values, in particular one value in the SFR group) makes it unfeasible to do a formal adjustment of the difference. The difference between the SFR and OB can be seen in all subgroups

except from those having a Cesarean section. Hence, an adjustment for type of delivery would attenuate the difference between mothers' SSC in SFR and OB.

3. Hours before SCC, mothers

Unadjusted difference in medians	SFR unit	OB unit	p value
Hours before SSC after birth, mothers'median (Q1,Q3)	4 (0, 12) hr	12 (0, 28) hr	.03

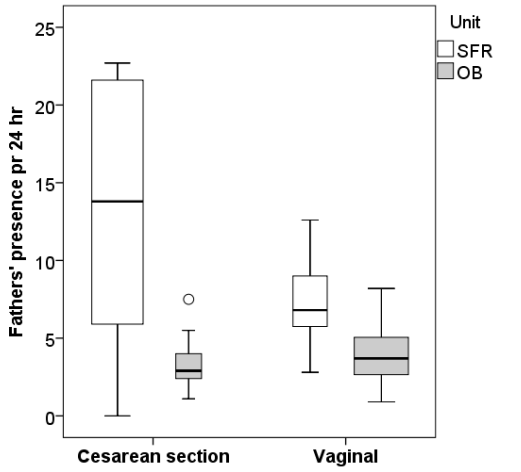


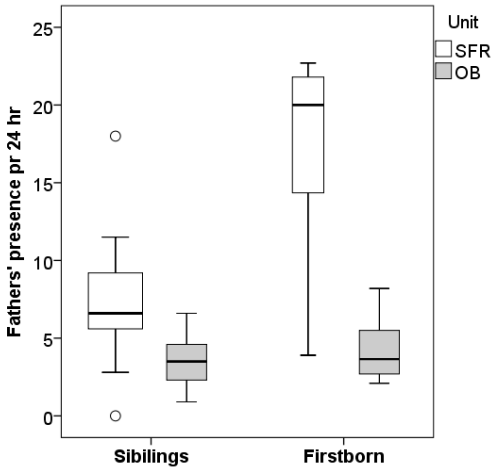
Explorative statistics showing the distribution of hours before mothers' SSC according to four possible confounders: Cesarean section/vaginal delivery (upper left), Siblings/Firstborn (upper right), Singleton/twins (lower left) and Gestational weeks (lower right).

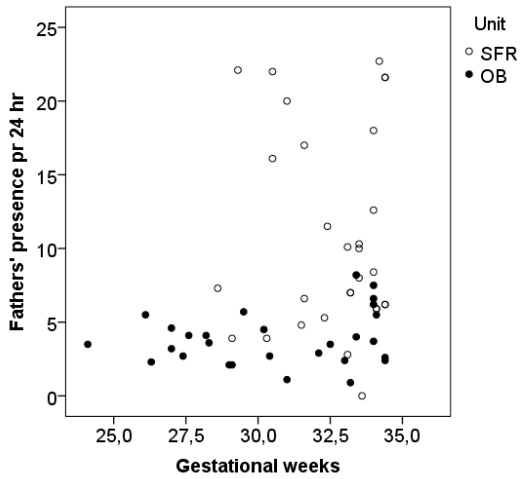
Comments: The small numbers in the subgroups and skewness of the distributions (partly due to some extreme values, in particular one value in the OB group) makes it unfeasible to do a formal adjustment of the difference, but the plots show that a difference between the SFR and OB is still present within all subgroups, however less strong than seen by mothers presence.

4. Fathers presence pr 24 hours

Unadjusted difference in medians	SFR unit	OB unit	p value
Fathers' presence pr 24 hr, median (Q1,Q3)	8 (6, 17) hr	4 (3, 5) hr	< .001







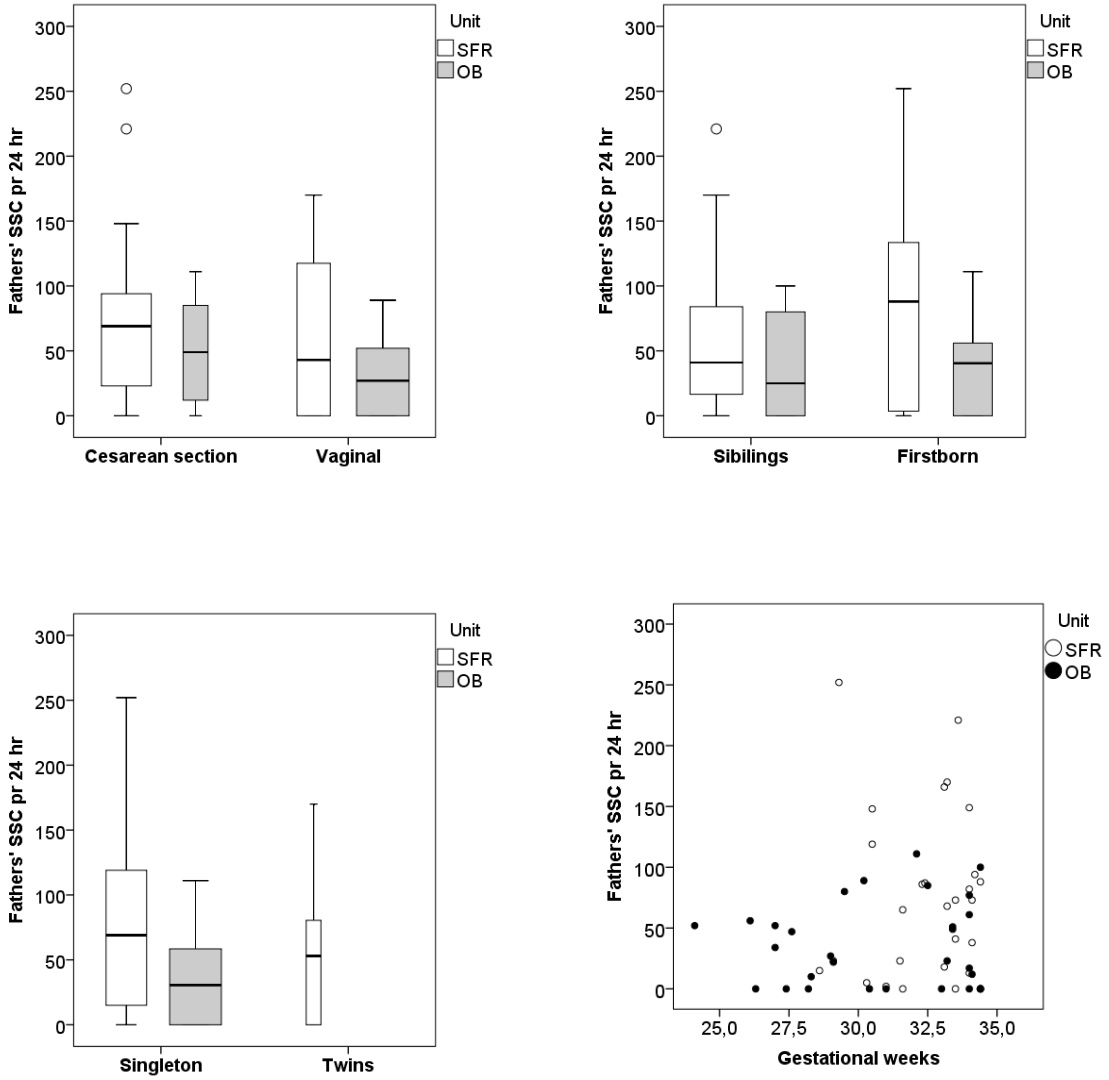
Explorative statistics showing the distribution of fathers'presence according to four possible confounders, that is, Cesarean section/vaginal delivery (upper left), Siblings/Firstborn (upper right), and Gestational weeks (lower left). There were no data available of fathers' presence and Singleton/twins.

Comments: The small numbers in the subgroups and skewness of the distributions makes it unfeasible to do a formal adjustment of the difference, but the plots show that the difference between the SFR

and OB persists within all subgroups, and that formal adjustment for any of these confounders would not affect the result substantially.

5. Fathers SSC pr 24 hours

Unadjusted difference in medians	SFR unit	OB unit	p value
Fathers' SSC pr 24 hr, median (Q1,Q3)	67 (11, 100) min	31 (0, 60) min	.05

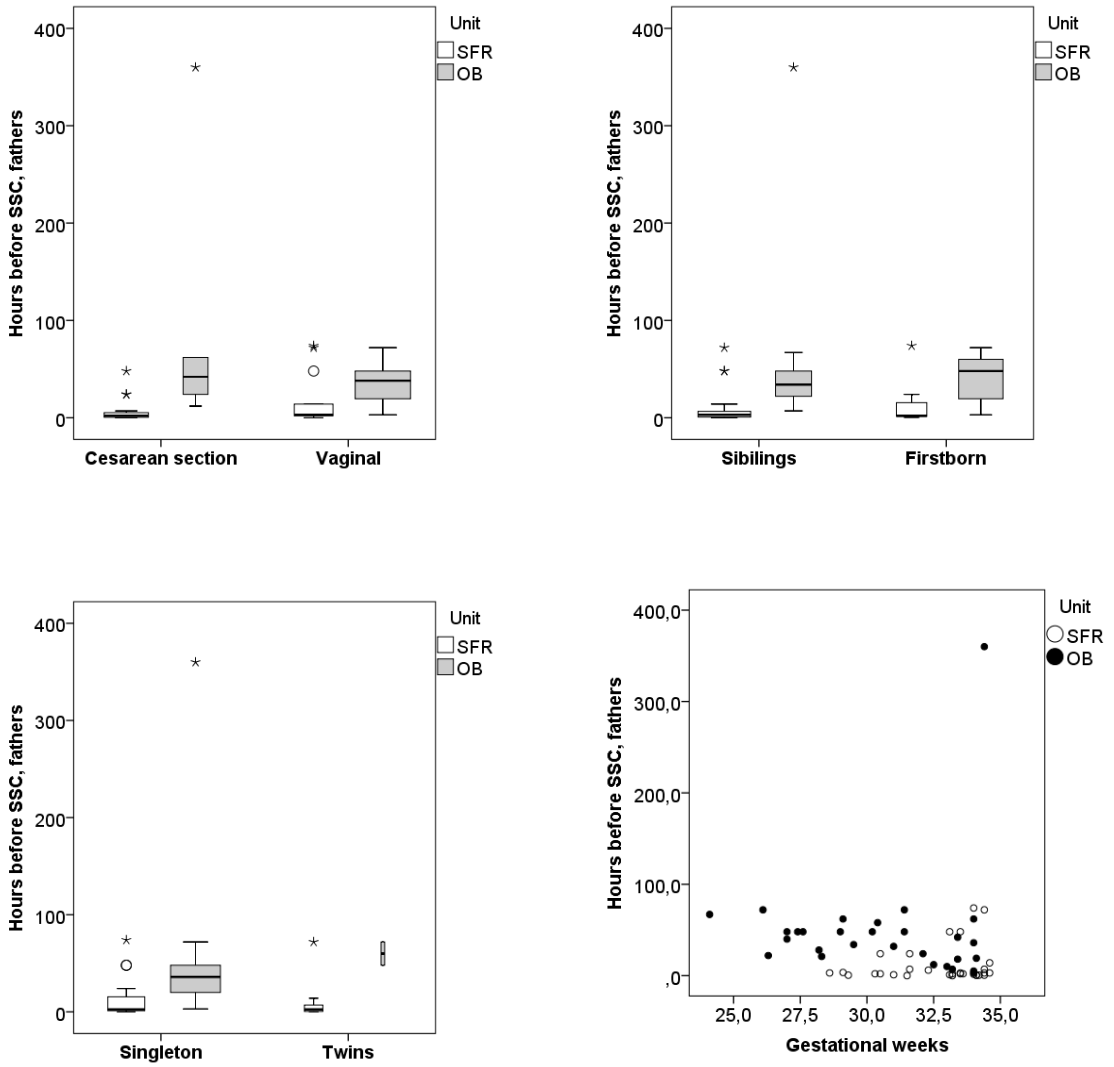


Explorative statistics showing the distribution of fathers' SSC time according to four possible confounders: Cesarean section/vaginal delivery (upper left), Siblings/Firstborn (upper right), Singleton/twins (lower left) and Gestational weeks (lower right).

Comments: The small numbers in the subgroups and skewness of the distributions makes it unfeasible to do a formal adjustment of the difference. The difference between the SFR and OB can be seen in all subgroups.

6. **Hours before SCC, fathers**

Unadjusted difference in medians	SFR unit	OB unit	p value
Hours before SSC after birth, fathers'median (Q1,Q3)	3 (1, 9) hr	40 (20, 53) hr	.004



Explorative statistics showing the distribution of fathers' SSC time according to four possible confounders: Cesarean section/vaginal delivery (upper left), Siblings/Firstborn (upper right), Singleton/twins (lower left) and Gestational weeks (lower right).

Comments: The small numbers in the subgroups and skewness of the distributions (partly due to some extreme values, in particular one value in the OB group) makes it unfeasible to do a formal adjustment of the difference. The difference between the SFR and OB can be seen in all subgroups.

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REGULAR ARTICLE

Single-family room design in the neonatal intensive care unit did not improve growth

Bente Silnes Tandberg (btandb@vestreviken.no)[1,2], Kathrine Frey Frøslie[3], Trond Markestad[2], Renèe Flacking[4], Hege Grundt[5], Atle Moen[1,6]

1.Department of Pediatric and Adolescent Medicine, Drammen Hospital, Vestre Viken Hospital Trust, Drammen, Norway
2.Department of Clinical Science, Faculty of Medicine and Dentistry, University of Bergen, Bergen, Norway
3.Norwegian Resource Centre for Women's Health, Oslo University Hospital, Rikshospitalet, Norway
4.School of Education, Health and Social Studies, Dalarna University, Falun, Sweden
5.Department of Pediatrics, Haukeland University Hospital, Bergen, Norway
6.Department of Neonatology, Oslo University Hospital, Oslo, Norway

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Family-centred care, Growth, Single-family room, Skin-to-skin contact, Very premature infant

Correspondence
BS Tandberg, Department of Pediatric and Adolescent Medicine, Drammen Hospital, Dronningt 28, 3004 Drammen, Norway.
Tel.: +4793010666 |
Fax: +4732862430 |
Email: btandb@vestreviken.no

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ABSTRACT

Aim: The aim was to compare growth in very premature infants cared for in a single-family room (SFR) and an open-bay (OB) unit. We recorded duration of parental presence and skin-to-skin contact as proxies for parental involvement in care of their infants.

Methods: We consecutively included infants with gestational ages 28 + 0 through 32 + 0 weeks at two hospitals in Norway, one SFR unit (n = 35) and one OB unit (n = 42). Weight, length, and head circumference were followed from birth to four months after term date. Both units adhered to the same nutritional protocol and methods of recording events.

Results: The SFR mothers spent a mean (standard deviation) of 111 (38) hours and the OB mothers 33 (13) hours with their infants during the first week and 21 (5) versus 7 (3) hours per day later. The respective duration of skin-to-skin care was 21 (10) versus 12 (8) hours during the first week and 4.2 (2) versus 3.0 (2) hours per day later. The differences were similar, but less pronounced for the fathers. The growth trajectories did not differ between the groups.

Conclusion: SFR care was associated with more parental involvement, but not with better growth.

INTRODUCTION

The physical environment in the neonatal intensive care unit (NICU) may influence short- and long-term outcomes in preterm infants (1–3). Involvement of parents (4), and family-centred care with parents as primary caregivers, has been associated with faster attainment of full enteral feeds (5) and weight gain (4). As opposed to open-bay (OB) units, single-family room (SFR) units protect the infant and parents from environmental stress and offer more privacy, which may facilitate long-term parent–infant closeness and skin-to-skin contact (SSC) (6,7). SFR design has been associated with more hours of maternal presence (8) improved weight gain (9), earlier feeding (10), reduced risk of infection and earlier discharge (11) and improved neurobehavioral and pulmonary outcomes (9,12,13). However, the results are conflicting and delayed language development has been reported after SFR care with limited parental presence (14).

In 2012, the NICU at Vestre Viken Hospital Trust (VVHT), Norway, was established as a SFR unit where parents could stay with their infant day and night from birth to discharge and participate as primary caregivers. From 2005, when the unit had an OB design, we registered weight at the postmenstrual age (PMA) of 34 weeks, at discharge, and at term date for infants with birth weights less than 1500 g and noted a substantial improvement in weight gain after the introduction of SFR care. We therefore hypothesised that a SFR

Abbreviations
CI, Confidence interval; HUH, Haukeland University Hospital; NICU, Neonatal intensive care unit; OB, Open bay; PMA, Postmenstrual age; SFR, Single-family room; SSC, Skin-to-skin contact; VVHT, Vestre Viken Hospital Trust.

Key notes
- Single-family room (SFR) encourages parent involvement but it is uncertain whether it improves growth in very premature infants.
- The SFR parents spent more time in the unit and in providing skin-to-skin care than parents in the open-bay unit, but the infants' growth trajectories were similar.
- We cannot exclude that a minimum of parental participation affects growth since the parents in both units spent much time with their infants.

design may improve growth through close parent–infant interaction, including more SSC.

Our aim was to compare growth velocities for weight, length and head circumference during and after hospitalisation in infants born prematurely at gestational ages 28 + 0 through 32 + 0 weeks who were cared for in an SFR and an OB unit. We recorded duration of parental presence and provision of SSC as indicators of parental involvement and adhered to the same protocols for nutrition and assessments.

PATIENTS AND METHODS

The SFR and OB units

In Norway, hospital care is financed through a public health insurance system and is free of charge for all citizens irrespective of income. No private neonatal intensive care is available. Parents also have extensive publicly financed social security benefits during pregnancy and when giving birth, and both parents are generally entitled job leave with full economic compensation during the hospitalisation of their infant. More than 90% of Norwegian children are in a kindergarten at day time; therefore, most siblings in our families would be expected to attend kindergarten during day time. Inclusion to the study started on May 1, 2014 and had to end on July 31, 2016, because the OB unit was moved to another building because the old paediatric department with the OB unit was demolished.

The SFR unit was located in Drammen and the OB unit at Haukeland University Hospital (HUH) in Bergen, Norway. Both units were located in maternity hospitals. At VVHT the infants were delivered in the same building and close to the NICU. At HUH the obstetric department was located in a different building 500 m from the NICU, and all infants requiring NICU care were transferred by ambulance. Both units provided care from birth until discharge for all infants born from a gestational age of 28 weeks within their hospital referral area. Both units encouraged and guided mothers in providing breast milk from day one and provided donor breast milk.

The SFR unit was built in 2012 and admits approximately 450 infants in 17 beds annually. It provides bathroom facilities for parents within the patient room area. Both parents can stay with their infant as long as they want, but mothers have to stay in the obstetric unit during the night until 48 hours after giving birth. All meals are provided without cost to both parents. Parents were encouraged and guided to provide SSC for as many hours as they wanted, and high-quality adjustable hospital beds were present for parents beside the infant's incubator or cot. Parents were also present and participated actively during daily rounds.

The OB unit was built in 1979 and was only modestly upgraded until the end of this study. It had 21 beds and admitted approximately 500 infants per year. Except for one single bedroom, which was used for particularly intensive or end-of-life care, the unit had two rooms; one for intensive- and intermediate care patients and one for care in cots before discharge home. The rooms were crowded, but one reclining armchair could be placed between incubators or cots, and screens could be placed around the family to provide some privacy. The parents had unlimited access at all hours, but they could not stay overnight in the unit. Mothers were accommodated in another building at the hospital after discharge from the maternity ward, and meals were only provided for the mothers. SSC was already established practice at both units for years before this study and was encouraged whenever parents were present.

Participants

To assure comparable cohorts, we limited the study to infants born at gestational ages of 28 + 0 through 32 + 0 weeks of families living in the respective catchment areas. The units were the only NICUs in their respective area. We excluded infants with congenital malformations, infants who experienced major complications such as intraventricular haemorrhage grade III/ IV or necrotising enterocolitis or who had a birth weight <800 g, in order to avoid infants with severe intrauterine growth restrictions and complex morbidities. We also excluded infants of parents who had a major mental illness or did not understand Norwegian language, infants of mother who had used illicit drugs or were on methadone during pregnancy and infants who were in the custody of the Child Protection Services from birth.

In both hospitals, gestational age was based on ultrasound assessment at 17–18 weeks of pregnancy, or on the last menstrual period if ultrasound assessment was not performed. The infants were recruited consecutively at admission. The parents received the same oral and written information and were included if both of them gave written consent within the second day. The study was approved by the Norwegian Regional Committee for Medical Research Ethics and registered in ClinicalTrials.Gov (NCT 02452580).

Nutrition

The units agreed on a common feeding protocol (Table S1 and Table S2). The goal was to give 80 mL/kg during the first 24 hours and thereafter increase the volume by 20 mL/kg/day until 180 mL/kg/day. Infants with a birth weight above 1250 g received full enteral feeds from day one, while infants with birth weights less than 1250 g received partial and decreasing parenteral nutrition for the first five days. Enteral feeds were started as either donor breast milk or preterm formula if breast milk was not available. Donor milk or preterm formula was replaced with the mother's own milk as production increased. A breast milk fortifier (FM85 Nestle®, Copenhagen Nordic, Denmark) was added to breastmilk according to protocol and continued until the infant weighed 2000 g or was fully breastfed. Subsequently, nutrition continued as breastmilk or a regular infant formula. Daily nutritional intake was registered from birth to PMA of 34 weeks, and nutrient intake was calculated according to our nutritional standards for breast milk and formula (15). Breastmilk feeding was registered as exclusive, partial or none at discharge, at expected term date, and at four months corrected age.

Assessments

Weight was registered daily, while crown to heel length and head circumference were measured at birth, after each completed week according to PMA until the PMA of 34 + 0 weeks, at discharge, at expected term date, and four months after expected term date. Weight was measured on electronic scales, which were routinely calibrated twice a year. Head circumference was measured with a nonstretch measuring tape and crown to heel length with the measuring tape at birth, at admission to the hospital, and when the infant was cared for in an incubator, but later with a stadiometer. The methods for measurements were standardised. All the infants were brought back for the measurements at term and all but one infant at each centre were brought back for the four months measurements. These measurements were performed by one person at each centre. The two remaining infants had their measurement at a public child healthcare clinic at four months. The infants were weighed naked. The number of skin-breaking procedures (heel lance, arterial and venous punctures) was also registered.

