Interventions to improve quantitative measures of parent satisfaction in neonatal care: a systematic review

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ABSTRACT

Objective  Interventions improving parent satisfaction can reduce parent stress, may improve parent-infant bonding and infant outcomes. Our objective was to systematically review neonatal interventions relating to parents of infants of all gestations where an outcome was parent satisfaction.

Methods  We searched the databases MEDLINE, EMBASE, PsychINFO, Cochrane Central Register of Controlled Trials, CINAHL, HMIIC, Maternity and Infant Care between 1 January 1946 and 1 October 2017. Inclusion criteria were randomised controlled trials (RCT), cohort studies and other non-randomised studies if participants were parents of infants receiving neonatal care, interventions were implemented in neonatal units (of any care level) and ≥1 quantitative outcome of parent satisfaction was measured. Included studies were limited to the English language only. We extracted study characteristics, interventions, outcomes and parent involvement in intervention design. Included studies were not sufficiently homogenous to enable quantitative synthesis. We assessed quality with the Cochrane Collaboration risk of bias tool (randomised) and the ROBINS-I tool (Risk Of Bias In Non-Randomised Studies - of Interventions) (non-randomised studies).

Results  We identified 32 studies with satisfaction measures from over 2800 parents and grouped interventions into 5 themes. Most studies were non-randomised involving preterm infants. Parent satisfaction was measured by 334 different questions in 29 questionnaires (only 6/29 fully validated). 18/32 studies reported higher parent satisfaction in the intervention group. The intervention theme with most studies reporting higher satisfaction was parent involvement (10/14). Five (5/32) studies reported involving parents in intervention design. All studies had high risk of bias.

Conclusions  Many interventions, commonly relating to parent involvement, are reported to improve parent satisfaction. Inconsistency in satisfaction measurements and high risk of bias makes this low-quality evidence. Standardised, validated parent satisfaction measures are needed, as well as higher quality trials of parent experience involving parents in intervention design.

What is known about the subject?

► Neonatal care significantly affects parents’ mental health; parent satisfaction is increasingly being used as a parent experience measure.
► Parent satisfaction is inversely related to parent stress; interventions improving parent satisfaction have the potential to reduce parent stress, improve parent-infant bonding and infant outcomes.
► Use of interventions measuring parent satisfaction as an outcome in neonatal units is increasing, although few are formally evaluated and wider uptake is limited; it is not known the degree to which parents are involved in intervention design.

What this study adds?

► There is inconsistency in how parent satisfaction in neonatal care is defined and measured, and the majority of studies do not include parents in intervention design.
► There is low-quality evidence that interventions relating to parent involvement may improve parent satisfaction with neonatal care.
► Standardised, validated measures of parent satisfaction and higher quality trials, involving parents in intervention design, are needed.

INTRODUCTION

One in 10 newborn babies in high-income countries require neonatal care.1 This is stressful for parents, who often develop anxiety, depression and post-traumatic stress disorder symptoms.2-4 Parental stress interferes with parent-child bonding5 and there is a well-established link between maternal mental health and infant development.6 Parent satisfaction, defined as ‘the perception of parents’ needs and expectations being met’ is inversely related to parental stress.7 As such, it is increasingly being used as a parent experience measure and neonatal service quality indicator. Interventions aimed at improving parent satisfaction have the potential to reduce parent stress, improve parent-infant bonding8 and infant outcomes.9
A range of parent-centred interventions, such as including parents on ward rounds, have recently become widespread in neonatal practice. Many are implemented on a small scale, without evaluating their impact on parent experience, making long-term integration into neonatal services challenging, while many others are using parent questionnaires. ‘Parent satisfaction’ as an outcome is gaining momentum, as neonatal trusts attempt to match more ‘business-like models’ where effectiveness of interventions (and evidence for change) is measured by quantitative outcomes. Moreover, where parent experience is measured as ‘parent satisfaction’, some studies include it as a primary outcome, whereas others use it as a secondary indicator to explore the parent point of view.

Furthermore, there are multiple experience measures available in addition to parent satisfaction, including parent stress, anxiety and depression scales; both quantitative and qualitative. Finally, it is not known the degree to which parents are involved in the design of such interventions. There have been no previous systematic evaluations focused on interventions measuring parent satisfaction with neonatal care as an outcome.