For each infant, both parents prospectively recorded the time present in the unit with their infant and the duration of SSC on the mother's or father's bare chest. Both periods were registered each day from birth to the PMA of 34 weeks in a closeness diary which was kept with the infant. In case of twins, each infant had a separate diary.

Statistics

The study was powered to examine the difference in mean weight at discharge between the SFR and OB units. In the pilot study at VVHT, the mean weight at discharge was 300 g higher in the SFR than in the OB unit. Based on an expected difference of 300 g, a power calculation suggested that 10 infants were needed in each group to obtain a significant result with a $p < 0.05$ and a power of 80%. However, the observed difference occurred in parallel with the reorganization of the unit within the hospital and was not necessarily representative when comparing the two units. We therefore chose to include up to total of 80 infants.

Data are presented as means with standard deviation (SD) and frequencies (percentages). We compared sample characteristics, nutritional intakes and measurements with two-sample *t*-tests and Pearson's chi-square tests. Mean differences in measures of growth velocities in weight, length and head circumference from birth to four months after expected term date were analysed with linear mixed models with random intercept and fixed effects for unit, PMA, and an interaction term between unit and PMA, that is, two-level models with weight, length or head circumference nested within each infant. The interaction term, interpreted as difference in growth slope (grams or mm per week) between the units was used to quantify velocities in weight, length and head circumference. In all models, a second-order polynomial term for PMA was added if significant. If such a term was added, we also checked for a corresponding interaction with unit. All models were also run with adjustments for differences in mode of delivery. Detailed information about the notation of the mixed model is provided (Appendix S1). The potential confounding effect of the difference between the groups in parental education was also explored but did not alter results. Due to the restricted number of infants in each of the units held up against the total number of parameters in the model, we did not include a formal adjustment for small for gestational age, multiples or first borne/siblings in the models. These parameters also had a similar distribution between the groups.

Mean differences in duration of parental presence and SSC until PMA of 34 weeks between the SFR and OB units were analysed in linear regression analyses. The main exposure was the unit (SFR or OB), and PMA at birth, mode of delivery (vaginal or caesarean section), parents education (elementary/high school or college/university).

Analyses of parental presence were done separately for mothers' and fathers' with an additional analysis of the cumulative parental presence and SSC for each infant.

Descriptive statistics, bivariate tests and linear regression models were done in SPSS statistic version 25 (IBM Inc., Armonk, NY, USA). The mixed-model analysis was done in The R Foundation software, version 3.5.0, using the function lme in the nlme package. A p value ≤ 0.05 was considered statistically significant.

RESULTS

Of 51 neonates admitted to the SFR unit, 15 did not fulfil the inclusion criteria, and the parents of one eligible neonate declined, leaving 35 neonates and 60 parents in the study. Of 69 neonates in the OB unit, 18 were not eligible, and the parents of nine eligible infants either declined (7) or withdrew (2), leaving 42 neonates and 72 parents in the study (Fig. 1). All the infants were cared for in their respective NICUs from birth until discharge.

The only significant differences between the infants in the OB and SFR units were that: both parents had higher education, the mean gestational age at birth was four days lower and the proportion of infants delivered by caesarean section was lower while the proportion treated with mechanical ventilation and the number of skin-breaking procedures were higher in the OB group. There were no significant differences between the units in the proportion of infants born small for gestational age, prevalence of bronchopulmonary dysplasia (Bancalari criteria), culture verified sepsis or length of stay (Table 1).

Due to an unexpected lack of banked breast milk, which was replaced with preterm formula during the first months of the study, the infants in the OB unit received significantly more protein and carbohydrates than the infants in the SFR unit during the first week of life (Table 2). The difference was moderate and did not result in different weight loss or time to regain birth weight (Table 3). There were no

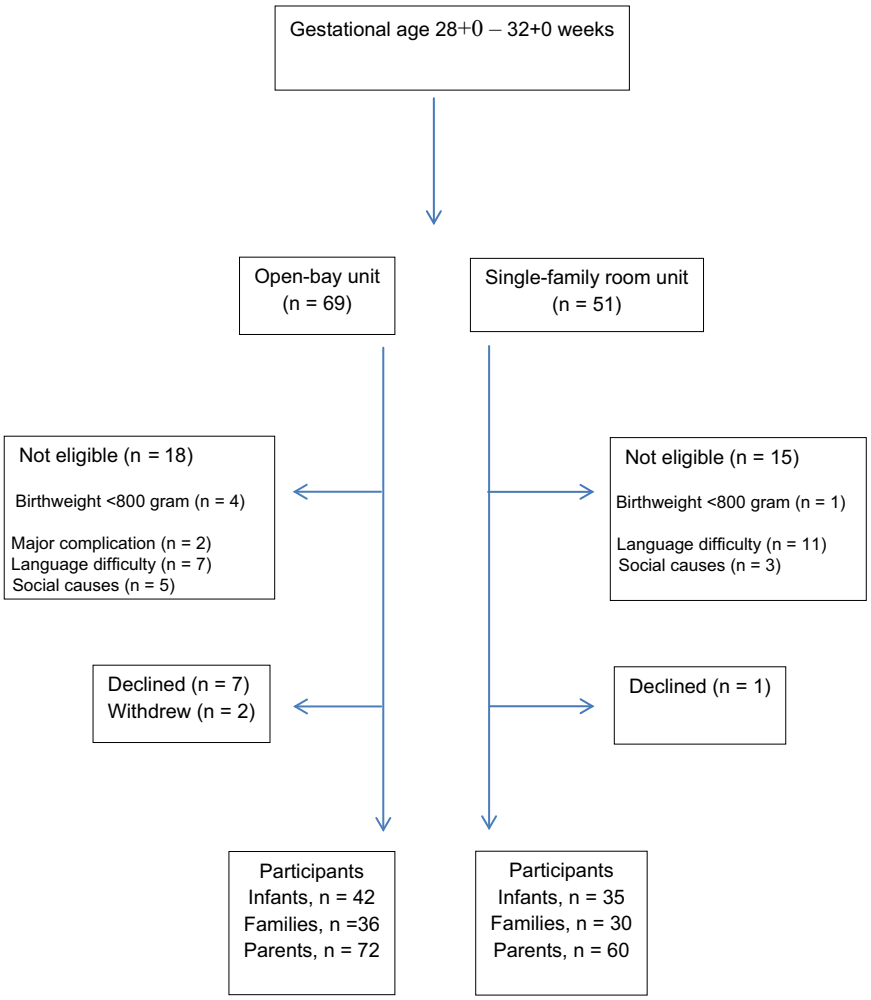

Figure 1 Flow diagram of participant recruitment.

differences in nutrient intake after the first week until the PMA of 34 weeks, or in the proportions of infants receiving breastmilk and regular formula at discharge, term date or four months after term date (Table 2).

On average, both the mothers and fathers in the SFR unit spent 80 more hours with their infant than the parents in the OB unit during the first week. After the first week, until the PMA of 34-week mothers spent 14 hours and fathers nine more hours in the SFR unit (Table 4). Adjustments for mode of delivery and gestational age or parental education did not alter these differences.. The duration of SSC was also significantly higher for the mothers in the SFR unit. For fathers, the difference of duration of SSC was not significant after the first week (Table 4).

There were no significant differences in mean weight, length or head circumference at birth or at PMA of 34 weeks, discharge, term date or four months after term date (Table 2). Adjustments for gestational age and mode of delivery did not alter the differences significantly (data not shown). The individual variation in growth curves was much larger than the variation between units (Fig. 2). A linear model for weight fitted the data well and the growth slope did not differ between the units (the adjusted estimate for difference in slope was 4.0 g/week [95% Confidence interval (CI): −5.0, 13.0, p = 0.38]. For length and head circumference, a polynominal term for PMA was added (Fig. 2B,C), but there was no interaction with unit, and the slopes did not differ between the units; the adjusted estimate for difference between the slopes was 0.32 mm/week (95% CI: −0.02, 0.67, p = 0.06) for length and 0.03 mm/week (95% CI:−0.19, 0.24, p = 0.79) for head circumference.

DISCUSSION

The two involved NICUs had the most modern and the most outdated design among NICUs in Norway. The parents in the SFR unit spent significantly more time with their infants and in provided more SSC than the parents in the OB unit, but despite these differences, the infants had similar developmental trajectories for weight, length and head circumference from birth until four months after expected term date.

Table 1 Characteristics of the families and infants treated in the single-family room (SFR) and open-bay (OB) units

Variable	SFR unit (n = 35)	OB unit (n = 42)	p-value*
Parents			
Mothers' age, years, mean(SD)	31 (7)	32 (6)	0.38
Fathers' age, years, mean (SD)	36 (10)	34 (7)	0.45
Single mother, n (%)	0 (0)	1 (2)	0.66
Norwegian first language, n (%)			
Mothers	28 (80)	39 (93)	0.21
Fathers	30 (86)	39 (93)	0.30
Education level, n (%)			
Mothers			
Elementary	4 (13)	0 (0)	0.015
High school	10 (33)	10 (30)	
College/university	15 (50)	23 (70)	
Fathers			
Elementary	3 (10)	0 (0)	0.012
High school	15 (50)	12 (38)	
College/university	12 (40)	20 (63)	
Infant			
Delivered by caesarean section, n (%)	25 (71)	20 (48)	0.04
Primipara, n (%)	8 (23)	11 (34)	0.64
Male sex, n (%)	19 (54)	15 (36)	0.11
Twins, n (%)	10 (29)	18 (43)	0.30
Small for gestational age†, n (%)	7 (20)	10 (24)	0.69
Gestational age, Weeks + days; mean (min, max)	30.5 (28.2, 32.0)	30.1 (28.1, 31.6)	0.03
PMA‡ at discharge, days, mean (SD)	252 (9)	255 (14)	0.34
Length of stay, days, mean (SD)	37 (11)	45 (18)	0.16
BPD, n (%)	0 (0)	2 (5)	0.20
Mechanical ventilation, n (%)	0 (0)	9 (22)	0.01
Ventilation, days, mean (SD)	0 (0)	0.3 (0.7)	0.01
Skin-breaking procedures§, mean (SD)	10 (3)	20 (9)	0.01
Septicaemia, n (%)	0 (0)	1 (2)	0.36
Breastmilk feeding, n (%)			
At discharge			
Exclusive	26 (77)	29 (69)	0.45
Partial	5 (15)	5 (12)	
None	3 (9)	8 (19)	
At expected term date			
Exclusive	20 (61)	18 (45)	0.61
Partial	6 (18)	11 (28)	
None	7 (21)	11 (28)	
Four months after term date			
Exclusive	5 (15)	4 (11)	0.42
Partial	14 (42)	13 (33)	
None	14 (42)	23 (58)	

*Two-sample *t-test* or Pearson's chi-square tests.
†Below the 10 th percentile.
‡Postmenstrual age.
§Heel lance/arterial/venous punctures.

Table 2 Macronutritions (means and SDs) per kg weight from birth to PMA of 34^0 weeks'

	SFR unit (n = 35)	OB unit (n = 42)	p-value*
First eight days			
Energy, kcal	703 (40.0)	735 (93.0)	0.06
Protein gram	15.5 (3.1)	17.7 (4.9)	0.03
Fat gram	37.8 (3.5)	37.7 (8.2)	0.94
Carbohydrates gram	73.4 (4.5)	80.0 (8.1)	0.01
Per day from the 8th day			
Calories, kcal	169 (27.0)	165 (21.0)	0.51
Protein gram	4.3 (0.8)	4.3 (0.7)	0.69
Fat gram	8.3 (1.4)	8.0 (1.2)	0.47
Carbohydrates gram	19.0 (3.0)	18.3 (2.7)	0.29

*Two-sample *t*-tests.

Table 3 Weight (gram), length (cm) and head circumference (cm) from birth to four months after term date in infants cared for in single-family room (SFR) and open-bay (OB) units

	SFR unit (n = 35)	OB unit (n = 42)
Birth		
Weight	1452 (301)	1382 (274)
Length	39.6 (2.7)	39.0 (2.3)
Head circumference	28.5 (1.6)	27.9 (1.9)
Postnatal weight loss	131 (66)	126 (92)
Days to regain birth weight	9 (3)	10 (3)
PMA 34 weeks		
Weight	1999 (269)	1984 (249)
Length	43.1 (1.8)	42.8 (2.3)
Head circumference	31.2 (1.0)	30.9 (1.0)
Discharge		
Weight	2271 (299)	2317 (297)
Length	45.4 (1.8)	45.0 (1.8)
Head circumference	32.7 (1.7)	32.6 (1.4)
Term date		
Weight	3346 (496)	3323 (454)
Length	49.3 (2.3)	49.8 (2.2)
Head circumference	35.8 (1.2)	35.8 (0.9)
Four months after term date		
Weight	6643 (807)	6686 (992)
Length	62.7 (2.8)	63.3 (2.5)
Head circumference	42.7 (2.9)	42.1 (2.5)

Data presented as means (SDs).

The strengths of this study were the uniform rights of parents and infants to health care and social benefits, the strict inclusion of comparable infants, the same nutrition protocol and uniform ways of registering nutritional practices, growth, parental presence and SSC. The method for recording presence and SSC through self-reports has been shown to be more reliable than registration recorded by nurses (16). Furthermore, we consider it important that the units were located in different parts of the country and without cooperation beyond this specific project. A randomized-controlled trial within one NICU would have introduced a great risk of bias since positive and negative expectations from staff and parents related to what was perceived as the superior treatment, could have

contaminated the study (17). The higher proportion of ventilated infants in the OB unit was probably due to the need for safe stabilisation before transportation since all the infants had to be transported in an ambulance from the maternity ward to the NICU. However, the time on mechanical ventilation was very short and does not indicate more severe airway disease. There was a difference in the number of skin-breaking procedures, which may be due to different routines or an effect of parents questioning the necessity of tests in the SFR unit. No other data indicated differences in disease severity between the two units. Further, there were no differences in infants receiving mothers' milk. The similar growth makes it unlikely that a study with a higher number of participants would have disclosed clinically significant differences. However, since the study did not include extremely preterm infants or infants with major morbidity, we cannot exclude a beneficial effect on growth when caring for more vulnerable infants.

We succeeded in providing macronutrients at or above recommendations for premature infants (18). Still, the infants in both groups did not attain a mean weight near the 50th percentile for intrauterine growth for Norwegian infants at the PMA of 34 weeks or at expected term date (19,20). In a setting with suboptimal nutrition or severe growth restriction due to medical complications, we cannot exclude a potential benefit of stress reduction in the infant from extensive parental involvement in a SFR setting.

The lack of effect on growth in our study is contrary to the findings of Lester et al. (9). They found positive effects of SFR care on growth, morbidity, neurobehavioral outcome and parental health (9,12,13). However, their study design compared outcomes before and after reallocation from OB to SFR care. A design with an asynchrony in time between a control and a study group may be particularly sensitive to gradual and unrecognised changes in many practices, including nutrition, which was probably the reason why we observed an increase in weight at PMA of 34 weeks when moving from an OB to a SFR unit.

Our hypothesis of a positive effect of SFR care on growth was based on an assumption that less strain from environmental stressors and increased positive sensory stimulation from the parents and other effects of SFR care would leave more energy for growth. There is evidence of improved clinical stability during hospitalisation and of better short-

Table 4 Hours (SD) of parental presence and skin-to-skin care (SSC) in single-family room (SFR) and open-bay (OB) units

	SFR unit Mean hours (SD)	OB unit Mean hours (*SD*)	Adjusted mean difference*	95% CI	p-value
Presence					
Mother first week	111 (38)	33 (13)	82	72, 91	0.000
Father first week	115 (39)	31 (13)	78	62, 95	0.000
Mothers' per day until 34 weeks' PMA	21 (5)	7 (3)	14	13, 15	0.000
Fathers' per day until 34 weeks' PMA	16 (6)	5 (2)	9	9, 13	0.000
Skin-to-skin contact					
Mother first week	21 (10)	12 (8)	11	7, 15	0.000
Father first week	13 (7)	8 (5)	4	0, 8	0.003
Parents' per day until 34 weeks' PMA	6.0 (2)	4.4 (2)	1.9	1, 3	0.000
Mothers' per day until 34 weeks' PMA	4.2 (2)	3.0 (2)	1.6	0.7, 2	0.000
Fathers' per day until 34 weeks' PMA	1.8 (1)	1.4 (1)	0.4	−0.1, 0.9	0.091

*Adjusted for mode of delivery (vaginal vs caesarean section), gestational age, parents education (elementary/high school or college/university) in linear regression analysis.

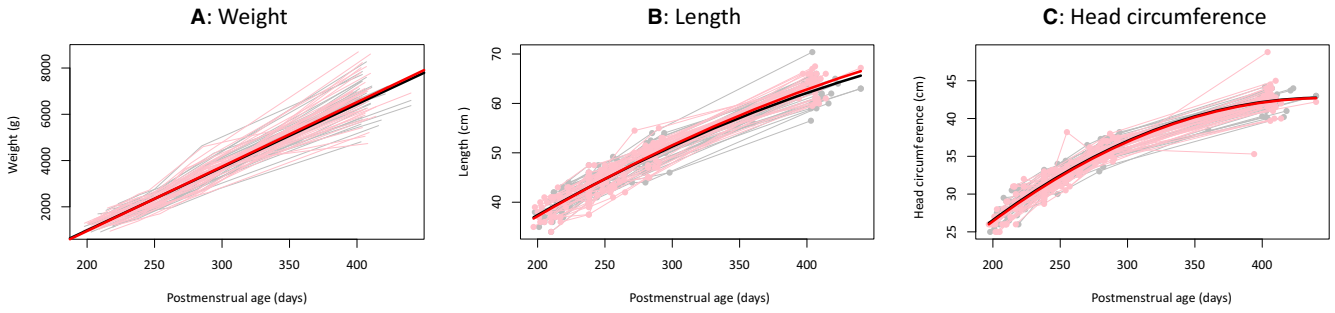

Figure 2 A–C. Individual growth trajectories from birth to PMA of four months'. Dots are measurements of the infants at birth, PMA of 34 weeks', discharge from the hospital, term date and four months after term date; the grey colour represents the single-family room (SFR) unit, and pink represents the open-bay (OB) unit. The grey and pink lines are the interpolation lines for individual growth trajectories. The black and red lines are the expected growth in the SFR and OB units, respectively, as estimated from a linear mixed model with random intercept and fixed effects for unit, PMA, and an interaction term between unit and PMA.

and long-term outcome if SSC and family-centred care are practiced on a daily basis (4,21). Both our and other studies (7) concluded that SFR care facilitate early and prolonged parental presence and involvement, and Lester et al. (12) suggested that these factors, together with developmental support, were the main mediators of the positive effects of SFR care. A possible explanation for the lack of difference on morbidity and growth between our two groups may be that family-centred care and SSC were practiced quite extensively in both units and that there may be a threshold for positive effects at less involvement than in our OB groups. Indeed, Cong et al. (22) reported that one hour of SSC per day was associated with improved cognitive and neurobehavioral outcome. In a meta-analysis, Boundy et al. (23) found that SSC had a long-term positive effect on head growth and weight, but there were major methodological issues such as a lack of detailed information about interventions and heterogeneity in the components of SSC and conventional care, and only a few studies were from high-income countries. SSC has also been associated with improved short-term clinical stability and decreased stress during procedures (21,24) as well as hormonal changes suggestive of reduced stress in parents and their infants (22). However, neither potential biological mechanism (25) nor dose–response relationship are known (21).

The relationship between the design of the unit and the culture of care are not independent of each other. We found care in SFR unit promotes parental involvement, including extensive presence and SSC. However, our study also documented that extensive presence and SSC can be accomplished in a traditional and crowded OB unit. Dedicated staff and extensive social security benefits for the families were probably important contributing factors. Our results should therefore be interpreted in the socioeconomic context of a publicly financed healthcare system with extensive benefits for parents and children. Future research should also study the effect of social security systems and benefits for parents on infant outcomes and parents role in the NICU.

CONCLUSION

For the infant to gain full advantage of the benefits of SFR care, it requires a social security system for parents allowing them to be present with their infant for longer periods every day. The families in the SFR unit spent substantially more time with their infants and in providing SSC than the families in the OB unit, but the growth trajectories of the infants did not differ.

FUNDING

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CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article:

Table S1 Feeding protocol if infants <=1250 g.
Table S2 Feeding protocol > 1250 g.
Appendix S1 Detailed information about the notation of the mixed model.

Supplement paper II

Detailed information about the notation of the mixed model

Specifically, the estimated growth trajectories in Figure 2A were based on the estimated fixed effects from the equation

$$y_{ij} = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \beta_3 x_{1i} x_{2i} + b_{0i} + \varepsilon_{ij},$$

where $i = 1, \ldots, n,\ j = 1,2, \beta_0, \beta_1, \beta_2$ and β_3 are the fixed effects, x_1 is the unit, x_2 is the PMA, $b_{0i} \sim N(0, \sigma_{b_0}^2)$ and $\varepsilon_{ij} \sim N(0, \sigma^2)$.

The variable "mode of delivery" was highly non-significant, and was therefore not included in the equation when we estimated the lines for the figure.

Similarly, the estimated growth trajectories in Figure 2B were based on the estimated fixed effects from the equation

$$y_{ij} = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \beta_4 x_{2i}^2 + \beta_3 x_{1i} x_{2i} + b_{0i} + \varepsilon_{ij},$$

No interaction with unit was found for the second-order polynomial term for PMA, and such a term was therefore not included in the equation when we estimated the lines for the figure.

The estimated growth trajectories in Figure 2C were based on the same equation as used for Figure 2B.

PLOS ONE

RESEARCH ARTICLE

Parent psychological wellbeing in a single-family room versus an open bay neonatal intensive care unit

Bente Silnes Tandberg[1,2,3]*, **Renée Flacking**[4], **Trond Markestad**[3], **Hege Grundt**[5], **Atle Moen**[1,6]

1 Department of Paediatric and Adolescent Medicine, Drammen Hospital, Vestre Viken Hospital Trust, Drammen, Norway, **2** Lovisenberg Diaconal University College, Oslo, Norway, **3** Department of Clinical Science, Faculty of Medicine and Dentistry, University of Bergen, Bergen, Norway, **4** School of Education, Health and Social Studies, Dalarna University, Falun, Sweden, **5** Department of Paediatrics, Haukeland University Hospital, Bergen, Norway, **6** Department of Neonatology, Oslo University Hospital, Oslo, Norway

* btandb@vestreviken.no

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Data Availability Statement: There are ethical or legal restrictions on sharing a de-identified data set. Data from the study are available upon request, as there are legal restrictions on sharing these data publicly due to the data containing sensitive and identifiable information. The data set contains information like birthweight, gestational age, birth data and gender - information that may be used to directly identify individuals, as Norway is a small country and the two health region even smaller, and as preterm birth applies to relatively few individuals in each hospital each year. In the informed consents signed by the guardians of the

Abstract

Background

Studies of parents' psychological well-being in single-family rooms in neonatal intensive care units have shown conflicting results.

Aims

To compare emotional distress in the form of depression, anxiety, stress and attachment scores among parents of very preterm infants cared for in a single-family rooms unit vs an open bay unit.

Study design

Prospective survey design.

Subject

Parents (132) of 77 infants born at 28 0/7–32 0/7 weeks of gestation in the two units.

Outcome measures

Duration of parental presence was recorded. Scores for depression (The Edinburgh Postnatal Depression Scale), anxiety (The State–Trait–Anxiety Inventory, Short Form Y), stress (The Parent Stressor Scale: neonatal intensive care unit questionnaire and The Parenting Stress Index—short form) and attachment (Maternal Postnatal Attachment Scale) measured 14 days after delivery, at discharge, expected term date and four months post-term.

Results

Parents were present 21 hours/day in the single-family room unit vs 7 hours/day in the Open bay unit. Ninety-three percent of the fathers in the single-family rooms unit were present

participant of this study, and granted by the regional committee for medical ethics in Helse Sør Øst, guardians were not asked about data sharing. Researchers interested in the data may contact the Privacy protection officer in Vestre viken Hospital Trust, Jens Kristian Jebsen at personvern@vestreviken.no and the ethics committee that approved the study (post@helseforskning.etikkom.no) and provide the reference: 2013/1076/REK sør-øst C.

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Competing interests: The authors have declared that no competing interests exist.

Abbreviations: EPDS, The Edinburgh Postnatal Depression Scale; **MPAS**, Maternal Postnatal Attachment Scale; **NICU**, Neonatal intensive care unit; **OB**, Open bay; **PSI**, The Parenting Stress Index—short form; **PSS NICU**, The Parent Stressor Scale: neonatal intensive care unit questionnaire; **SFR**, Single-family room; **SSC**, Skin-to-skin contact; **STAI**, The State–Trait–Anxiety Inventory, Short Form Y.

more than 12 hours per day during the first week. Mothers in the single-family rooms had a significantly lower depression score -1.9 (95% CI: -3.6, -0.1) points from birth to four months corrected age compared to mothers in the Open bay unit, and 14% vs 52% scored above a cut-off point considered being at high risk for depression ($p<0.005$). Both mothers and fathers in the single-family rooms reported significantly lower stress levels during hospitalization. There were no differences between the groups for anxiety, stress or attachment scores after discharge.

Conclusion

The lower depression scores by the mothers and lower parental stress scores during hospitalization for both parents supports that single-family rooms care contribute to parents' psychological wellbeing.

Introduction

Parents of preterm infants often face immediate and prolonged separation from their babies during hospitalization. The post-partum emotional response of both the mother and the infant is rooted in instincts programmed by evolution to secure survival and safety of the mammalian off-spring, and separation may induce distress and fear in both[1, 2]. Compared to other mammalian species, the brain of the human newborn is larger and more adaptable, but also particularly immature and dependent on caregiving behaviours and a nurturing environment [3]. There is increasing evidence that early experience and stimulation may influence long-term outcomes and the mechanism may at least partly be related to the rapid development of the brain during infancy and most pronounced in infants born preterm [4]. Stressors during the neonatal intensive care unit (NICU) hospitalisation may affect regulation of the hypothalamic-pituitary-adrenal axis, which is our central stress response regulating system, as well as general brain development [5, 6]. The bonding and interaction between infants and their mothers are also important for healthy developmental trajectories [3]. Over the last two decades the principles of family-centred care have gradually been implemented in the care of premature and sick newborn infants [7, 8] and in 2018, the European Foundation for the Care of Newborn Infants (EFCNI) launched the European standards of care for newborn health, defining family-centred care and a physical environment that allows extensive parental presence and participation as the European standard of care for hospitalized newborn infants [9, 10]. Parental presence also brings care in accordance with the UN Convention on the Rights of the Child, Article 7, acknowledging the infant's right to be cared for by his or her parents [11]. However, there are large variation between units in parental presence and involvement, also in units claiming to work in accordance with family-centred principles [12, 13].

The number of NICU's with a single patient or single-family room design (SFR) is growing. The medical and psychological benefits of including parents in care have been well documented [14], and one study in particular has provided evidence for both short- and long-term medical benefits of SFR care [15–17]. Parents' participation in care may also be beneficial for parents' own mental health [14, 16]. However, Pineda et al. [12] and Domanico et al. (13) showed an increase in parental stress and isolation when infants were treated in single-patient rooms. Even though parental presence increased with a SFR design, the time of parental presence in these studies was low, in particular the time providing active care, holding and skin-to-

skin contact (SSC) [18, 19]. Pineda et al. have even indicated adverse findings on MRI and neurodevelopmental outcome at two years after care in single-patient rooms [20]. However, in this unit single room care was carried out with very limited parental presence and family participation compared to what is commonly seen in a Scandinavian NICUs [21]. Although most NICU professionals may acknowledge that parent participation is warranted, there is no consensus on how much presence and active participation in care parents can and wish to provide. It is well documented that parents of preterm infants may experience mixed emotions, causing symptoms of stress, anxiety and/or depression [22, 23]. In this study, we have used parents' self-reports of depression and anxiety, stress and negative influence on attachment as indicators of emotional distress.

Differences in parental outcomes may be influenced by external policy factors such as rights to parental leave and access to health insurance, and by socio-economic differences that are not directly observable by parents or the NICU staff. In addition, differences in infant morbidity between studies may contribute. No studies have explored the effects on emotional distress when both parents live with their infant all or most of the day from birth to discharge, and we therefore designed a controlled study of parents' emotional distress in two different units providing care in accordance with the principles of family-centred care. One unit had a SFR design; the other was an old unit with an open bay (OB) design.

We hypothesized that parents participating actively in care through continuous presence in a SFR unit did not experience more emotional distress than parents in an OB unit who spent less time with their infant.

Materials and methods

We have previously reported effects of SFR design on parental presence, infant growth trajectories, morbidity, medical procedures and nutrition [24]. In the present study, we report parents' emotional reactions to continuous presence, using questionnaires to screen for the risk of depression, anxiety, stress and attachment, and we provide a more in-depth description of parental presence. Both participating units were located in maternity hospitals and provided care until discharge.

The units

In 2012, the NICU at Vestre Viken Hospital Trust, Drammen, Norway, was established as a SFR, allowing parents to stay with their infant day and night from birth to discharge and to participate as primary caregivers. The unit provided care from birth for infants with gestational age (GA) $\geq$ 28.0 weeks and admits approximately 450 infants in 17 beds annually. Each room has two different areas; one infant-area with a place for the incubator or cot, sink, nursing table, and equipment (CPAP, pumps, ventilators), in addition to a parent-area with two high-quality hospital beds (105 cm wide electrically adjustable). Separate bathrooms are included in all SFRs. At day time, there is no physical separation between the parent and infant area and equipment are mounted on flexible arms allowing easy and secure transfer of the infant from the incubator to the parents' bed without disconnecting medical equipment. During night time, parents can close flexible folding doors to the sleeping area, while nurses still have direct access to the infant without interrupting parents (pictures of the SFR unit are presented as supplement, S1a–S1c Picture). All meals were provided without cost to both parents. At the time of the study, parents had access to a psychologist working part time at the unit and to weekly parent meetings with other parents. The unit was staffed with five consultants having 50% of their clinical service in the unit and 62 registered nurses of whom 24% were specialists

in intensive care, paediatrics, or neonatal nursing. Parents were present and participated actively during daily rounds.

The OB unit was located at Haukeland University Hospital in Bergen, Norway, and provided care from birth for infants with GA $\geq$ 23.0 weeks. The OB unit was built in 1979 and underwent no subsequent major changes. It had 21 beds and admitted approximately 500 infants per year. Except for one single-bed room used for high-intensive or end-of-life care, the unit had two rooms; one for intensive- and intermediate care infants and one for care in cots before discharge to home. The rooms were crowded, but one reclining armchair could be placed between incubators or cots, and screens could be placed around the family to provide some privacy. The parents had unlimited access at all hours, but they could not stay overnight in the unit. Mothers were offered accommodation in another building at the hospital area after discharge from the maternity ward. Free meals were provided only for mothers. A psychologist was available upon special request. The number of neonatologists in full time position was 3.5 and 64% of nurses were specialist nurses. Parents were not routinely involved in medical rounds.

Although the facilities available for parents to room in were different, both units had an explicit policy of allowing parents unlimited access and to stay with their infant for as long as they wanted. SSC was strongly encouraged in both units. Both units encouraged and guided mothers to provide breastfeeding from day one.

Norway has extensive social benefits related to pregnancy and birth. Health care insurance is publicly funded, hospital care is free of costs and both parents are allowed full job-leave with compensation for salary-loss during hospitalization with their infant. Parents also have 48 weeks of fully paid parental leave shared between them after discharge from the NICU.

Participants

Parents of infants born at 28 0/7–32 0/7 weeks of gestation with the mothers' address in the hospitals' respective catchment areas were eligible for inclusion. Infants with congenital malformations or major complications (intraventricular haemorrhage grade III/ IV or surgically treated necrotizing enterocolitis) and infants with birth weight less than 800 grams were excluded. We also excluded infants if one or both parents suffered from a major mental illness or did not understand Norwegian language, infants of mothers who had taken illicit drugs or were on methadone during pregnancy and infants in the custody of the Child Protection Services from birth. Both parents received oral and written information about the study, and they were included if both gave written consent by the end of the second day post-partum. In the SFR unit, 60 parents of 35 neonates were included and in the OB unit 72 parents of 42 neonates were included consecutively. Inclusion to the study started on May 1, 2014 and ended on July 31, 2016 as the OB unit was moved to another building with better facilities (Fig 1).

The study was approved by the Norwegian Regional Committee for Medical Research Ethics and registered at ClinicalTrials.Gov (NCT 02452580).

Data collection

For each infant, both parents prospectively recorded time present in the unit with their infant and the duration of SSC on the mother's or father's bare chest. From birth to postmenstrual age of 34 weeks, both periods were registered each day in a closeness diary lying next to the infant. Twins had separate diaries. Continuous presence was defined as presence for more than 12 hours a day for each parent.

Parents were asked to complete a set of questionnaires at 14 days post-partum, at discharge, at term date and at four months after term date. If one parent did not participate in a follow-

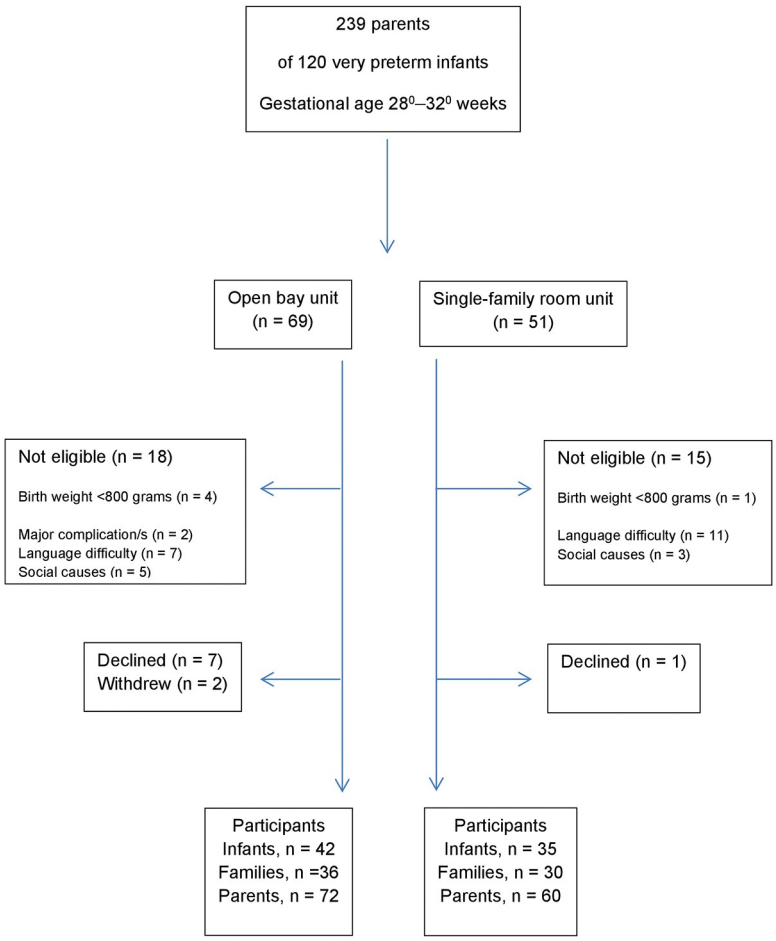

Fig 1. Flow diagram of participant recruitment.

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up consultation after discharge, the questionnaires were brought home with the participating parent along with a stamped envelope and returned by post to the project manager. For twins parents answered one set of questionnaire.

1) *The Edinburgh Postnatal Depression Scale (EPDS)* [25] aims to identify depressive symptoms in pregnant women or women who have recently given birth. The EPDS is validated for use in a Norwegian population [26, 27]. The range of score is 0–30 and the score increases with a increasing symptoms. We applied a cut off score $\geq$ 13 giving a sensitivity of 77% and specificity of 94% in detecting symptoms of depression [28].

2) *The State–Trait–Anxiety Inventory*, *Short Form Y (STAI SF)* measures symptoms of anxiety in adults [29]. The short version contains six statements, three items with anxiety present and three with anxiety absent, which the respondents rate on a scale from 1 to 4 [30]. The range of the total STAI score is 20–80 and it increases with increasing symptoms. Scores below 36 is considered normal [31]. STAI SF has demonstrated reliability and validity in study samples of parents with sick infants [32].

3) The Parental Stressor Scale: *NICU (PSS*: *NICU)* [33, 34] measures stress experienced by parents during hospitalization related to alterations in their parental role, the appearance and behaviour of their child, and sights and sounds of the unit. Parents are asked to rate items on a five-point scale ranging from "not at all stressful" to "extremely stressful". “Sights and sounds

of the environment" and "Infant's appearance" are scored as one sub-scale, with scores ranging from 20 to 100. "Parental role alteration" has a range of scores from 7 to 35. The tool has been shown to predict depressive symptoms [34] and a moderate correlation with state anxiety [35] and has also been validated for a European population [36].

4) *Parenting Stress Index (PSI- SF)*. The short form (36 questions) of PSI is a widely used clinical and research self-report questionnaire to identify stress due to parental factors or deviant development of the child [37, 38]. The questionnaire includes a parent domain (i.e. social isolation, attachment to the child, health, role restriction, depression and partner) and a child domain (i.e. distractibility/hyperactivity, adaptability, how demanding the child is perceived to be, mood and acceptance). The total score ranges from 18 to 90 and higher scores indicate higher levels of parent-related stress. A total score between 52 and 90 is considered to represent a high-risk level, whereas scores from 18 to 44 are considered low-risk/normal [39].

5) *The Maternal Postnatal Attachment Scale* (MPAS) evaluates the mother's subjective feeling of attachment ("the emotional tie") to the infant (40). In this study, fathers also were asked to complete the MPAS. The instrument consists of 19 statements referring to three different factors: *patience and tolerance*, *pleasure in interaction* and *affection and pride*. The respondents indicate to what extent (always, very often, often, sometimes) the statements match their perception. The possible range of scores is 19 to 95, higher scores indicating more attachment. At term date, the mean normal score was 83 (range 56–95) and at four months post-term it was 85 (range 59–95) [40].

The STAI and MPAS tools were translated into Norwegian with forward and backward translation. For PSS: NICU, a former Norwegian translation was used.

Questionnaires were not returned by: 2% and 13% of the mothers and fathers, respectively, at day 14; by 3% and 16% at discharge; by 18% and 27% at term; and by 20% and 17%, respectively, at four-month corrected age. There were no significant differences between the two groups in the number of unreturned questionnaires.

Statistics

The SFR and OB units were compared by independent sample t-tests, Mann-Whitney tests or Pearson's chi-square tests, according to distribution of the data. Two baseline characteristics were unequally distributed in the groups (mode of delivery and education). Therefore, in addition to the main explanatory variable (the SFR or the OB unit), mean differences in outcome measures (parents' answers to the questionnaire) were analysed with a linear mixed model. This model included repeated measurements and thereby the effects of time, and took into account the correlation structure and dependency between the repeated measurements. The model treated each of the measurements (scores from the different questionnaires from birth to four months after expected term date) as level one and the individual parent as level two. This is a two-level model with fixed effects for unit, time, mode of delivery (vaginal or caesarean section) and parental education (elementary, high school and college/university). In the mixed model, we used the autoregressive covariance structure (AR1) because the correlations between adjacent time points were higher than the correlations between measurements at time points further apart. Model assumptions (collinearity, residuals and outliers) were thoroughly checked. Results were given as an estimate of the mean difference between the OB and SFR units, adjusted for confounders with corresponding 95% confidence intervals. For the questionnaires, EPDS, STAI and MPAS missing values of the inventory were replaced by the mean value from remaining items when no more than one was missing from the sub scale.

One item on each of the two different sub-scales in the PSS: NICU ("Sights and sounds of the environment and Infant appearance"; and "Parental role alteration") were systematically

missing because of a technical failure when distributing this questionnaire to parents in both units. The two items ("My baby's unusual or abnormal breathing patterns" and "Not being able to hold my baby when I want") were replaced by the remaining items on each of the sub-scales, after agreement with the author, Dr M. Miles (e-mail correspondence dated 05.09.2018). For the PSI, which contains several domains, answers were replaced with the mean value from the other score within each domain if no more than two item answers were missing from the parent domain and no more than one item from the child domain. The statistical significance was set at a p-value of <0.05.

Mean differences between the SFR and OB units in duration of parental presence and SSC until postmenstrual age of 34 weeks were determined in linear regression analyses. The main exposure was the unit (SFR or OB), and the outcomes were adjusted for postmenstrual age at birth, mode of delivery (vaginal or caesarean section) and parents' education (elementary/high school or college/university). Analyses of parental presence were performed separately for mothers and fathers, with an additional analysis of the cumulative parental presence and SSC for each infant. All analyses were done in SPSS Statistics version 25 (IBM, Inc., Armonk, NY, USA).

Results

The SFR parents had a lower level of education, a higher proportion of the infants were delivered by caesarean section and their mean GA was slightly higher (Table 1).

During the first week, both parents in the SFR unit were present for a mean of 20 hours per day, while the parents in the OB unit were present for a mean of four hours (Fig 2).

Eighty-seven percent of the mothers and 93% of the fathers in the SFR unit were continuously present (>12 hours per day), compared to none in the OB unit (Table 1). From birth until postmenstrual age of 34 weeks, parents in SFR maintained an average continued presence of 21 hours for mothers and 16 hours for fathers, compared, respectively, with seven hours and five hours in the OB unit. The respective mean daily hours of providing SSC from the second week were six and four hours ($p<0.001$) (Table 1).

The EPDS scores were lower for mothers in the SFR than in the OB unit from birth to four months corrected age, and the estimated difference for the period was -1.9 (95% CI: -3.6, -0.1) (Table 2). Table showing all covariates examined in the linear mixed model of repeated measurements are provided as supplement, S1 Table.

The difference between units was most pronounced during hospitalization, when 14% scored at a level indicating symptoms of depression in the SFR unit, as opposed to 52% in the OB unit ($p<0.005$) (Table 3).

During hospitalization, the SFR parents scored 8 points lower on the STAI-SF questionnaire (Table 3). Parents' scores decreased to levels considered normal in both units at discharge and in the mixed model there was no significant difference between the units (Table 2).

Both SFR parents scored lower on stress related to "Sights and sounds of the environment" and "Infant's appearance", a mean difference of -5.0 (95% CI: -9.4, -0.6) by mothers and -5.3 (95% CI: -9.5, -1.1) by fathers. Also in regard to stress related to "Parental role alteration", the SFR parents scored lower, with a mean difference of -5.2 (95% CI: -8.7, -1.6) by mothers and -7.2 (95% CI: -10.3, -4.2) reported by fathers.

From term date, there were no differences in PSI-SF scores between the groups in any of the sub-scales (Table 2). Parents in both units reported average scores just above the high-risk level (score of 52–90) and total stress scores remained in the lower part of the range defined as high-risk level (Table 3).

Table 1. Characteristics of the families and infants cared for in the single-family room (SFR) and open-bay (OB) units presented as means (SDs) or number (%) within each unit.

Variable	SFR unit (n = 35)	OB unit (n = 42)	*p*-value[1]
Mother's age (y)	31 (7)	32 (6)	0.38
Father's age (y)	36 (10)	34 (7)	0.45
Single mother, n (%)	0 (0)	1 (2)	0.66
Norwegian first language, n (%)			
Mother	28 (80)	39 (93)	0.21
Father	30 (86)	39 (93)	0.30
Education level[2], n (%)			
Mother			
Elementary	4 (13)	0 (0)	0.015
High school	10 (33)	10 (30)	
College/university	15 (50)	23 (70)	
Father			
Elementary	3 (10)	0 (0)	0.012
High school	15 (50)	12 (38)	
College/university	12 (40)	20 (63)	
Infant			
Caesarean section, n (%)	25 (71)	20 (48)	0.04
Primipara, n (%)	8 (23)	11 (34)	0.64
Gestational age (GA) (min, max)	30.5 (28.2, 32.0)	30.1 (28.1, 31.6)	0.03
PMA[3] discharge, days	252 (9)	255 (14)	0.34
Parental presence			
Mother			
First week, hrs	111 (38)	33 (13)	<0.001
Overall average presence[4], hrs	21 (5)	7 (3)	<0.001
Continuous presence[5], n (%)	26 (87)	0 (0)	<0.001
Father			
First week, hrs	115 (39)	31 (13)	<0.001
Overall average presence[4], hrs	16 (6)	5 (2)	<0.001
Continuous presence[5], n (%)	28 (93)	0 (0)	<0.001
SSC[6] first week			
Total SSC, hrs	34 (12)	21 (11)	<0.001
Mother, hrs	21 (10)	12 (8)	<0.001
Father, hrs	13 (7)	8 (5)	0.001
SSC[6] average/day			
Total SSC, hrs	6 (2)	4 (2)	<0.001
Mother, hrs	4 (2)	3 (2)	0.002
Father, hrs	2 (1)	1 (0.6)	0.041

[1] Independent *t-test* or Pearson's chi-square tests.

[2] One couple in SFR unit missing information regarding education level.

[3] Postmenstrual age.

[4] Daily registrations from birth to the infant reach gestational age (GA) 34 postmenstrual age.

[5] Present ≥12 hours.

[6] SSC: skin-to skin contact.

https://doi.org/10.1371/journal.pone.0224488.t001

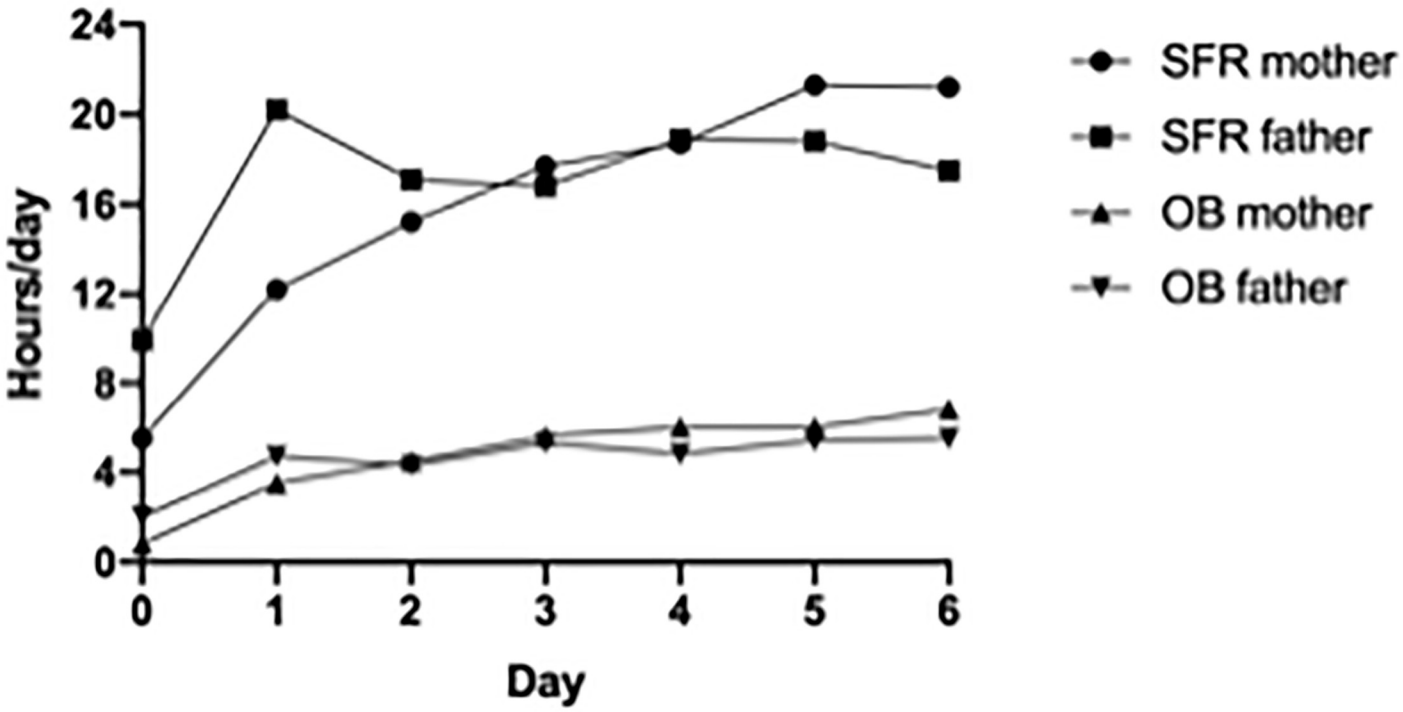

Fig 2. Parental presence first week. Mean hours of daily presence during first week of hospitalisation by mothers and fathers in the SFR unit and OB unit.

https://doi.org/10.1371/journal.pone.0224488.g002

Table 2. Repeated measurements of depression, anxiety, stress and attachment by parents, presented as adjusted mean difference examined in linear mixed model.

	Mother				Father			
	Estimate*	SE	95% CI	*p*-value	Estimate*	SE	95% CI	*p*-value
EPDS								
Unit	-1.9	0.9	[-3.6, 0.1]	0.03	-0.5	0.9	[-2.3, 1.3]	0.58
STAI								
Unit	-3.0	2.3	[-7.7, 1.6]	0.20	-2.6	2.2	[-7.1, 1.9]	0.30
PSS: NICU								
Sights and sounds of the environment and Infant appearance								
Unit	-5.0	2.2	[-9.4, -0.6]	0.03	-5.3	2.1	[-9.5, -1.1]	0.01
Parental role alteration								
Unit	-5.2	1.8	[-8.7, -1.7]	0.004	-7.2	1.5	[-10.3,-4.2]	0.000
PSI								
Unit	2.8	4.5	[-6.2,11.8]	0.55	-0.5	5.4	[-11.2, 10.3]	0.93
MPAS								
Unit	-1.7	1.0	[-3.6, 0.3]	0.09	-0.5	1.2	[-3.0, 2.0]	0.68

* Estimate for the effect of unit, presented as adjusted mean difference between mothers and fathers, adjusted for mode of delivery (vaginal vs. caesarean section), parents' education (elementary/high school or college/university) in linear mixed model: **EPDS** The Edinburgh Depression Scale. **STAI** The State–Trait–Anxiety Inventory, Short Form Y. **PSS: NICU** The Parent Stressor Scale: neonatal intensive care unit questionnaire. **PSI SF** The Parenting Stress Index—short form: Reporting the total stress score. All sub-scales within PSI were thoroughly checked. **MPAS** Maternal Postnatal Attachment Scale. Higher scores indicate more depression / more anxiety / more stress / more attachment

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Table 3. Mothers' and fathers' scores of depression, anxiety, stress and attachment, presented as means (SDs), median [Q1, Q3] or number (%) within each unit.

	SFR unit	OB unit	Difference between units*
AT DAY 14			***p*-value**
DEPRESSION			
EPDS sum score, mothers	8 [6,11]	14 [10,15]	0.005
Depression symptoms (cut-off ≥13), mothers, n (%)	4 (14%)	16 (52%)	
EPDS sum score, fathers	6 [3,7]	8 [5,7]	0.17
Depression symptoms (cut-off ≥13), fathers, n (%)	1 (4%)	3 (11%)	
ANXIETY			
STAI-SF sum score, mothers	39 (13)	47 (13)	0.04
STAI-SF sum score, fathers	35 (10)	39 (14)	0.25
STRESS, PPS: NICU			
Sights and sounds of the environment and Infant appearance, mothers	35 (11)	39 (10)	0.12
Sights and sounds of the environment and Infant appearance, fathers	28 (10)	33 (9)	0.06
Parental role alteration, mothers	13 (7)	21 (8)	0.000
Parental role alteration, fathers	7 [4, 6]	12 [11,18]	0.003
At DISCHARGE			
DEPRESSION			
EPDS sum score, mothers	7 [5,10]	9 [7,10]	0.43
Depression symptoms (cut-off ≥13), mothers, n (%)	4 (15%)	3 (10%)	
EPDS sum score, fathers	4 [3,8]	6 [4,8]	0.57
Depression symptoms (cut-off ≥13), fathers n (%)	1 (4%)	4 (15%)	
ANXIETY			
STAI-SF sum score, mothers	37 (12)	34 (9)	0.48
STAI-SF sum score, fathers	32 (6)	31 (10)	0.73
STRESS, PPS: NICU			
Sights and sounds of the environment and Infant appearance, mothers	32 (14)	37 (12)	0.13
Sights and sounds of the environment and Infant appearance, fathers	25(9)	33 (11)	0.003
Parental role alteration, mothers	14[10,18]	17 [14,20]	0.06
Parental role alteration, fathers	7 [5, 9]	11 [10,15]	0.004
BY TERM			
DEPRESSION			
EPDS sum score, mothers	5 [3,6]	5 [4,7]	0.41
Depression symptoms (cut-off ≥13), mothers, n (%)	0 (0)	1 (3)	
EPDS sum score, fathers	3 [2,4]	3 [2,6]	0.24
Depression symptoms (cut-off ≥13), fathers, n (%)	0 (0)	1 (3)	
ANXIETY			
STAI-SF sum score, mothers	30 (9)	33 (11)	0.43
STAI-SF sum score, fathers	28 (8)	31 (10)	0.45
STRESS, (PSI-SF)			
Parental distress, mothers	19 [15,23]	23 [17,24]	0.29
Parental distress, fathers	21 [11,21]	19 [15,22]	0.68
Parent-child dysfunctional Interaction, mothers	20 [15,22]	19 [14,20]	0.71
Parent-child dysfunctional Interaction, fathers	17 (5)	17 (8)	0.16
Difficult child, mothers	18 (7)	19 (9)	0.75

(*Continued*)

Table 3. (Continued)

	SFR unit	OB unit	Difference between units*
AT DAY 14			***p*-value**
Difficult child, fathers	17 [10,19]	21 [19,23]	0.15
Total stress, mothers	55 (25)	56 (26)	0.84
Total stress, fathers	59 [31,67]	58 [44,66]	0.38
ATTACHMENT			
MPAS sum score, mothers	92 (6)	95 (1)	0.05
MPAS sum score, fathers	77 (26)	88 (4)	0.10
At 4th MONTH CORRECTED AGE			
DEPRESSION			
EPDS sum score, mothers	4 [3,7]	5 [4,7]	0.65
Depression symptoms (cut-off ≥13), mothers, n (%)	1 (3)	1 (3)	
EPDS sum score, fathers	3 [2, 4]	3 [2,5]	0.92
Depression symptoms (cut-off ≥13), fathers, n (%)	0 (0)	1 (3)	
ANXIETY			
STAI-SF sum score, mothers	32 (11)	32 (8)	0.54
STAI-SF sum score, fathers	28 (7)	32 (9)	0.11
STRESS, (PSI-SF)			
Parental distress, mothers	20 (5)	19 (10)	0.60
Parental distress, fathers	19 (7)	17 (11)	0.50
Parent-child dysfunctional interaction, mothers	16 (4)	15 (8)	0.62
Parent-child dysfunctional interaction, fathers	16 (6)	15 (9)	0.16
Difficult child, mothers	19 (5)	17 (8)	0.23
Difficult child, fathers	20 (7)	19 (11)	0.77
Total stress, mothers	55 (18)	50 (25)	0.42
Total stress, fathers	55 (18)	51 (29)	0.68
Attachment			
MPAS sum score, mothers'	89 (3)	88 (8)	0.51
MPAS sum score, fathers'	85 (5)	84 (5)	0.49

EPDS The Edinburgh Depression Scale. **STAI** The State–Trait–Anxiety Inventory, Short Form Y. **PSS: NICU** The Parent Stressor Scale: neonatal intensive care unit questionnaire. **PSI** The parenting Stress Index—short form. **MPAS** Maternal Postnatal Attachment Scale

* Independent *t-test*.

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There were no significant differences between the units on the MPAS sum scores (Table 2). Mothers and fathers in both units scored high on parental attachment (Table 3).

Discussion

To our knowledge, this is the first controlled study of emotional distress in a setting with documented continuous parental presence during their infant's medical care. Emotional distress did not increase, and the risk of depression and stress were actually decreased among parents in the SFR unit compared to the OB unit. Of particular interest is the extensive presence by fathers in the SFR unit from the day of birth. Such extensive active participation throughout the infants' stay by fathers has not previously been reported. Studies of fathers' role and involvement in care and their contribution to the social–emotional development of preterm infants has just started to emerge [41, 42]; however, knowledge of *how* fathers increased involvement contributes to and affects the family is still limited [43].

Emotional distress was measured with five different questionnaires covering different aspects of emotional reactions and disturbance in attachment. We consider the consistency in the finding of no increased emotional distress in the SFR compared to the OB unit across the panel of questionnaires to strengthen our conclusion. Also, the uniform selection of patients, the similar right to health care services and parental leave, the clearly defined differences in design and the large differences in time parents were present in the two units strengthens the validity of the conclusion. The units were located more than 400 km apart, and they did not cooperate beyond this specific project. Therefore, a spill-over effect or negative expectations among participants, which may be a major challenge in true randomized controlled trials, seems rather unlikely [44].

We have previously shown that the study populations did not differ significantly in terms of morbidity and practices related to treatment and nutrition [24]. Although both units were the only units providing care for the eligible infants in their respective geographical areas and provided the same medical and nursing care, we cannot exclude unrecognized confounders related to care culture and practices. The OB unit also provides care for smaller and sicker infants, which could increase the general level of a stress in the unit. Studies using a quasi-randomization [20] or a before-and-after design with asynchrony in time between the study groups [15, 16] are also prone to the same and other confounders.

Lester et al. found that the effects of SFR were largely mediated through increased maternal involvement, breastfeeding and developmental care in the SFR unit. Optimizing facilities for parents of preterm infants in the NICU and thereby increasing parental presence and involvement may contribute to improved long-term outcomes [45]. Parents may provide unique sensory stimulation to their infants through SSC [46], talk and singing [47, 48]. The possibilities of such positive stimulation are better when parents are present around the clock compared to a few hours of visiting each day.

In our study, gestational age was higher and morbidity lower than in other studies reporting effects of SFR design [16, 49]. This may influence both the levels of distress and the extent of parental presence. In our experience, parents do not disappear or back out when the infant's condition is deteriorating. Unfortunately we do not have data on maternal health (e.g., pre-eclampsia) before preterm delivery or about the parents' previous mental health status. Both factors could potentially have some impact on the outcome measures, but there is no obvious reason why this should differ between the two study groups.

Regarding the difference in depression scores in mothers it is difficult to state a clinically relevant effect size precisely, but it has been proposed to be around four points [50]. Our results showed a difference of six points at day 14. It is relevant to speculate about an association between time spent per day by mothers with their infant and the risk of developing depressive symptoms. In the SFR unit, mothers were present daily three times longer than in the OB unit (21 vs. 7 hours). From a biological and evolutionary perspective, not being allowed or able to protect and take maternal responsibility for the infant would be expected to cause emotional distress and may explain the report of more depressive symptoms (52%) by mothers in the OB unit. However, only 6% of the fathers in the OB unit scored above the cut-off of >13 points at day 14, indicating a difference in vulnerability between mothers and fathers immediately after preterm birth.

Others have documented an increased burden of emotional distress on fathers after preterm birth [51, 52]. The extensive presence of fathers in SFR's throughout the stay, with an average of 20 hours daily for the first three days, may provide additional emotional support for mothers who have been initially incapacitated and recovering from complications of pregnancy. How fathers' biological emotional responses are programmed and developed towards

their preterm infant has not yet been sufficiently explored [53]. We found that fathers did not report depressive symptoms, and this finding was similar in both units.

Both groups scored in the lower range for anxiety, indicating that this was not a predominant symptom among parents in any of these units. Infants included in the study carried a low risk for both short- and long term severe adverse outcomes, and this may have contributed to the low scores on anxiety.

Although stress among NICU parents is well documented by others [23, 54, 55], we found parents' average stress scores to be in the lower range. Parents of preterm infants are undoubtedly prone to stress, but the effect sizes are small in populations with low morbidity and higher gestational ages [56]. Nevertheless, the differences in stress scores between the units were significant during hospitalization. The mean stress scores were more than five points higher for the mothers, and seven points for fathers in OB unit compared to the SFR unit, which could be considered clinically relevant. A previous study of the two units found that parents in the SFR unit gave higher scores on emotional support and participation [57]. Increased satisfaction with care may not necessarily decrease emotional distress, but a possible causality between the two deserves further research.

Pineda et al found slightly increased stress in mothers of infants hospitalized in single rooms and argued that stress was related to isolation, lack of support from other mothers, in addition to an increased feeling of obligation and responsibility of the infant. However the authors also hypothesised that the large variation in visitation could be associated with other factors like socioeconomic status and maternal health, and that they may have a larger impact on maternal stress than time present in a single-room [18].

In the SFR unit parents were included in daily rounds and may therefore represent the best continuity in the care of their infant [57]. When parents are involved and allowed unrestricted access, they participate actively in shared decision making at an informed and competent level, based on their knowledge of the infant. Most parents in the SFR unit are present also during night-time. They rarely leave the infant to the staff, and their continuous presence allows them to provide closeness and care immediately at the cues of the infant. This may reinforce parents' feeling of being in control and provide stress relief. Aagaard et al. found mothering of a preterm infant to be a developmental process nurtured by close relationship with the infant [54]. The ability to be close to the infant is indeed enhanced in the SFR unit, and this may trigger positive emotions [58]. The questionnaire, *PSS*: *NICU*, may also predict depressive symptoms, and as such confirms the differences between the units from the EPDS scores. Still, at term date and at four months post-term, parents in both units scored just above the lower limit for high risk on the PSI questionnaire, without any difference between the units. This could question the validity of the results of the PSS: NICU, but it may just as well reflect stress experienced during the transition from hospital to home. Using a modified version of the PSI questionnaire, Flacking et al. found, in accordance with our findings, no overall effect of co-care vs. no co-care on stress, but reported more stress on a sub-scale related to feelings of incompetence among the mothers as a result of being unable to provide co-care [59].

Preterm infants can, for obvious reasons, only express their distress indirectly, through behavioural signals and physiological instability [60]. The long-term negative effects of infant stress during NICU care are also starting to emerge through follow-up studies with impaired neurodevelopment and psychological outcomes [55, 61]. The majority of effective non-pharmacological interventions to reduce infant pain and distress require active parental participation [16, 62–65]. Provided with facilities supporting presence in the SFR unit, parents chose to be present for most of the day and night. We therefore document that extensive parental participation is possible without increasing parents' emotional distress; indeed, it seems to be reduced by continuous presence. Most research on the effect of positive stimulation and

parental presence in the NICU has been conducted in preterm infants, but the same basic psychological needs mediated through parental closeness are present also for severely ill infants born at term. Parental presence and their vulnerability to psychological distress may be influenced by external factors such as differences in health care financing, a social welfare system compensating presence economically as recognized also by others [18]. To rebuild a NICU into SFR facilities are costly, potentially there could be cheaper interventions (e.g., frequent psychological support) to increase parents' psychological wellness. However, a large and increasing evidence based knowledge of the medical and psychological benefits of parent–infant closeness in the NICU may point at near-continuous parental presence as one of the most underestimated interventions available in NICU care. A society and health care system adopting a policy allowing continuous parental presence takes a major step towards the goal of providing care at the premises of the patient and in accordance with the highest medical, legal and ethical standards.

Conclusion

This study shows that continuous presence of both parents of infants hospitalised in a SFR NICU can be achieved without increasing parental distress. In addition, the risk of depression and stress decreased during hospitalization with potential long-term positive effects on parental well-being. Providing a NICU design that enables parents to stay continuously may also be beneficial for long-term outcomes of the infants. A physical design of the NICU facilitating the implementation of evidence-based practice of parental presence and participation should therefore be considered superior to a design limiting these possibilities.

Supporting information

S1 Picture. Patient and parents area in the SFR unit. Picture showing the patient and parents area in a single family room at Drammen hospital, Vestre viken HT.
(JPG)

S2 Picture. Patient area in the SFR unit. Picture showing the patient in a single family room at Drammen hospital, Vestre viken HT.
(JPG)

S3 Picture. Illustration photo of patient and parent in the SFR unit. Illustration photo a patient (a doll) and a mother (an employee) in a single family room at Drammen hospital, Vestre viken HT. The medical device is mounted on flexible arms so we can move the infant into the parent area without disconnect from monitoring and possible ventilation support.
(JPG)

S1 Table. Table showing all covariates examined in the linear mixed model. Table 2 Showing all covariates examined in the linear mixed model of repeated measurements of depression, anxiety, stress and attachment by parents, presented as adjusted mean difference.
(DOCX)

S1 File. Protocol. Protocol for the study "Impact of Family Centered Care in Single Family Rooms on Preterm infants and their Parents—A prospective comparative study".
(DOCX)

S2 File. TREND Checklist. Transparent Reporting of Evaluations with Nonrandomized Designs—TREND statement checklist.
(PDF)

Author Contributions

Conceptualization: Bente Silnes Tandberg, Renée Flacking, Trond Markestad, Hege Grundt, Atle Moen.

Data curation: Bente Silnes Tandberg, Hege Grundt.

Formal analysis: Bente Silnes Tandberg, Renée Flacking, Trond Markestad, Hege Grundt, Atle Moen.

Funding acquisition: Bente Silnes Tandberg, Trond Markestad, Atle Moen.

Investigation: Bente Silnes Tandberg, Hege Grundt.

Methodology: Bente Silnes Tandberg, Renée Flacking, Trond Markestad, Hege Grundt, Atle Moen.

Project administration: Bente Silnes Tandberg, Trond Markestad, Hege Grundt.

Supervision: Renée Flacking, Trond Markestad, Atle Moen.

Validation: Trond Markestad, Atle Moen.

Writing – original draft: Bente Silnes Tandberg, Renée Flacking, Hege Grundt, Atle Moen.

Writing – review & editing: Bente Silnes Tandberg, Renée Flacking, Trond Markestad, Atle Moen.

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Supplement 2

Table 2 Showing all covariates examined in the linear mixed model of repeated measurements of depression, anxiety, stress and attachment by parents, presented as adjusted mean difference

	MOTHER				FATHER			
	Estimate*	**SE**	**95% CI**	**P**	**Estimate***	**SE**	**95% CI**	**P**
EPDS								
Vaginal birth[1]	-1.7	0.8	[-3.4, -0.06]	0.04	1.0	0.9	[-2.7, 0.7]	0.25
Education[2]	0.8	1.8	[-2.8, 4.5]	0.66	0.7	2.2	[-5.0, 3.6]	0.74
Time 2[3]	-2.1	0.6	[-3.2, -0.9]	0.000	-0.1	0.5	[-1.1, 0.9]	0.86
Time 3[4]	-5.4	0.6	[-6.6, -4.3]	0.000	-2.1	0.5	[-3.1, -1.0]	0.000
Time 4[5]	-5.1	0.6	[-6.3, -3.9]	0.000	-2.8	0.5	[-3.7, -1.7]	0.000
Unit	-1.9	0.9	[-3.6, -0.1]	0.03	-0.5	0.9	[-2.3, 1.3]	0.58
STAI								
Vaginal birth	-0.1	2.2	[-4.5, 4.4]	0.98	-2.3	2.2	[-6.6, 2.1]	0.30
Education	7.0	4.9	[-2.7, 16.8]	0.16	2.0	5.5	[-9.1, 13.0]	0.72
Time 2	-5.8	1.8	[-9.3, -2.3]	0.000	-4.8	1.5	[-7.1, 1.9]	0.002
Time 3	-12.2	1.8	[-15.8, -8.6]	0.000	-7.8	1.5	[-10.9, -4.8]	0.000
Time 4	-11.8	1.8	[-15.4, -8.3]	0.000	- 7.13	1.5	[-10.1, -4.1]	0.000
Unit	-3.0	2.3	[-7.7, 1.6]	0.20	-2.6	2.2	[-7.1, 1.9]	0.30
Sights and sounds of the environment and Infant's appearance								
Vaginal birth	-0.4	2.1	[-4.6, 3.7]	0.85	-0.4	2.0	[-4.2, 3.7]	0.88
Education	4.4	4.5	[-4.6, 13.4]	0.34	-4.4	4.9	[-14.2, 5.3]	0.37
Time 2	-1.8	2.1	[-6.0, 2.3]	0.39	-1.2	1.9	[-5.1, 2.6]	0.52
Unit	-5.0	2.2	[-9.4, -0.6]	0.03	-5.3	2.1	[-9.5, -1.1]	0.01
Parental role alteration								
Vaginal birth	-0.5	1.6	[-3.7, 2.7]	0.76	-0.2	1.5	[-3.1, 2.7]	0.88
Education	-2.4	3.5	[-9.3,4.5]	0.49	-4.2	3.6	[-11.4, 2.8]	0.24
Time 2	-0.8	1.6	[-4.0,2.4]	0.61	1.4	1.4	[-1.4, 4.3]	0.33
Unit	-5.2	1.8	[-8.7, -1.7]	0.004	-7.2	1.5	[-10.3,-4.2]	0.000
PSI[6]								
Vaginal birth	5.1	4.4	[-3.5, 13.7]	0.25	6.3	5.2	[-4.0, 16.7]	0.23
Education	3.1	10.0	[-16.8, 22.9]	0.76	-17.3	14.3	[-45.8, 11.2]	0.23
Time 4	-3.6	4.4	[-12.3, 5.2]	0.42	2.4	5.2	[-7.9, 12.7]	0.65
Unit	2.8	4.5	[-6.2, 11.8]	0.55	-0.5	5.4	[-11.2, 10.3]	0.93
MPAS								
Vaginal birth	-1.3	1.0	[-3.2,0.6]	0.18	0.4	1.2	[-2.1, 2.7]	0.78
Education	1.4	1.7	[-2.0, 4.8]	0.41	-14.5	4.0	[-22.6, -6.5]	0.001
Time 4	-4.8	1.0	[-6.9,-2.8]	0.000	-0.2	1.7	[-3.7, 3.1]	0.90
Unit	-1.7	1.0	[-3.6, 0.3]	0.09	-0.5	1.2	[-3.0, 2.0]	0.68

EPDS The Edinburgh Depression Scale. **STAI** The State–Trait–Anxiety Inventory, Short Form Y. **PSS: NICU** The Parent Stressor Scale: neonatal intensive care unit questionnaire. **PSI** The Parenting Stress Index – short form. **MPAS** Maternal Postnatal Attachment Scale.

[1] Vaginal vs. caesarean section.

[2] Elementary, high school or college/university.

[3] Discharge.

[4] Term age.

[5] Four months after term age.

[6] Reporting the total stress score. All sub-scales within PSI were thoroughly checked, and there were no differences between the units or between genders.

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Effects of Single Family Room Care on Breastfeeding Rates in Preterm Infants

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Key Message

- There is a lack of studies on the effects of single family room care on milk expression and breastfeeding in mothers of preterm infants.
- Mothers of preterm infants cared for in a single family room neonatal intensive care unit initiated milk expression and direct breastfeeding significantly earlier than mothers in an open bay unit.
- Mother-infant dyads cared for in a single family room neonatal intensive care unit were significantly more likely to sustain exclusive direct breastfeeding up until 4 months of corrected age.
- In order to increase the occurrence of exclusive direct breastfeeding in preterm infants, the design of neonatal intensive care units should facilitate both continuous presence of the mother and privacy for the mother-infant dyad.

BREASTFEEDING PRETERM INFANTS AND SINGLE FAMILY ROOM CARE

Abstract

Background: Hospitalization in open bay neonatal intensive care units reduces mothers' presence and involvement in care. A single family room design enables mothers to be continuously present, but less is known regarding effects on milk production and breastfeeding.

Research aim: To compare initialization of milk expression and breastfeeding, volumes of mother's milk produced, the extent to which infants received mother's milk, occurrence of direct breastfeeding, and breastfeeding self-efficacy in a single family room unit versus an open bay unit.

Methods: A prospective observational study comparing 77 infants born at 28^0 to 32^0 weeks' gestational age and their 66 mothers (n = 35/30 in single family room and 42/36 in open bay). Milk volume, mother's milk as nutrition and occurrence of direct breastfeeding was compared from birth to four months' corrected infant age. Breastfeeding self-efficacy was compared across mothers who were directly breastfeeding at discharge (n = 45).

Results: First expression (6 versus 30 hours, p <.001) and first attempt at breastfeeding (48 versus 109 hours, p <.001) occurred earlier, and more infants were exclusively directly breastfed until four months' corrected age in the single family room unit: OR 8.2 (95% CI: [2.9, 23.1]). There was no significant difference between the units regarding volume of milk, the extent to which infants received mother's milk, or breastfeeding self-efficacy.

Conclusion: In order to increase the occurrence of exclusive direct breastfeeding in preterm infants, the design of units should facilitate both the continuous presence of the mother and privacy for the mother-infant dyad.

Effects of Single Family Room Care on Breastfeeding Rates in Preterm Infants

Mother's own milk provides substantial health benefits to preterm infants (Dieterich, Felice, O'Sullivan, & Rassmussen, 2013). For mothers, to provide milk and breastfeed their infant directly can be perceived as highly meaningful and strengthen the mother-infant relationship during hospitalization in a neonatal intensive care unit (NICU) (Flacking, Thompson, & Axelin, 2016). However, to maintain milk expression for weeks, until the infant can feed directly at the breast, has been reported as emotionally challenging (Bujold, Feeley, Axelin, & Cinguino, 2018), and associated with lower success in producing adequate volumes of milk and establishing direct breastfeeding after a preterm birth (Abrams & Hurst, 2017). Preterm infants often receive little to none of their nutritional intake from their mother's own milk, and breastfeeding rates vary widely (between 19 and 70 percent) at discharge from European NICUs (Bonet et al., 2011). Direct breastfeeding can be challenging, and may be affected by factors in the infant (i.e., immaturity, gestational age, morbidity, male gender, or multiples), the mother (i.e., psychological well-being, motivation, self-efficacy, level of education, or smoking), NICU care practices (i.e., the use of skin-to-skin care, nipple shields, or pacifiers) (Maastrup et al., 2014), and architectural design (Van Veenendaal et al., 2019).

Mothers' perceived expectation of their ability to cope with breastfeeding is commonly referred to as 'breastfeeding self-efficacy'. Such expectations may influence the effort a mother undertakes to succeed in breastfeeding. A higher level of self-efficacy is associated with greater success in breastfeeding (Dennis & Faux, 1999).

Hospitalization in a traditional open bay (OB) NICU separate mother and infant and reduce maternal presence and involvement. In this setting, the complex transition from tube feeding to direct breastfeeding is expected to take place. A single family room (SFR) NICU design reduces stressful stimuli, facilitates privacy, and allows undisturbed parent-infant closeness with longer periods of skin-to skin care (SSC) (Dunn, MacMillan-York, & Robson,

2016). Large differences in duration of parental presence and SSC between an OB and a SFR NICU have been reported (Tandberg et al., 2019b), with concurrent reduction in depression scores among SFR mothers and reduced stress in both parents (Tandberg, Flacking, Markestad, Grundt, & Moen, 2019a). SSC facilitate milk production and direct breastfeeding, and is associated with improved breastfeeding rates in preterm infants (Sharma, Farahbakhsh, Sharma, Sharma, & Sharma, 2019), and so is increased parental involvement (Boundy et al., 2016; O'Brien et al., 2018). Vohr et al. found that SFR design increased the volumes of expressed mother's milk (Vohr et al., 2017). However, there have also been SFR units which report no impact on the volume of expressed mother's milk (Dowling, Blatz, & Graham, 2012). It is notable that in Sweden, where parents have unrestricted access to NICUs and many units have SFRs, the breastfeeding prevalence in preterm infants fell significantly over a ten-year period despite a potential increase in parental involvement and presence (Ericson, Flacking, Hellstrøm-Westas, & Ericcson, 2016).

There is a lack of knowledge about the effects of SFR care on milk production and breastfeeding. We aimed to compare initialization of milk expression and direct breastfeeding, volumes of mother's milk produced, the extent to which infants received mother's milk, occurrence of direct breastfeeding, and breastfeeding self-efficacy in a SFR unit compared with an OB unit. We hypothesized that the SFR NICU design would increase milk volumes, direct breastfeeding, and breastfeeding self-efficacy after preterm birth.

Methods

Design

The study had a prospective comparative observational design and was approved by the Norwegian Regional Committee for Medical Research Ethics (REK no. 2013/1076).

Setting

Data was collected from May 1, 2014 until July 31, 2016. One SFR unit and one OB unit participated in the study. Both units provided care until discharge at maternity hospitals in two different hospital catchment areas more than 400 kilometers apart.

In the SFR unit, every family had adjustable and comfortable hospital beds in their own private room, with full overnight accommodation for both parents and facilities for the preterm infant. Parents were encouraged to live together with their infant throughout the infants' hospitalization, and SSC was encouraged by the staff. The unit provided full meals to both parents and siblings were welcome to stay. There was a breast pump in every room.

The OB unit had several open bays facing a corridor. Four to eight infants shared one room throughout hospitalization. One room, shared by two, was available for critically ill infants. Parents had unrestricted access to the unit, with exceptions made during medical rounds and some medical procedures. As the delivery unit was approximately 500 meters from the NICU, transport was by ambulance at admittance and for visitation by hospitalized mothers. Basic overnight accommodation outside the NICU building was available for parents. Rooming-in was only possible during the last days prior to discharge in a dedicated room outside of the unit. SSC was encouraged, facilitated with comfortable recliners beside the cot or incubator. Privacy was attained with moveable floor screens. The unit provided all meals for one parent, and siblings could visit with limitations. Three breast pumps within and two outside the unit were available for mothers to share. Breast pumps rented through the pharmacy department were reimbursed.

Both units actively promoted expressing milk and breastfeeding from day one, with all nurses trained to guide milk production and direct breastfeeding. The SFR unit had five fully-trained lactation support providers, while the OB unit had six. The same advice regarding milk expression was provided; to express by hand 6-8 times per day in the first two days after

birth, and thereafter double pumping by electric breast pump at least 6-8 times per day, including once during the night. Both units used the same brand of electric breast pump.

As part of the study the units agreed on a common feeding protocol. Enteral feed were begun using either donor breast milk or preterm formula if the mother's own milk was not available. This was then replaced with the mother's own milk as production increased. A human milk fortifier was added according to protocol (continuing until the infant weighed 2000 grams or achieved exclusive direct breastfeeding), and feeding was continued with the mother's own milk or a regular infant formula.

Inclusion and Exclusion

Infants with a gestational age (GA) between 28^0 and 32^0 weeks, born at one of the two participating hospitals, were included in the study. Exclusion criteria were: parents not speaking Norwegian, the infant being in the custody of the child protection service, drug-abusing mother, one parent suffering from a mental illness, birthweight <800 grams, triplets/quadruplets, and infants with severe morbidities.

Measurements

Mothers reported the first time they expressed milk and attempted direct breastfeeding as hours postpartum on a designated form. At day 7, day 14, and at PMA 34^0 weeks they reported the total volume of milk expressed and/or directly breastfed during a 24-hour period. Directly breastfed volumes were measured with test weighing; one gram of infant weight gain was considered equivalent to one milliliter of milk. The extent to which the infant was fed mother's milk and/or donor breast milk was retrieved from the infants' medical charts from birth until PMA 34^0, at discharge, and reported by mothers at term date and at four months' corrected age. This was categorized in accordance with the WHO criteria as exclusively (mother's milk and supplements), fully (mother's milk and water/juice), partly (mother's milk and formula/solids), or formula-fed (The World Health Organization, 2019).

How the infant was fed was also recorded. Direct breastfeeding was retrieved from the infants' medical chart during hospitalization and was reported by the mothers at term and at four months' corrected age. This was categorized as exclusively directly breastfed (fed only from the breast), partly directly breastfed (fed from the breast and by gavage/cup/spoon/bottle), and not directly breastfed. The use of nipple shields was retrieved from the infants' medical charts from PMA 32^0 to discharge and reported by mothers at term and at four months corrected age.

Mothers who breastfed directly at discharge (either exclusively or partly) answered the Breastfeeding Self-efficacy Scale - Short Form (BSES-SF) questionnaire at discharge. BSES-SF addresses both the mothers perceived technical skills and subjective feelings about their breastfeeding situation through 14 statements (such as "*I can always determine that my baby is getting enough milk*"). Mothers rate these statements on a 5-point Likert scale. The possible range is 14-70. A higher score indicates a higher self-efficacy, associated with greater success in breastfeeding (Dennis & Faux, 1999). The questionnaire has been found to be reliable and valid in preterm and ill newborns (Tuthill, Cusson, Graber, McGrath, & Young, 2016) and has been translated into Norwegian (Haga, 2012).

Data Collection

Data was collected by a designated research nurse in each unit. Parents of infants who met the inclusion criteria were approached no later than two days post-partum. Signed informed consent was retrieved from both parents upon recruitment. At term date and four months' corrected age the infants and parents returned to the unit and reported data for these time points.

Data Analysis

Results were analyzed using SPSS (version 24, IBN 2010). The groups were compared by bivariate analyses; two-sample *t*-tests and Pearson's chi-square tests. Descriptive statistics

are given as means (*M*) with standard deviation (*SD*), medians with quartiles *(Q1-Q3)* or frequencies (percentages) according to the type and distribution of data. A *p*-value <.05 was considered statistically significant. Due to the correlation effect within the repeated measurements (and the unequal distribution between the groups in GA, mode of delivery, and level of education) mean differences in outcomes were analyzed using a linear mixed model for continuous variables (volumes of mother's milk) and a logistic mixed model for categorical variables (the extent to which infants received mother's milk and direct breastfeeding). The models included the effects of time and the correlation structure within the repeated measurements, in addition to fixed effects for unit, GA, mode of delivery (vaginal or caesarean section), and maternal education (elementary, high school, or college/university). Results are given as estimate *B* (interpreted as the mean difference between the SFR and OB units) or the Odds ratio (*OR*) adjusted for confounders with corresponding 95% confidence intervals (*CI*).

Results

From the eligible cohort (120 infants), 77 infants (SFR n = 35, OB n = 42) and their 66 mothers (SFR n = 30, OB n = 36) were enrolled in the study. The study groups were similar except for a statistically significant lower GA of 4 days in the OB unit ($p = .03$). Mothers in the SFR unit were present for a mean of 21 hours per day, which is 14 more hours per day compared to mothers in the OB unit ($p = < .001$). They also gave more than one more hour SSC per day compared to mothers in the OB unit ($p = .002$) (Table 1). Infants in the SFR unit were more often delivered by caesarean section ($p = .04$) and SFR mothers had a lower level of education ($p = .02$). Infants in the OB unit were more often initially mechanically ventilated ($p = .01$), but time on mechanical ventilation was short (usually a few hours). In general, morbidity was low, and no clinically significant differences were seen between the groups (Table 2).

The median [q^1-q^3] for first time mothers expressed milk was at 6 [6-11] hours post-partum in the SFR unit compared to 30 [27-40] hours in the OB unit (p = <.001) (Table 3). Most mothers were able to initiate milk production and maintain enough milk to feed exclusively or partly with their own milk until discharge. Neither the adjusted mean difference in volumes of mothers own milk: B = 102 milliliters (*95% CI:* [-72.2, 275.8]) (Table 4) nor the adjusted difference in the extent to which infants was fed mother's milk from PMA 32^0 until four months' corrected age differed significantly: B = -.5 (*95% CI:* [-1.3, -.3]) (Table 4 and figure 1).

The median [q^1-q^3] for first attempt at direct breastfeeding was at 48 [47-100] hours post-partum in the SFR unit compared to 109 [96-183] hours in the OB unit (p = <.001) (Table 3). Most mothers in both units practiced direct breastfeeding, but neither the total number of breastfeeding sessions, the BSES-SF score (Table 3) nor the use of nipple-shields (Table 5) differed significantly between the units.

At discharge, all infants that were exclusively fed on their mothers' own milk in the SFR unit were also exclusively directly breastfed. In contrast, only a few infants in the OB unit were exclusively directly breastfed; most infants were fed their mother's expressed breast milk by bottle in addition to directly breastfeeding. In a logistic mixed model analysis we compared exclusively directly breastfed infants against all others (partly directly breastfed and not directly breastfed), and found that the likelihood for achieving exclusive direct breastfeeding was more than eightfold higher in the SFR unit compared to the OB unit: *OR* = 8.2 (*95% CI*: [2.9, 23.1]), a difference that persisted until four months' corrected age (Table 4).

Discussion

We found that mothers in the SFR unit initiated expressing and direct breastfeeding significantly earlier than mothers in the OB unit, and the likelihood of sustaining exclusive

direct breastfeeding was more than eightfold higher in the SFR unit. There was a positive trend in favor of the SFR unit throughout regarding BSES-SF scores, milk volumes produced and the extent to which infants were fed mother's milk, but the differences did not reach statistical significance.

Previous studies of breastfeeding in SFR NICUs have mainly focused on the volumes of mother's milk produced or the extent to which infants are fed human milk, rather than on direct breastfeeding. In a systematic review and meta-analysis, Van Veenendaal et al. (2019) found a higher instance of exclusive breastfeeding at discharge in SFR care compared to OB care, applying a definition of 'breastfeeding' as 'receiving the mother's milk'. In a comprehensive study on SFR design, Lester et al. (2016) reported higher levels of 'feeding' (but not specifically direct breastfeeding) in the SFR unit as part of their maternal involvement outcome. From the same cohort, Vohr et al. (2017) reported higher volumes of mothers' milk produced and human milk intake in the SFR unit.

In this study, most mothers initiated milk expression and direct breastfeeding, with no significant difference between units regarding self-efficacy. To our knowledge, this study is the first to report on time of first expression and first attempt of direct breastfeeding, and to compare BSES-SF, in the SFR context. In OB units, provision of the mother's own milk and breastfeeding as much and as often as possible can become even more important, and may somewhat compensate for the separation caused by the lack of optimized NICU facilities (Flacking et al., 2016). Whereas the SFR design offers unlimited presence and privacy, the OB design means that mothers are constantly surrounded by staff and other mothers in a similar situation. Role models and observational learning are emphasized as important in the development of self-efficacy (Bandura, 1977). In summary, these factors may ameliorate the disadvantages of not having an optimized physical environment in OB units. Although mothers in the SFR unit initiated milk expression and breastfeeding attempts earlier, and

subsequently attained exclusively direct breastfeeding more often than mothers in the OB unit did, we could not demonstrate that SFR care was associated with significantly increased volumes of mother's milk produced, or differences in the extent to which infants received mother's milk as nutrition, which contradicts other studies (Boundy et al., 2016; Sharma et al., 2019; O'Brien et al., 2018; Vohr et al., 2017; Van Veenendaal et al., 2019).

In both units, infants were mostly fed their mother's own milk exclusively or partly until discharge, and many mothers still provided mother's milk at four months' corrected age (equivalent to 6-7 months' chronological age). We know no other comparative studies on SFR design providing breastfeeding data until four months corrected age. Although mothers in the SFR unit had more milk at most time points, the difference was not statistically significant. Even so, the adjusted mean difference in volumes of mother's milk produced between the units are rather large, and may therefore be considered clinically relevant for the infants included.

Maintenance of a sufficient milk supply until the infant is able to be breastfeed directly is a prerequisite to feed the infant exclusively on their mother's own milk. Given the lack of significant differences in milk supply and self-efficacy, we find it probable that the significantly higher likelihood for attaining exclusive direct breastfeeding are related to the facilitation of continuous mother-infant closeness in the SFR unit. Continuous maternal presence is indeed fundamental in order to attain exclusive direct breastfeeding. Mothers in the SFR unit were mostly present around the clock, and spent more than an hour more every day providing SSC. Due to the SFR design, mothers could express milk and breastfeed in privacy whenever they wanted, also during the night. In OB units, mothers are visitors and spend many hours every day away from their infant. Thus, infants must be fed by staff, in the participating OB unit, by gavage or cup until direct breastfeeding was considered established, thereafter by bottle if the mothers agreed to this. At discharge, most mothers in the OB unit

combined direct breastfeeding with expressing milk for feeding in their absence, as the OB design limited their ability to breastfeed around the clock. Notably, the feeding pattern established during hospitalization was generally maintained after discharge in both units; very few mothers in the OB unit attained exclusive direct breastfeeding after leaving the hospital.

Our study may have been underpowered to detect a statistically significant difference in volumes of milk, the extent to which the infants were fed mother's milk, or mother's self-efficacy. On the other hand, a lack of difference may also be due to the positive general attitude towards breastfeeding in Norway. Cultural expectations may enhance mothers' efforts to accomplish breastfeeding, regardless of the physical NICU environment. The optimal duration of maternal presence or SSC needed to increase feeding with mother's milk or occurrence of direct breastfeeding is not known. There is, however, convincing evidence that maternal presence, involvement in care, and SSC mediate infant outcomes, and that early initiation of SSC most likely triggers a cascade of maternal involvement, including breastfeeding (Lester et al., 2016). In both units, the levels of maternal presence were much higher than the maternal involvement reported by Lester et al., and several hours of SSC were obtained in both units on a daily basis. In Norway, infants have the right to have both parents present during hospitalization with full economic compensation for loss of income. The social security system allows parental leave with economic compensation throughout the infant's first year. This may facilitate breastfeeding. The positive cultural attitude towards breastfeeding, the observed high prevalence of breastfeeding initialization, and the high volumes of mothers' milk produced and fed to infants in both units may differ from the base levels of other studies.

Limitations

For some of our outcomes, the study may have been underpowered to detect a statistically significant difference between the two units. Furthermore, cultural differences or

care practices may have influenced breastfeeding rates independent of the design. Even so, we have controlled for many factors affecting breastfeeding rates, and we consider the differences found to be related to unit design and the concept of continuous maternal presence.

Conclusion

The continuous presence of mothers in SFRs led to earlier initiation of mother's milk expression and breastfeeding. There was a greater likelihood of attaining exclusive direct breastfeeding from discharge to four months corrected age with a SFR design. Neither the total volumes of mothers' milk produced nor the extent to which the infants received mother's milk differed significantly between the units, nor was breastfeeding self-efficacy affected by the SFR design.

Implications for Clinical Practice and Future Research

Both NICU design and care culture are important for facilitating continuous maternal presence with increased mother-infant physical closeness. Our results show that SFR design contributed to earlier initialization of milk expression and breastfeeding, with ultimately increased occurrence of exclusive direct breastfeeding. Because little is known about the optimal level of maternal presence or SSC for milk production and breastfeeding, further research is required. In addition, more research is needed to establish how breastfeeding support in SFR units should be delivered in order to improve maternal self-efficacy, milk production and direct breastfeeding in mothers of preterm infants.

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Conflicts of Interest: None.

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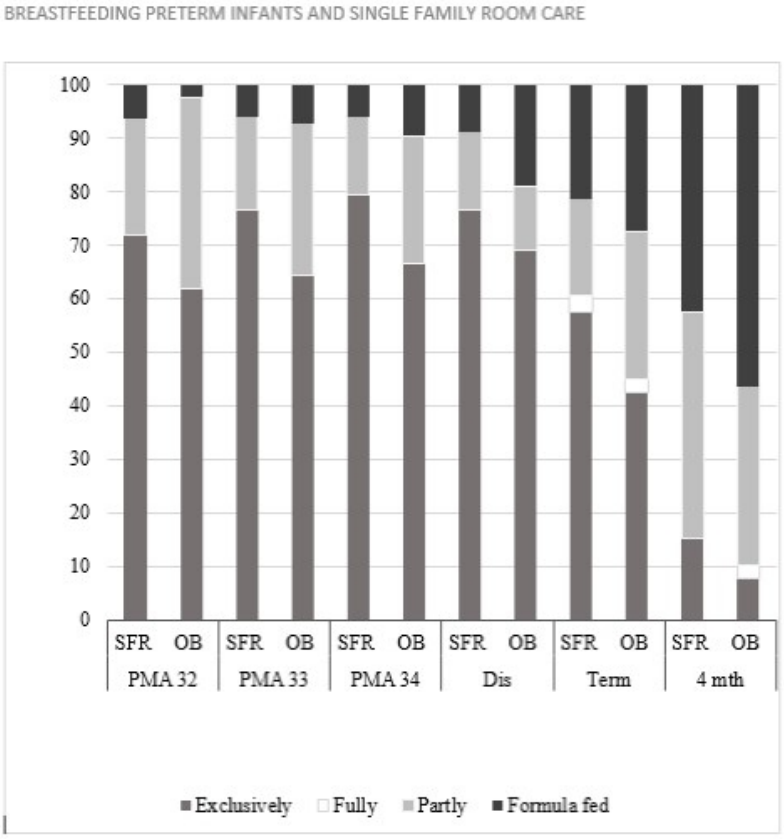


Figure 1. The percentage distribution of the extent to which infants received mother's milk in the single family room unit (SFR) and the open bay unit (OB) at infants postmenstrual age (PMA) 32, 33 and 34 weeks, at discharge, term and four months corrected age. The extent to which infants received mother's milk was defined in line with the WHO criteria as: Exclusively (mother's milk and supplements), fully (mother's milk and water/juices), partly (mother's milk and formula/solids) or formula fed (The World Health Organization, 2019)

The extent to which infants recived mother's milk

157x170mm (96 x 96 DPI)

Table 1.

Characteristics of Infants and Mothers

Characteristics	SFR[a] *M (SD)*	Min-max	OB[b] *M (SD)*	Min-max	*p*-value
Infants (N =77)	**n = 35**		**n = 42**		
Gestational age at birth; weeks days	30^{5} (1)	28^{2}-32^{0}	30^{1} (1)	28^{1}-31^{6}	.03
Postmenstrual age at discharge: days	252 (9)	232-270	255 (14)	242-332	.27
Length of stay; days	38 (12)	22-61	44 (18)	25-134	.16
Weight at birth; grams	1452 (301)	910-2134	1382 (274)	945-2055	.29
Weight at discharge; grams	2271 (299)	1840-2830	2317 (297)	1700-3318	.51
Mothers (N = 66)	**n = 30**		**n = 36**		
Age; years	31 (7)	19-47	32 (6)	21-44	.38
Presence in the unit; hours/day	21 (7)	11-24	7 (3)	1-12	< .001
Skin to skin care; hours/day	4 (2)	.1-9	3 (2)	.1-10	.002

Note. [a] = Single Family Room unit. [b] = Open Bay Unit.

Table 2.

Characteristics of Infants and Mothers

	SFR[a] n (%)	OB[b] n (%)	*p*-value
Infants (N = 77)	**n = 35**	**n = 42**	
Gender; male	16 (46)	27 (64)	.01
Twins	10 (29)	18 (43)	.30
Cesarean birth	25 (71)	20 (48)	.04
Mechanical ventilation	0 (0)	9 (21)	.01
Mothers (N = 66)	**n = 30**	**n = 36**	
Norwegian first language	24 (80)	30 (83)	.21
Smoking	1 (3)	0 (0)	.92
Married/cohabitant	30 (100)	33 (92)	.64
Level of education;			.02
Elementary school	4 (13)	0 (0)	
High school	10 (33)	10 (28)	
College/university	15 (50)	24 (67)	

Note. [a] = Single Family Room unit. [b] = Open Bay Unit.

Table 3.

Breastfeeding Practice, Milk Expression, Breastfeeding Self-efficacy and Volumes of Mother's Milk Produced

Variables	SFR[a] *M (SD) or Median [q^1-q^3]*	Min-max	OB[b] *M (SD) or Median [q^1-q^3]*	Min-max	*p*-value
Infants (N = 77)	**n = 35**		**n = 42**		
First attempt at direct breastfeeding; hours post-delivery; *median [q^1-q^3]*	48 [47-100]	3-264	109 [96-183]	12-600	<.001
Total sessions at the breast, post menstrual age 32^0 -34^0; *M (SD)*	26 (16)	0-62	27 (16)	0-67	.71
Mothers (N = 66)	**n = 30**		**n = 36**		
First time expressing; hours post-delivery; *median [q^1-q^3]*	6 (6-11)	2-29	30 (27-40)	6-72	<.001
Breastfeeding self-efficacy – short form[c] (N = 45); *M (SD)*	54 (13)	22-70	51 (13)	22-70	.46
Total Volumes of Milk Produced; expressed/directly breastfed; *M (SD)*					
Day 7 post-delivery; milliliters	543 (436)	24-1495	376 (297)	6-1090	.08
Day 14 post-delivery; milliliters	660 (456)	0-1600	491 (381)	6-1640	.06
Post menstrual age 34^0; milliliters	686 (403)	0-1580	527 (334)	1-1250	.12

Note. [a] = Single Family Room Unit [b] = Open Bay Unit. [c] = Breastfeeding self-efficacy scale, short form questionnaire; Possible range 14-70, with higher score indicating higher level of self-efficacy in breastfeeding, answered at discharge by mothers whom breastfed directly (exclusively or partly) n = 25 in SFR and 20 in OB unit.

Table 4.

Exclusively Direct Breastfeeding, Volumes of Mother's Milk Produced and the Extent to which Infants Received Mother's Milk

Variable	N	Goodness of fit (QICC)	B	Exp (B)	95% CI Lower Bound	95% CI Upper Bound	*p*-value
Exclusive direct breastfeeding[a]	77	180.3		8.2	2.9	23.1	<.001
Volumes of mother's milk produced[b]	66		101,8		-72.2	275.8	.25
The extent to which infants received mother's milk [c]	77		-.5		-1.3	.3	.20

Note. [a] = Infants exclusively directly breastfed was adjusted for time (from discharge to four months corrected age), mode of delivery (vaginal/caesarean section), maternal education (highest level/lowest level) infants' gestational age at birth and unit (Single Family Room /Open Bay) in logistic mixed model analysis. [b] = Volumes of mothers' own milk was adjusted for time (from day 7 post-partum to infants postmenstrual age 34 weeks), mode of delivery (vaginal/caesarean section), maternal education (highest level/lowest level), infants' gestational age at birth and unit (Single Family Room /Open Bay) in linear mixed model analysis. [C] = The extent to which infants received mother's milk was adjusted for time (from infants' postmenstrual age 32 weeks until 4 months corrected age), mode of delivery (vaginal/caesarean section), maternal education (highest level/lowest level), infant gestational age at birth and unit (Single Family Room /Open Bay) in logistic mixed model analysis, in line with the definition made by The World Health Organization: Exclusively (mother's milk and supplements), fully (mother's milk and water/juices), partly (mother's milk and formula/solids) or formula fed (The World Health Organization, 2019).

Table 5.

Occurrence of Direct Breastfeeding **N = 77**

Time point	Variables	SFR[a] n = 35 n (%)	OB[b] n = 42 n (%)	*p*-value
At discharge	Exclusively direct breastfed	22 (63)	4 (10)	<.001
	Partly direct breastfed [c]	6 (17)	28 (66)	<.001
	Not direct breastfed	7 (20)	10 (24)	.32
At term	Exclusively direct breastfed	20 (57)	11 (26)	.022
	Partly direct breastfed [c]	3 (9)	17 (41)	.10
	Not direct breastfed	12 (34)	14 (33)	.78
At four months corrected age	Exclusively direct breastfed	4 (11)	3 (7)	.51
	Partly direct breastfed [c]	13 (38)	12 (29)	1.00
	Not direct breastfed	18 (51)	27 (64)	.32

Time point	Variables	SFR[a] n =35 n (%)	OB[b] n = 42 n (%)	*p*-value
	Introduced to solid foods at four month corrected age	27 (77)	36 (86)	.29
Nipple shields	At post menstrual age 32 weeks	4 (13)	6 (14)	1.00
	At post menstrual age 33 weeks	7 (21)	14 (33)	.33
	At post menstrual age 34 weeks	15 (44)	15 (36)	.61
	At discharge	10 (30)	12 (29)	1.00
	At term	5 (16)	6 (15)	1.00
	At four months corrected age	0 (0)	0 (0)	-

Note. [a] = Single-Family Room unit. [b] = Open Bay unit. [c] Partly direct breastfed = Directly breastfed, but also fed by gavage/cup/ spoon/bottle.

Instruksjoner for foreldrene

Kjære foreldre som deltar i ”The International Closeness Survey I Study
Vennligst les instruksjonene nedenfor om praktisk gjennomføring av studien.

Spørsmål sendes som tekstmeldinger

Du vil bli sendt ett spørsmål som en SMS hver kveld kl 21:00 om din opplevelse av den omsorg ditt barns sykehus har gitt den dagen

- Vennligst send ditt svar på spørsmålet innenfor samme dag med tallene 1, 2, 3, 4, 5, 6, 7 eller 0.
- I tillegg til tallet (som er ditt svar på spørsmålet), skriv gjerne tilleggsinformasjon om du ønsker det.
- Å sende svaret på SMS vil ikke koste deg mer enn å sende en tekstmelding i ditt eget land (meldingen sendes til Finland, hos de fleste operatører kan sms sendes fritt i Europa). Kostnadene er knyttet til din kontrakt med din mobiltelefonoperatør. Å motta spørsmålene som tekstmeldinger koster deg ikke noe.
- Vi ønsker at du skal svare på disse spørsmålene hver dag under sykehusoppholdet.
- Du vil ikke motta et nytt spørsmål før du har svart på det forrige spørsmålet. Hvis du glemmer å svare, kan du fortsette din deltakelse i studien ved å besvare den tidligere tekstmelding du har glemt å svare på.
- Dersom du ikke svarer vil du to dager senere vil du motta det samme spørsmålet igjen. Hvis du ikke svarer på dette spørsmålet heller, vil det ikke bli sendt flere spørsmål.
- Utsendelsen av spørsmål stoppes senest første dag etter at babyen din skrives ut fra sykehuset eller eventuelt overføres til en annen enhet. Vennligst ikke svar på det spørsmålet du vil få to dager senere.
- På utreisedagen før barnet ditt skrives ut fra sykehuset vil vi be deg om å svare på tre spørsmål knyttet til amming og din tillit til å ta vare på babyen. Spørsmålene vil være i en konvolutt i samme mappe som foreldre-nærhetsdagboken.
- Alle svarene vil bli behandlet absolutt konfidensielt og vil ikke være kjent for noen av de ansatte som behandler eller pleier barnet ditt.

En datamaskin vil daglig tilfeldig velge ut et av de ni spørsmålene nedenfor

1. I hvilken grad lyttet de ansatte til deg i dag?

På en skala fra 1 til 7 eller 0 (1=ikke i det hele tatt–7=i svært høy grad, 0=Ikke på avdelingen)
2. I hvilken grad har du deltatt i pleien av din baby i dag?

På en skala fra 1 til 7 eller 0 (1=ikke i det hele tatt–7=i svært høy grad, 0=
Ikke på avdelingen)

3. Fylte veiledningen fra personalet dine behov i dag?

På en skala fra 1 til 7 eller 0 (1=ikke i det hele tatt–7=i svært høy grad, 0=Ikke på avdelingen)
4. **Ble din mening vurdert i beslutninger tatt om din baby?** *På en skala fra 1 til 7 eller 0 (1=ikke i det hele tatt–7=i svært høy grad, 0=Ikke på avdelingen)*

5. Stolte du på de ansatte i deres pleie av babyen din i dag?

På en skala fra 1 til 7 eller 0 (1=ikke i det hele tatt–7=i svært høy grad, 0=Ikke på avdelingen)
6. Stolte de ansatte på deg i din omsorg for din baby i dag?

På en skala fra 1 til 7 eller 0 (1=ikke i det hele tatt–7=i svært høy grad, 0=Ikke på avdelingen)
7. I hvilken grad har du deltatt i diskusjoner på legevisitten?

På en skala fra 1 til 7 eller 0 (1=ikke i det hele tatt–7=i svært høy grad, 0=Ikke på avdelingen)
8. Følte du at ditt informasjonsbehov ble ivaretatt i dag?

På en skala fra 1 til 7 eller 0 (1=ikke i det hele tatt–7=i svært høy grad, 0=Ikke på avdelingen)
9. Tilbød de ansatte deg følelsesmessig støtte i dag?

På en skala fra 1 til 7 eller 0 (1=ikke i det hele tatt–7=i svært høy grad, 0=Ikke på avdelingen)
Foreldre -nærhetsdagboken

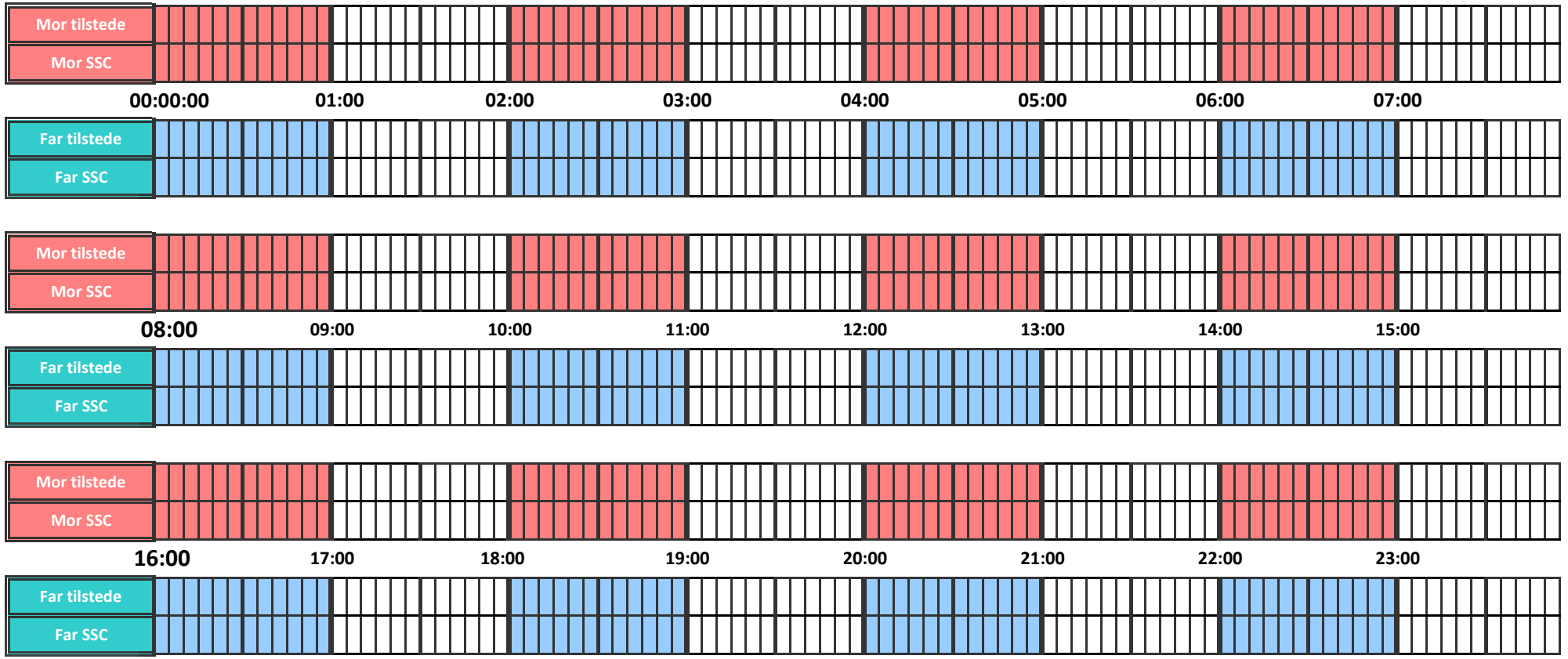
I løpet av ditt barns opphold på sykehuset vil vi gjerne at du skal benytte foreldre - nærhetsdagboken til å registrere følgende:
1) Hvor mye du er tilstede i avdelingen
2) Hvor mye du ligger hud mot hud med babyen din

- En side i dagboken representerer en dag. Tidsperioden er gitt ved hjelp av en tidslinje med fem minutters mellomrom.
- I dagboken er det en spesiell plass for mors og fars / partners tilstedeværelse, for mengden av hud-til-hud omsorg.
- Så lenge studien pågår vil dagboken vil bli oppbevart i en lukket mappe ved siden av babyens seng. Andre foreldre eller sykepleiere vil ikke få se svarene.

NAVN:
ID:

FORELDRENÆRHETSDAGBOK

DATO:



SSC: Babyen ligger på forelderens bare bryst. Babyen kan ha på seg lue og en liten body.
Holder: Babyen er i forelderens armer. Seng i seng telles som holding.

Attachment 3

Nutritional protocol

A) Feeding protocol if infants < = 1250 grams

	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
Volume/kg/day	80	100	120	140	150	160	170	180	180	180	180
Breast milk	20	50	70	90	150	160	170	180	180	180	180
Vaminolac	25	25	25	25		0	0				
Glucose 10 mg/ml			25	25	0	0	0				
Glucose 150mg/ml	35	25									
BMF FM85 g/100ml									2,5	2,5	5
Energy Kcal/kg/d	41	56	66	80	97	114	121	128	143	143	158
Fat g/kg/d	0,8	2,1	2,9	3,7	6,2	6,6	7	7,4	7,4	7,4	7,44
Protein g/kg/d	1,8	2,1	2,4	2,6	2,0	2,1	2,2	2,3	3,2	3,2	4,10
Carbohydrates g/kg/d	6,2	7,4	7,5	9	10,8	11,5	12,2	13	15,9	15,9	18,9

B) Feeding protocol if infants > 1250 g

	Day 0	Day 1	Day 2	Dag 3	Day 4	Dag 5	Day 6	Day 7	Day 8	Day 9	Day 10
Volum breast milk ml/kg	80	100	120	140	150	160	170	180	180	180	180
Energy Kcal/kg/d	57	71	85	99	106	114	121	128	143	143	158
BMF FM85 g/100ml									2,5	2,5	5
Fat g/kg/d	3,3	4,1	4,9	5,7	6,2	6,6	7,0	7,4	7,4	7,4	7,4
Protein g/kg/d	1,0	1,3	1,6	1,8	2,0	2,1	2,2	2,3	3,2	3,2	4,1
Cabohydrates g/kg/d	5,8	7,2	8,6	10,1	10,8	11,5	12,2	13,0	15,9	15,9	18,9

Utregnings mal for ernæring

Morsmelk		
Mengde:	100	ml
Mengde/kg	100	
Kcal	70	
Fett	4	
Protein	1,3	
Karbohydrat	7	

Morsmelk med 5 gram FM85		
Mengde:	100	ml
Mengde/kg	100	
Kcal	87	
Fett	4	
Protein	2,3	
Karbohydrat	10,3	

PRE-Nan Discharge		
Mengde:	100	ml
Mengde/kg	100	
Kcal	73	
Fett	3,8	
Protein	2,05	
Karbohydrat	7,7	

Glukose 10 %		
Mengde:	100	ml
Mengde/kg	100	
Kcal	40	
Karbohydrat	10	

Morsmelk med 2,5 gram FM85		
Mengde:	100	ml
Mengde/kg	100	
Kcal	78,5	
Fett	4	
Protein	1,8	
Karbohydrat	8,65	

PRE-Nan Premiee		
Mengde:	100	ml
Mengde/kg	100	
Kcal	80	
Fett	4	
Protein	2,9	
Karbohydrat	8,1	

Vaminolac		
Mengde:	100	ml
Mengde/kg	100	
Kcal	24	
Protein	7	

Glukose 15 %		
Mengde:	100	ml
Mengde/kg	100	
Kcal	60	
Karbohydrat	15	

VESTRE VIKEN

The FCC Study ID_____

Nærhetsdagboken er fundamentet i prosjektet. Foreldre med hjelp fra personell fyller ut nærhetsdagboken *kontinuerlig* fra fødsel og under hele oppholdet inntil barnet når GA 34+0 – dvs i perioden:_____

Spedbarn- og familiekarakteristika

1. Dato for termin:	
2. Tid og dato for fødsel:	
3. Svangerskapslengde i uker og dager:	
4. Fødselsvekt (g): Fødselslengde (cm): Hodeomkrets (cm) ved fødsel	g cm cm
5. Kjønn:	☐ Pike ☐ Gutt
6. Fødsel:	☐ Keisersnitt ☐ Vaginal fødsel
7. Flerfødsel:	☐ En baby ☐ Tvillinger – hvis ja: Tvilling 1 Tvilling 2
8. Har foreldrenes hatt barn innlagt i Nyfødt intensiv avdeling tidligere?	☐ Ja ☐ Nei
9. Foreldrenes alder	Mor år: Far år:
10. Mors morsmål:	
11. Fars/partners morsmål:	

VESTRE VIKEN

12. Mors høyeste nivå/grad innen utdanning:	☐ Grunnskole ☐ Videregående/yrkesfag ☐ Høgskole/universitet
13. Fars/partners høyeste nivå/grad innen utdanning:	☐ Grunnskole ☐ Videregående/yrkesfag ☐ Høgskole/universitet
14. Før fødsel var mor (flere kryss er mulig)	☐ I lønnet arbeid ☐ Hjemmeværende ☐ Arbeidsledig ☐ Annet ☐ Student
15. Før fødsel var far/partner (flere kryss er mulig)	☐ I lønnet arbeid ☐ Student ☐ Arbeidsledig ☐ Annet: _____
16. Røyker mor?	☐ Nei ☐ Ja, hvor mange sigaretter per dag: _____
17. Røyker far/partner?	☐ Nei ☐ Ja, hvor mange sigaretter per dag: _____
18. Familie/foreldre	☐ Enslig ☐ I forhold, ikke samboer ☐ I forhold, samboer/gift
19. Familie/barn	☐ Hva er alderen til husstandens barn under 18 år (minst 50 % av tid tilbrakt i husstand ved delt omsorg):

VESTRE VIKEN

The FCC Study– Ernæring / vekst & amming - Daglig registrering gjennom barnets første leveuke

DATO: _____ DAG NR: _____

1. Volum gitt	ml
2. Vekt	gram

Enteral ernæring

3. Type melk (flere kryss er mulig)	☐ Morsmelk ☐ Bank/donormelk ☐ Morsmelk erstatning
4. Hvordan ernæres barnet? (flere kryss mulig)	☐ Bryst ☐ Flaske ☐ Kopp ☐ Sonde Hvis sonde; ☐ måltid ☐ kontinuerlig drypp
5. Melkevolum	Morsmelk ml Bank/donormelk ml Morsmelk erstatning ml
6. PreNan FM85 - 2,5 g/100 ml[1]	ml

[1] Volum av melk gitt med berikning

7. PreNan FM85 - 5 g/100 ml	ml
9. Berikning av melk med karbohydrat energisupplement	Type_____ Styrke ☐ 3 % ☐ 6 % _____ ml
10. Hvor mange ganger har barnet ligget til brystet[2] i dag?	
11. Nacl	mmol tilført

Parenteral ernæring

12. VVHF: volum Vaminolac HUS: volum Prematurløsning/Vaminiolac		ml ml
16. Peditrace tilsatt i Prematurløsning/Vaminiolac		ml
17. Volum Glucose	Styrke mg/ml: Styrke mg/ml: Styrke mg/ml: Totalt gram/ døgn:	Mengde ml: Mengde ml: Mengde ml:
18. VVHF: volum Clinoleic HUS: volum SMOFlipid (regn med det som er standard i prematurløsning + det som tilsettes i tilegg)	Type: Antall ml:	tilsvarer gram fett:
19. Vitalipid/soluvit	Type:	total ml løsning:

TOTAL REGNSKAP

Kcal

Protein

Fett

Karbohydrat

[2] Ligget til brystet, referer til at barnets munn har berørt mors brystknopp

VESTRE VIKEN

OPPSUMERING PÅ DAG 7 i første leveuke Dato: _____

1. Klassifisering[3] av amming/ inntak av morsmelk	☐ Eksklusiv amming ☐ Fullernært med morsmelk ☐ Delvis ernært med morsmelk ☐ Morsmelk erstatning på flaske
2. Hvordan ernæres barnet? (flere kryss mulig)	☐ Bryst ☐ Flaske ☐ Kopp ☐ Sonde Hvis sonde; ☐ måltid ☐ kontinuerlig drypp
3. Benyttes brystskjold som hjelpemiddel under amming?	☐ Ja ☐ Nei
4. Dato da barnet eventuelt avsluttet amming	☐ Ammer fortsatt ☐ Dato da sluttet: _____
5. Årsak til avsluttet amming	

6. Vekt	gram
7. Hodeomkrets	cm
8. Lengde	cm

Måling av hodeomkrets: måles med et ikke-elastisk målebånd rundt hodets maksimale hodeomkrets. Mål 3 ganger, største mål gjelder.
Måling av lengde: krever 2 pleiere. Barnet skal måles i sideleie på stabilt underlag. En pleier holder målebåndet ved hodets øverste punkt. Øverste ben strekkes ut og målebåndet skal ligge langs barnets midtlinje. Måler til barnets fotsåle med utstrukket kneledd.

9. På dag 7 måles mors melkemengde[4]:	ml

[3] WHO kriterier: eksklusiv amming (vitaminer tillates), full ernært med morsmelk (tillater vann, vitaminer, juice), delvis ernæring med morsmelk (både morsmelk og morsmelk erstatning/fast føde)

[4] Mengden mor pumper + mengden melk barnet dier. Barnet blir veid før og etter hver amming. Omregne vektøkning i gram til volumet av inntak i milliliter

Deretter daglig registrering for hver hele ga-uke [5] fom GA uke 28 tom GA 34+0

DATO: _____GA – UKE _____ DAG NR: _____

1. Volum gitt	ml
2. Vekt	gram

Enteral ernæring

3. Type melk (flere kryss er mulig)	☐ Morsmelk ☐ Bank/donormelk ☐ Morsmelk erstatning
2. Hvordan ernæres barnet? (flere kryss mulig)	☐ Bryst ☐ Flaske ☐ Kopp ☐ Sonde Hvis sonde; ☐ måltid ☐ kontinuerlig drypp
4. Melkevolum	Morsmelk ml Bank/donormelk ml Morsmelk erstatning ml
5. PreNan FM85 - 2,5 g/100 ml[6]	ml
6. PreNan FM85 - 5 g/100 ml	ml
8. Berikning av melk med karbohydrat energisupplement	Type: Styrke ☐ 3 % ☐ 6 % ml
10. Hvor mange ganger har barnet ligget til brystet [7] i dag?	
11. Når ble barnet ammet første gang med mer enn 5 ml	Dato

[5] Dette vil medføre at det blir noe overlapp mellom registrering igjennom barnets første leveuke og ved barnets første hele GA- uke.
[6] Volum av melk gitt med berikning
[7] Ligget til brystet, referer til at barnets munn har berørt mors brystknopp

12. Nacl	mmol tilført

Parenteral ernæring

12. VVHF: volum Vaminolac HUS: volum Prematurløsning/Vaminiolac	ml Type: ml
16. Peditrace tilsatt i Prematurløsning/Vaminiolac	ml
17. Volum Glucose	Styrke mg/ml: Mengde ml: Styrke mg/ml: Mengde ml: Styrke mg/ml: Mengde ml: Totalt gram/ døgn:
18. VVHF: volum Clinoleic HUS: volum SMOFlipid (regn med det som er standard i prematurløsning + det som tilsettes i tilegg)	Type: Antall ml: tilsvarer gram fett:
19. Vitalipid/soluvit	Type: total ml løsning:
TOTAL REGNSKAP Kcal Protein Fett Karbohydrat	

VESTRE VIKEN

STATUS ved hver hele GA –uke 29 □ 30 □31 □ 32□ 33 □ 34 □ **-Dato:**

Klassifisering[8] av amming/ inntak av morsmelk	☐ Eksklusiv amming ☐ Fullernært med morsmelk ☐ Delvis ernært med morsmelk ☐ Morsmelk erstatning på flaske
Hvordan ernæres barnet? (flere kryss mulig)	☐ Bryst ☐ Flaske ☐ Kopp ☐ Sonde Hvis sonde; ☐ måltid ☐ kontinuerlig drypp
Benyttes brystskjold som hjelpemiddel under amming?	☐ Ja ☐ Nei
Dato da barnet eventuelt avsluttet amming	☐ Ammer fortsatt ☐ Dato da sluttet:
Årsak til avsluttet amming	

Vekt	gram
Hodeomkrets	cm
Lengde	cm
Overarms omkrets (obs kun ved 34+0)	cm

Måling av hodeomkrets: måles med et ikke-elastisk målebånd rundt hodets maksimale hodeomkrets. Mål 3 ganger, største mål gjelder.
Måling av lengde: krever 2 pleiere. Barnet skal måles i sideleie på stabilt underlag. En pleier holder målebåndet ved hodets øverste punkt. Øverste ben strekkes ut og målebåndet skal ligge langs barnets midtlinje. Måler til barnets fotsåle med utstrukket kneledd.

På GA 34+0 måles mors melkemengde: **ml**

[8] WHO kriterier: eksklusiv amming (vitaminer tillates), full ernært med morsmelk (tillater vann, vitaminer, juice), delvis ernæring med morsmelk (både morsmelk og morsmelk erstatning/fast føde)

VESTRE VIKEN

På dag 14 etter fødsel ☐ MOR BESVARER SPØRRESKJEMAER ☐ FAR BESVARER SPØRRESKJEMAER

Ved utreise

Dato: _____

☐ Mor har svart på spørreskjemaer - Hvis ikke begge foreldre møter, send med ferdig frankert konvolutt	☐ Far har svart på spørreskjemaer - Hvis ikke begge foreldre møter, send med ferdig frankert konvolutt

Antall dager innlagt:

Ga uker ved utreise:

PMA ved utreise:

Laveste vekt under opphold:

Dato for gjenvunnet fødselsvekt:

Antall dager til gjenvunnet fødselsvekt:

PMA ved gjenvunnet fødselsvekt:

Vekt	gram
Hodeomkrets	cm
Lengde	cm
Overarms omkrets	cm

Måling av hodeomkrets: måles med et ikke-elastisk målebånd rundt hodets maksimale hodeomkrets. Mål 3 ganger, største mål gjelder.
Måling av lengde: krever 2 pleiere. Barnet skal måles i sideleie på stabilt underlag. En pleier holder målebåndet ved

hodets øverste punkt. Øverste ben strekkes ut og målebåndet skal ligge langs barnets midtlinje. Måler til barnets fotsåle med utstrukket kneledd.

Om amming & hud mot hud

Klassifisering[9] av amming/ inntak av morsmelk	☐ Eksklusiv amming ☐ Fullernært med morsmelk ☐ Delvis ernært med morsmelk ☐ Morsmelk erstatning på flaske
Hvordan ernæres barnet med morsmelk? (flere kryss mulig)	☐ Bryst ☐ Flaske ☐ Kopp ☐ Sonde Hvis sonde; ☐ måltid ☐ kontinuerlig drypp
Benyttes brystskjold som hjelpemiddel under amming?	☐ Ja ☐ Nei
Berikes morsmelken?	☐ Ja ☐ Nei Hvis ja; type Berikning/dose:
Årsak til avsluttet amming	
Hvor mange timer etter fødsel ble barnet lagt til brystet første gang?	Antall timer
Når ble barnet lagt til brystet første gang	Dato
Når pumpet mor seg første gang?	Timer etter fødsel
Hvor og hos hvem lå barnet første gang hud mot hud	Nyfødt intensiv ☐ På operasjon ☐ Mor /Far (sett ring rundt)

[9] WHO kriterier: eksklusiv amming (vitaminer tillates), full ernært med morsmelk (tillater vann, vitaminer, juice), delvis ernæring med morsmelk (både morsmelk og morsmelk erstatning/fast føde)

Etter hvor mange timer etter fødsel lå barnet første gang hud mot hud?	Timer etter fødsel

Sykelighetsdata

Når ble babyen tatt ut av kuvøsen i 24 timer for første gang?	Etter hvor mange dager_____ ☐ Aldri i kuvøse
IVH grad[10]	☐ Ja ☐ Nei ☐ Ikke undersøkt
ROP	☐ Ja ☐ Nei
BPD	☐ Ja ☐ Nei
Respiratorbehandling	☐ Nei ☐ < 1 døgn Antall dager (hvis minst 1 døgn):
Cpap	☐ Nei ☐ < 1 døgn Antall dager hvis minst1 døgn):
High Flow	☐ Nei ☐ < 1 døgn Antall dager hvis minst 1 døgn:
Oskygentilskudd (grime og/eller maske)	☐ Nei ☐ < 1 døgn Antall dager hvis minst 1 døgn):
Pneumothorax	☐ Ja ☐ Nei
Hyperbilirubinemi	Antall ganger i lys: Antall timer lysbehandling totalt:
Påvist sepsis med positiv blodkulktur (ikke vurdert som forurenset)	☐ Ja ☐ Nei Hvis ja, hvor mange ganger: Fått antibiotika? ☐ Ja ☐ Nei Hvis ja, antall dager med anitibiotikabehandling:

[10] IVH grad 3 og 4 ekskluderes fra studien

Mistanke om sepsis/klinisk sepsis	☐ Ja ☐ Nei Hvis ja, hvor mange ganger: Fått antibiotika? ☐ Ja ☐ Nei Hvis ja, antall dager med anitibiotikabehandling:
Antall rtg thorax	
Antall ultralyd caput	
Antall ultralyd cor	
Antall rekvirerte blodprøver (antall stikk)	
Koffein	☐ Nei ☐ Ja; totalt antall dager: Dato ved siste seponering:
Nacl	☐ Nei ☐ Ja, totalt antall dager: Totalt antall mmol:
Vitaminer	Etter standard prosedyre ☐ Ja ☐ Nei

Ved termin

Dato: _____

☐ Mor har svart på spørreskjemaer: - Hvis ikke begge foreldre møter, send med ferdig frankert konvolutt	☐ Far har svart på spørreskjemaer: - Hvis ikke begge foreldre møter, send med ferdig frankert konvolutt

Vekt	gram
Hodeomkrets	cm
Lengde	cm
Overarms omkrets	cm

Måling av hodeomkrets: måles med et ikke-elastisk målebånd rundt hodets maksimale hodeomkrets. Mål 3 ganger, største mål gjelder.
Måling av lengde: krever 2 pleiere. Barnet skal måles i sideleie på stabilt underlag. En pleier holder målebåndet ved hodets øverste punkt. Øverste ben strekkes ut og målebåndet skal ligge langs barnets midtlinje. Måler til barnets fotsåle med utstrukket kneledd.

Klassifisering[11] av amming/ inntak av morsmelk	☐ Eksklusiv amming ☐ Fullernært med morsmelk ☐ Delvis ernært med morsmelk ☐ Morsmelk erstatning på flaske
Hvordan ernæres barnet med morsmelk? (flere kryss mulig)	☐ Bryst ☐ Flaske ☐ Kopp ☐ Sonde Hvis sonde; ☐ måltid ☐ kontinuerlig drypp
Benyttes brystskjold som hjelpemiddel under amming?	☐ Ja ☐ Nei

[11] WHO kriterier: eksklusiv amming (vitaminer tillates), full ernært med morsmelk (tillater vann, vitaminer, juice), delvis ernæring med morsmelk (både morsmelk og morsmelk erstatning/fast føde)

Berikes morsmelken?	☐ Ja ☐ Nei Hvis ja; type Berikning/dose:
Hvis avsluttet amming: PÅ hvilken dato skjedde det?	☐ Ikke sluttet ☐ Har sluttet; dato:_____
Årsak til avsluttet amming	
Vitaminer	Etter standard prosedyre ☐ Ja ☐ Nei
Har barnet vært reinnlagt og /eller behandlet på sykehus (evt poliklinikk) etter utskrivelse?	☐ Nei ☐ Ja; Hvis ja, angi årsak:
Har barnet blitt introdusert for fast føde?	☐ Nei ☐ Ja; angi omtrent dato for introduksjon: Hvis ja, hvilken type mat? ☐ Velling: ☐ Grøt : ☐ Brød : ☐ Middag; ☐ industri ☐ hjemmelaget: ☐ Frukt :

Ved 4 måneder korr alder

Dato: _____

☐ Mor har svart på spørreskjemaer: - Hvis ikke begge foreldre møter, send med ferdig frankert konvolutt	☐ Far har svart på spørreskjemaer: - Hvis ikke begge foreldre møter, send med ferdig frankert konvolutt

Vekt	gram
Hodeomkrets	cm
Lengde	cm
Overarms omkrets	cm

Måling av hodeomkrets: måles med et ikke-elastisk målebånd rundt hodets maksimale hodeomkrets. Mål 3 ganger, største mål gjelder.
Måling av lengde: krever 2 pleiere. Barnet skal måles i sideleie på stabilt underlag. En pleier holder målebåndet ved hodets øverste punkt. Øverste ben strekkes ut og målebåndet skal ligge langs barnets midtlinje. Måler til barnets fotsåle med utstrukket kneledd.

Klassifisering[12] av amming/ inntak av morsmelk	☐ Eksklusiv amming ☐ Fullernært med morsmelk ☐ Delvis ernært med morsmelk ☐ Morsmelk erstatning på flaske
Hvordan ernæres barnet med morsmelk? (flere kryss mulig)	☐ Bryst ☐ Flaske ☐ Kopp ☐ Sonde Hvis sonde; ☐ måltid ☐ kontinuerlig drypp

[12] WHO kriterier: eksklusiv amming (vitaminer tillates), full ernært med morsmelk (tillater vann, vitaminer, juice), delvis ernæring med morsmelk (både morsmelk og morsmelk erstatning/fast føde)

Dato når barnet eventuelt avsluttet amming	☐ Ammer fortsatt ☐ Dato for avslutning:
Årsak til avsluttet amming	
Vitaminer	Etter standard prosedyre ☐ Ja ☐ Nei
Har barnet vært reinnlagt og /eller behandlet på sykehus (poliklinikk) etter utskrivelse?	☐ Nei ☐ Ja ; angi kort årsak:
Har barnet blitt introdusert for fast føde?	☐ Nei ☐ Ja; angi omtrent dato for introduksjon: Hvis ja, hvilken type mat? ☐ Velling: ☐ Grøt : ☐ Brød : ☐ Middag; ☐ industri ☐ hjemmelaget: ☐ Frukt :

Ønsker foreldre tilsendt informasjon om studiens resultater når disse foreligger? ☐ Ja ☐ Nei

Kjære mor og far som deltar i studien "Sammenligning mellom to nyfødt intensivavdelinger"

Nå skal du snart reise hjem med barnet ditt – og som avtalt ber vi deg svare på en del spørsmål. Spørreskjemaet består av flere deler. Den starter med spørsmål om stress knyttet til at du har barnet ditt innlagt på en nyfødt intensivavdeling. Deretter følger noen spørsmål om dine opplevelser. Dette er de samme spørsmålene som du har besvart tidligere.

Vi er takknemlige om du fyller ut alle spørsmålene. Hvert svar er verdifullt.

I fortsettelsen er det listet opp ulike erfaringer som foreldre har rapportert som stressende. Ved stressende menes at opplevelsen har forårsaket at du føler deg engstelig, urolig eller anspent. Når du nå ser tilbake på **oppholdet ditt i sin helhet** kan du angi ved å sette ring hvor stressende hvert element som er oppført nedenfor ved hjelp av følgende skala:

1 = Ikke i det hele tatt stressende: opplevelsen førte ikke til at du følte deg urolig, anspent eller engstelig

2 = litt stressende

3 = moderat stressende

4 = svært stressende

5 = ekstremt stressende

I. A = ikke aktuelt

Hvis du ikke har gjort deg noen erfaring rundt det elementet det spørres om, viser du dette ved å sette ring rundt I.A (ikke aktuelt).

Nå følger en liste over de ulike *syns-og hørselsinntrykk* som ofte oppleves i en nyfødt intensiv avdeling. Sett ring rundt det tallet som du mener passer best med din opplevelse av inntrykkene.

	IA= ikke aktuelt	1= ikke i det hele tatt stressende	2= litt stressende	3= moderat stressende	4= Svært stressende	5= ekstremt stressende
Tilstedeværelse av monitor og utstyr	IA	1	2	3	4	5
Den konstante støyen fra skjermer og utstyr	IA	1	2	3	4	5
Den plutselige støyen av alarmer fra overvåkningsutstyr	IA	1	2	3	4	5
De andre syke barna i avdelingen	IA	1	2	3	4	5
Det store antall personer som arbeider i avdelingen	IA	1	2	3	4	5
Maskinen (respirator/CPAP) som puster for barnet mitt	IA	1	2	3	4	5

Nedenfor er en liste over elementer som kan beskrive hvordan *barnet ditt ser ut og oppfører seg* samt noen av *de behandlinger* du har sett bli utført på barnet ditt. Ikke alle barn har disse erfaringene eller ser ut på denne måten. Dersom du ikke har opplevd elementene setter du sirkel rundt I.A. Sett ring rundt det tallet som du mener passer best med din erfaring.

	IA= ikke aktuelt	1=ikke i det hele tatt stressende	2= litt stressende	3 = moderat stressende	4= Svært stressende	5= Ekstremt stressende
Ledninger, slanger og utstyr på eller i nærheten av barnet mitt	IA	1	2	3	4	5
Skader, kutt eller sår på barnet mitt	IA	1	2	3	4	5
Den uvanlige fargen på barnet mitt (for eksempel ser blek eller gul ut)	IA	1	2	3	4	5
Den lille størrelsen på barnet mitt	IA	1	2	3	4	5
Det rynkete utseendet på barnet mitt	IA	1	2	3	4	5
Synet av nåler og slanger på barnet mitt	IA	1	2	3	4	5
Når barnet mitt får mat intravenøst eller via sonde	IA	1	2	3	4	5
Når det ser ut som barnet mitt har smerter	IA	1	2	3	4	5
Når barnet mitt ser trist ut	IA	1	2	3	4	5

	IA= ikke aktuelt	1= ikke i det hele tatt stressende	2= litt stressende	3= moderat stressende	4= svært stressende	5= ekstremt stressende
Det kraftløse og svake utseendet på barnet mitt	IA	1	2	3	4	5
De rykkete eller urolige bevegelsene på barnet mitt	IA	1	2	3	4	5
Når barnet mitt ikke er i stand til å gråte som andre barn	IA	1	2	3	4	5
Når barnet mitt gråter i lange perioder	IA	1	2	3	4	5
Når barnet mitt ser redd ut	IA	1	2	3	4	5
Når barnet mitt plutselig endrer farge (foreksempel blir blek eller blå)	IA	1	2	3	4	5
Å se at barnet mitt slutter å puste	IA	1	2	3	4	5

Nå ønsker vi å spørre deg om hvordan du opplever *ditt forhold til barnet ditt* og hvordan du ser på *din foreldrerolle*. Hvis du har opplevd følgende situasjoner eller følelser, viser du hvor stressende det var ved å sette sirkel rundt det aktuelle nummeret.

	IA= ikke aktuelt	1= ikke i det hele tatt stressende	2= Litt stressende	3= moderat stressende	4= svært stressende	5= ekstremt stressende
Være adskilt fra barnet mitt	IA	1	2	3	4	5
Ikke selv kunne gi mat til barnet mitt	IA	1	2	3	4	5
Ikke være i stand til å selv ta vare på barnet mitt (for eksempel skifte bleie og bade det)	IA	1	2	3	4	5
Føle meg hjelpeløs og ute av stand til å beskytte barnet mitt fra smerte og smertefulle prosedyrer	IA	1	2	3	4	5
Føle meg hjelpeløs i forhold til hvordan jeg kan hjelpe barnet mitt i denne perioden	IA	1	2	3	4	5
Ikke ha mulighet til å være alene med barnet mitt	IA	1	2	3	4	5
Noen ganger glemme hvordan barnet mitt ser ut	IA	1	2	3	4	5

	IA= ikke aktuelt	1= ikke i det hele tatt stressende	2= Litt stressende	3= moderat stressende	4= svært stressende	5= ekstremt stressende
Ikke kunne dele barnet mitt med andre familie-medlemmer	IA	1	2	3	4	5
Være redd for å ta på eller holde barnet mitt	IA	1	2	3	4	5
Følelse av at personalet er nærmere barnet mitt enn det jeg er	IA	1	2	3	4	5
Generell opplevelse av å ha barnet mitt innlagt på en nyfødt intensiv avdeling	IA	1	2	3	4	5

Å få barn er i seg selv en stor omveltning. Mye forandrer seg både fysisk og psykisk. Reaksjonen kan være mange og sammensatte. Du har sikkert opplevd at følelsene kan svinge mer enn ellers, - fra glede og lykke til uro og bekymring, noen ganger sterk fortvilelse og nedstemthet. Svingninger er helt vanlig og ansees som en normal tilpasningsprosess ved store endringer i livet.

Flere påstander som folk har brukt for å beskrive seg selv er gitt nedenfor.

Les hver påstand og sett sirkel rundt det tallet til høyre for påstanden, som du best mener angir hvordan du føler deg a k k u r a t nå, i d e t t e ø y e b l i k k e t. Det er ikke noen rette eller gale svar. Bruk ikke for mye tid på en påstand, men svar i tråd med hva som best synes å beskrive dine nåværende følelser.

	Ikke i det hele tatt	**Litt**	**Moderat**	**I stor grad**
Jeg føler meg urolig	1	2	3	4
Jeg er anspent	1	2	3	4
Jeg føler meg opprørt	1	2	3	4
Jeg er avslappet	1	2	3	4
Jeg føler meg tilfreds	1	2	3	4
Jeg er bekymret	1	2	3	4

Nå følger noen flere påstander. Les hver påstand og sett sirkel rundt det tallet som du best mener angir hvordan du har følt deg *de syv siste dagene*. Det er ikke noen rette eller gale svar.

1. Jeg har kunnet le og se det komiske i en situasjon

(0) like mye som vanlig

(1) ikke riktig så mye som jeg pleier

(2) klart mindre enn jeg pleier

(3) ikke i det hele tatt

2. Jeg har gledet meg til ting som skulle skje

(0) like mye som vanlig

(1) noe mindre enn jeg pleier

(2) klart mindre enn jeg pleier

(3) nesten ikke i det hele tatt

3. Jeg har bebreidet meg selv uten grunn når noe gikk galt

(3) ja, nesten hele tiden

(2) ja, av og til

(1) ikke særlig ofte

(0) nei aldri

4. Jeg har vært nervøs eller bekymret uten grunn

(0) nei, slett ikke

(1) nesten aldri

(2) ja, i blant

(3) ja, veldig ofte

5. Jeg har vært redd eller fått panikk uten grunn

(3) ja, svært ofte

(2) ja, noen ganger

(1) sjelden

(0) nei, aldri

6. Jeg har følt at det har blitt for mye for meg

(3) ja, jeg har stort sett ikke fungert i det hele tatt

(2) ja, iblant har jeg ikke klart å fungere som jeg pleier

(1) nei, for det meste har jeg klart meg bra

(0) nei, jeg har klart meg like bra som vanlig

7. Jeg har vært så ulykkelig at jeg har hatt vanskelig med å sove

(3) ja, for det meste

(2) ja, i blant

(1) ikke særlig ofte

(0) nei, ikke i det hele tatt

8. Jeg har følt meg nedfor eller ulykkelig

(3) ja, det meste av tiden

(2) ja, ganske ofte

(1) ikke særlig ofte

(0) nei, ikke i det hele tatt

9. Jeg har vært så ulykkelig at jeg har grått

(3) ja, nesten hele tiden

(2) ja, veldig ofte

(1) ja, det har skjedd i blant

(0) nei, aldri

10. Tanken på å skade meg selv har streifet meg

(3) ja, nokså ofte

(2) ja, av og til

(1) ja, så vidt

(0) aldri

Tusen takk for innsatsen!

HELSE BERGEN
Haukeland universitetssjukehus

Vestre Viken HF

SPØRRESKJEMA VED UTREISE TIL MØDRE SOM AMMER

Nedenfor følger påstander om amming. Vennligst indiker nedenfor i hvilken grad du er enig eller uenig.

	Sjelden	Noen ganger	Jevnlig	Ofte	Alltid
Jeg klarer å avgjøre om barnet mitt får nok melk	1	2	3	4	5
Jeg takler amming slik jeg alltid takler utfordrende oppgaver	1	2	3	4	5
Jeg føler at barnet mitt får god kontakt med brystet og suger ordentlig gjennom en amming	1	2	3	4	5
Jeg ammer uten å bruke kunstig fremstilt morsmelk som et tillegg	1	2	3	4	5
Jeg klarer å amme	1	2	3	4	5
Jeg klarer å amme selv om barnet mitt gråter	1	2	3	4	5
Jeg klarer å beholde lysten til å amme	1	2	3	4	5
Jeg er komfortabel med å amme selv om andre i familien er tilstede	1	2	3	4	5
Jeg er fornøyd med ammeopplevelsen	1	2	3	4	5
Jeg takler at ammingen kan være tidkrevende	1	2	3	4	5

	Sjelden	Noen ganger	Jevnlig	Ofte	Alltid
Jeg klarer å mate barnet fra et bryst før jeg bytter til det andre	1	2	3	4	5
Jeg klarer å amme barnet til hvert måltid	1	2	3	4	5
Jeg klarer å holde tritt med barnets behov for amming	1	2	3	4	5
Jeg vet når barnet er forsynt/ferdig med å amme	1	2	3	4	5

Kjære mor og far som deltar i studien "Sammenligning mellom to nyfødt intensivavdelinger" ID:_____

Nå har barnet ditt nådd termin alder – og som avtalt ber vi deg svare på en del spørsmål. Spørreskjemaet består av flere deler. Det starter med noen spørsmål om stress. Det er ikke de samme spørsmålene som du har svart på tidligere. Deretter følger noen spørsmål om dine opplevelser. Dette er de samme spørsmålene som du har besvart tidligere. I tillegg ber vi deg helt til sist svare på noen spørsmål om dine erfaringer med samspill med barnet ditt. Vi er takknemmelige om du fyller ut alle spørsmålene. Hvert svar er verdifullt.

Det er helt vanlig at foreldre føler at de har forskjellige problemer i hverdagslivet. Nedenfor finner du vanlige uttalelser foreldre kommer med. Noen vil du være enig i, og andre vil du nok være uenig i. Bestem deg for om du er enig eller uenig i en bestemt uttalelse. Er du ikke sikker på om du er enig eller uenig, setter du en sirkel rundt "Ikke sikker" (IS). Hvis du er enig må du bestemme deg for om du vil sette sirkel rundt "Ening" (E) eller "Sterkt enig" (SE). Tilsvarende blir det for "Uenig" (U) "Sterkt uenig" (SU). Ikke alle spørsmålene er tilpasset ditt barns alder og utviklingsnivå. Hvis du synes spørsmålet virker rart eller ikke angår deg og barnet ditt nå så setter du ring rundt (SU). Finner du at en uttalelse ikke passer helt til din mening, sett sirkel rundt den uttalelsen som kommer nærmest det du føler.

Spørsmålene starter på neste side.

- o Mor
- o Far

	SE = strekt enig	**E = enig**	**IS = Ikke sikker**	**U = uenig**	**SU = sterk uenig**
Jeg opplever ofte at jeg ikke klarer ting særlig bra	SE	E	IS	U	SU
Jeg opplever at jeg forsaker mye mer i livet mitt enn jeg hadde forventet for å tilfredsstille mine barns behov	SE	E	IS	U	SU
Jeg opplever meg fanget av mitt ansvar som forelder	SE	E	IS	U	SU
Siden jeg fikk dette barnet har jeg vært ute av stand til å gjøre nye (og forskjellige)ting	SE	E	IS	U	SU
Siden jeg fikk barn opplever jeg at jeg nesten aldri har kunnet gjøre ting jeg liker	SE	E	IS	U	SU
Jeg er misfornøyd med det siste kleskjøpet mitt	SE	E	IS	U	SU
Det er ganske mange ting som plager meg i livet mitt	SE	E	IS	U	SU
Å få et barn har forårsaket flere problemer med min ektefelle enn jeg hadde forventet	SE	E	IS	U	SU
Jeg føler meg alene og uten venner	SE	E	IS	U	SU
Når jeg går i selskap forventer jeg ikke å hygge meg	SE	E	IS	U	SU
Jeg er ikke så interessert i mennesker som jeg pleiede å være	SE	E	IS	U	SU
Jeg setter ikke pris på så mye lenger	SE	E	IS	U	SU
Mitt barn gjør sjelden ting (for meg) som gjør at jeg føler meg vel ved	SE	E	IS	U	SU

	SE = Sterkt enig	E = Enig	IS= ikke sikker	U= Uenig	SU= Sterkt uenig
Mesteparten av tiden føler jeg at mitt barn ikke liker meg, og ikke vil være i nærheten av meg	SE	E	IS	U	SU
Barnet mitt smiler sjeldnere enn forventet	SE	E	IS	U	SU
Når jeg gjør ting for mitt barn får jeg følelsen av at han/hun ikke setter særlig pris på det	SE	E	IS	U	SU
Når mitt barn leker er det sjelden han/hun ler eller babler	SE	E	IS	U	SU
Barnet mitt ser ikke ut til å lære like fort som barn flest	SE	E	IS	U	SU
Barnet mitt smiler ikke så ofte som barn flest	SE	E	IS	U	SU
Barnet mitt klarer ikke så mye som jeg forventet	SE	E	IS	U	SU
Det tar tid, og det er veldig vanskelig, for barnet mitt å bli vant til nye ting	SE	E	IS	U	SU

For det neste utsagnet, velg et svar fra 1 til 5 under

Jeg opplever at jeg er:

	1	2	3	4	5
1. ikke noen særlig god forelder					
2. en person som har problemer med å være forelder					
3. en gjennomsnittlig forelder					
4. en bedre enn gjennomsnitt forelder					
5. en veldig god forelder					

	SE = strekt enig	**E = enig**	**IS = Ikke sikker**	**U = uenig**	**SU = sterk uenig**
Jeg forventet å ha nærere og varmere følelser for barnet mitt enn jeg har, og dette plager meg	SE	E	IS	U	SU
Noen ganger gjør barnet mitt ting som plager meg bare for å være vanskelig/slem	SE	E	IS	U	SU
Barnet mitt gråter og lager oppstyr mer enn andre barn	SE	E	IS	U	SU
Når barnet mitt våkner er det vanligvis i dårlig humør	SE	E	IS	U	SU
Jeg opplever at barnet mitt har et skiftende humør og lett blir oppbrakt	SE	E	IS	U	SU
Barnet mitt gjør en del ting som plager meg	SE	E	IS	U	SU
Barnet mitt reager sterkt når det hender noe det ikke liker	SE	E	IS	U	SU
Barnet mitt blir lett opprørt over den minste ting	SE	E	IS	U	SU
Å etablere rutiner for spising og søvn hos barnet mitt er vanskeligere enn jeg hadde forventet	SE	E	IS	U	SU

For det neste utsagnet, velg et svar fra 1 til 5 under

Jeg opplever at å få mine barn til å gjøre noe, eller stoppe det fra å gjøre noe er: 1.mye vanskeligere enn jeg hadde forventet 2.noe vanskeligere enn jeg hadde forventet 3.omtrent så vanskelig som jeg hadde forventet 4. noe lettere enn jeg hadde forventet 5.mye lettere enn jeg hadde forventet	1	2	3	4	5

For det neste utsagnet, velg et svar fra valgene ”10+” til ”1-3”

Tenk nøye over det og tell antall forhold hos barnet som plager deg. For eksempel somler/driver omkring, nekter å høre, overaktiv, gråter, forstyrrer, sloss, skriker, etc	10+	8-9	6-7	4-5	1-3

	SE= Sterkt enig	E= enig	IS= Ikke sikker	U= uenig	SU= sterkt uenig
Det er enkelte ting som barnet mitt gjør som virkelig plager meg	SE	E	IS	U	SU
Mitt barn er blitt et mye større problem enn jeg hadde forventet	SE	E	IS	U	SU
Barnet mitt krever mer av meg enn barn flest	SE	E	IS	U	SU

Å få barn er i seg selv en stor omveltning. Mye forandrer seg både fysisk og psykisk. Reaksjonen kan være mange og sammensatte. Du har sikkert opplevd at følelsene kan svinge mer enn ellers, - fra glede og lykke til uro og bekymring, noen ganger sterk fortvilelse og nedstemthet. Svingninger er helt vanlig og ansees som en normal tilpassning prosess til store endringer i livet.

Flere påstander som folk har brukt for å beskrive seg selv er gitt nedenfor. Les hver påstand og sett sirkel rundt det tallet til høyre for påstanden, som du best mener angir hvordan du føler deg
a k k u r a t nå, i d e t t e ø y e b l i k k e t. Det er ikke noen rette eller gale svar. Bruk ikke for mye tid på en påstand, men svar i tråd med hva som best synes å beskrive dine nåværende følelser.

	Ikke i det hele tatt	Litt	Moderat	I stor grad
Jeg føler meg urolig	1	2	3	4
Jeg er anspent	1	2	3	4
Jeg føler meg opprørt	1	2	3	4
Jeg er avslappet	1	2	3	4
Jeg føler meg tilfreds	1	2	3	4
Jeg er bekymret	1	2	3	4

Nå følger noen flere påstander. Les hver påstand og sett sirkel rundt det tallet som du best mener angir hvordan du har følt deg *de syv siste dagene*. Det er ikke noen rette eller gale svar.

1. Jeg har kunnet le og se det komiske i en situasjon

(0) like mye som vanlig

(1) ikke riktig så mye som jeg pleier

(2) klart mindre enn jeg pleier

(3) ikke i det hele tatt

2. Jeg har gledet meg til ting som skulle skje

(0) like mye som vanlig

(1) noe mindre enn jeg pleier

(2) klart mindre enn jeg pleier

(3) nesten ikke i det hele tatt

3. Jeg har bebreidet meg selv uten grunn når noe gikk galt

(3) ja, nesten hele tiden

(2) ja, av og til

(1) ikke særlig ofte

(0) nei aldri

4. Jeg har vært nervøs eller bekymret uten grunn

(0) nei, slett ikke

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5. Jeg har vært redd eller fått panikk uten grunn

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(1) sjelden

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9. Jeg har vært så ulykkelig at jeg har grått

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(1) ja, det har skjedd i blant

(0) nei, aldri

10. Tanken på å skade meg selv har streifet meg

(3) ja, nokså ofte

(2) ja, av og til

(1) ja, så vidt

(0) aldri

Nå til sist følger flere påstander om hvordan du som mor eller far vurderer samspill med barnet ditt. Denne gangen skal du sette kryss når du angir hvordan påstanden stemmer for deg.

Når jeg pleier barnet får jeg følelser av ergrelse eller irritasjon

- ☐ Svært ofte
- ☐ Ofte
- ☐ Av og til
- ☐ Svært sjeldent
- ☐ Aldri

Når jeg pleier barnet får jeg en følelse av at barnet bevisst oppfører seg vanskelig eller prøver å opprøre meg

- ☐ Svært ofte
- ☐ Ofte
- ☐ Av og til
- ☐ Svært sjeldent
- ☐ Aldri

De siste to ukene vil jeg beskrive mine følelser overfor barnet som:

- ☐ Motvilje
- ☐ Ingen sterke følelser overfor barnet
- ☐ Svak hengivenhet
- ☐ Moderat hengivenhet
- ☐ Intens hengivenhet

Angående mitt generelle samhandlingsnivå med barnet:

- ☐ Har jeg sterke skyldfølelser for at jeg ikke er mer involvert
- ☐ Har jeg moderate skyldfølelser for at jeg ikke er mer involvert
- ☐ Har jeg svake skyldfølelser for at jeg ikke er mer involvert
- ☐ Jeg har ikke skyldfølelser angående dette

Når jeg samhandler med barnet føler jeg meg:

- ☐ Svært inkompetent med manglende selvtillit
- ☐ Moderat inkompetent med manglende selvtillit
- ☐ Moderat kompetent og selvsikker
- ☐ Svært kompetent og selvsikker

Når jeg er sammen med barnet føler jeg meg anspent og nervøs:

- ☐ Svært ofte
- ☐ Ofte
- ☐ Av og til
- ☐ Nesten aldri

Når jeg er sammen med barnet i andre folks nærvær, føler jeg meg stolt av barnet:

- ☐ Svært ofte
- ☐ Ofte
- ☐ Av og til
- ☐ Nesten aldri

Jeg prøver å involvere meg så mye som mulig i LEK med barnet:

- ☐ Dette er sant
- ☐ Dette er usant

Når jeg må forlate barnet:

- ☐ Føler jeg meg vanligvis temmelig trist (eller det er vanskelig å dra)
- ☐ Føler jeg meg ofte temmelig trist (eller det er vanskelig å dra)
- ☐ Har jeg blandete følelser av både tristhet og lettelse
- ☐ Føler jeg meg ofte temmelig lettet (og det er lett å dra)
- ☐ Føler jeg meg vanligvis temmelig lettet (og det er lett å dra)

Når jeg er sammen med barnet:

- ☐ Får jeg alltid mye glede/tilfredsstillelse ut av det
- ☐ Får jeg ofte mye glede/tilfredsstillelse ut av det
- ☐ Får jeg av og til mye glede/tilfredsstillelse ut av det
- ☐ Får jeg sjeldent mye glede/tilfredsstillelse ut av det

Når jeg ikke er sammen med barnet, tenker jeg på det:

- ☐ Nesten hele tiden
- ☐ Svært ofte
- ☐ Ofte
- ☐ Av og til
- ☐ Overhodet ikke

Når jeg er sammen med barnet:

- ☐ Prøver jeg vanligvis å forlenge tiden jeg tilbringer sammen med ham/henne
- ☐ Prøver jeg vanligvis å forkorte tiden jeg tilbringer sammen med ham/henne

Når jeg har vært borte fra barnet en stund og snart skal være sammen med ham/henne igjen, føler jeg vanligvis:

- ☐ Intens glede ved tanken
- ☐ Moderat glede ved tanken
- ☐ Svak glede ved tanken
- ☐ Ingen følelser overhodet ved tanken
- ☐ Negative følelser ved tanken

Jeg anser nå barnet:

- ☐ I stor grad som min egen baby
- ☐ Litt som min egen baby
- ☐ Egentlig ikke som min egen baby

Angående tingene har vi måttet oppgi på grunn av barnet:

- ☐ Misliker jeg det svært mye
- ☐ Misliker jeg det moderat
- ☐ Misliker jeg det litt
- ☐ Misliker jeg det ikke i det hele tatt

De siste tre månedene har jeg følt at jeg ikke har hatt nok tid til meg selv eller dyrking av mine egne interesser:

- ☐ Nesten hele tiden
- ☐ Svært ofte
- ☐ Av og til
- ☐ Overhodet ikke

Ansvaret ved å ta seg av dette barnet er en tung byrde. Jeg mener dette er:

- ☐ Svært sant
- ☐ Noenlunde sant
- ☐ Litt sant
- ☐ Overhodet ikke sant

Jeg stoler på min egen dømmekraft angående barnets behov:

- ☐ Nesten aldri
- ☐ Av og til
- ☐ Mesteparten av tiden
- ☐ Nesten hele tiden

Vanligvis når jeg er sammen med barnet:

- ☐ Er jeg svært utålmodig
- ☐ Er jeg litt utålmodig
- ☐ Er jeg moderat tålmodig
- ☐ Er jeg ekstremt tålmodig

Tusen takk for innsatsen!