The aim of this review is to identify and describe neonatal interventions relating to parents of infants of all gestations where an outcome was parent satisfaction. For the reasons outlined above, we have only included studies that reported ≥1 quantitative measure of parent satisfaction. We aim to report each intervention’s effect on parent satisfaction, as well as parent input in intervention design.

METHODS
We reported this study using Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. We searched MEDLINE, EMBASE, PsychINFO, Cochrane Central Register of Controlled Trials, CINAHL, HMIC, Maternity and Infant Care (online supplementary file 1) for English papers published between 1 January 1946 and 1 October 2017, with update searches on 1 September 2018.

Inclusion criteria were: randomised controlled trials (RCT) and non-randomised studies (non-RCT) if participants were parents of infants receiving neonatal care, interventions were implemented in neonatal units and ≥1 quantitative outcome of parent satisfaction was measured. We have restricted our review to studies where ≥1 quantitative outcome of parent satisfaction was measured, in order to enable comparison of interventions, which has previously not been possible in any published review. Including studies with all available measures of parent experience (in addition to parent satisfaction), as well as those only qualitatively evaluated, would make any comparison very difficult. By using these preregistered search criteria, we also ensured we would capture studies measuring parent satisfaction both as primary and as secondary outcomes. We included studies from all neonatal care level units and all healthcare settings, without excluding studies in low-income or middle-income settings. This was because definitions of neonatal care levels differ between different countries and healthcare settings, making them not easily comparable. Moreover, different levels of care are found within the same hospital settings. We excluded systematic reviews, entirely qualitative studies, grey literature (e.g., conference abstracts), studies only reporting protocols or abstracts and full reports not in English.

Two authors (SS, IA) independently double-screened titles and abstracts, reviewed full texts for eligibility and resolved any discrepancies with a third reviewer (JW). We extracted data using a pilot-tested, standardised data extraction form including study characteristics, interventions, outcomes and parent input into interventions’ design. We assessed methodological quality with the Cochrane Collaboration risk of bias tool for RCT and the ROBINS-I tool (Risk Of Bias In Non-randomised Studies - of Interventions) for non-RCT.

We presented individual study aggregate data in a narrative synthesis, grouped studies into themes using a Grounded Theory Approach and planned meta-analysis where data were appropriate for quantitative synthesis.

Patient and public involvement
This review was conceived in response to the clinical need identified by parents with neonatal care experience; a partnership including families with experience of preterm birth identified ‘what emotional and practical support improves attachment and bonding, and does the provision of such support improve outcomes for premature babies and their families?’ as a top 10 research priority. Additionally, this review was conceived as part of planning a wider project to pilot a neonatal intervention, with parents’ full input. Patients were not directly involved in the design, conduct, reporting or dissemination plans of our research.

RESULTS
We identified 8362 studies for screening and assessed 73 full-text articles for eligibility (figure 1). A total of 32 studies describing interventions that measured parent satisfaction in neonatal care as an outcome met the inclusion criteria, reporting data from over 2866 parents, 1 study did not report number of parents. Our analysis included 10 RCT and 22 non-RCT: 3 cohort trials, 18 unspecified designs and 1 implementation project (tables 1–3). We further classified the unspecified non-RCT into two types, depending on how they defined their control groups and how they evaluated parent satisfaction (table 3).

1. ‘Unit-level effect’: studies that assessed parent satisfaction during a period of routine care (control group) and introduced the intervention at a later time, with a different group of parents. In these studies, improvement in parent satisfaction was evaluated between different parent groups, on a unit level.
2. ‘Group level effect’: studies that formed intervention and control groups using convenience sampling during the same time period. Both groups (or sometimes only the intervention group) had satisfaction measured after the intervention period (postintervention testing). Baseline parent satisfaction was also measured in both groups (preintervention testing) in some studies. Improvement in parent satisfaction was demonstrated either by comparing outcomes between intervention/ control groups following the intervention, or in comparison with the preintervention data.

Parent participants included mothers (14 studies), mothers and fathers (10 studies) or were not specified (7 studies). One study defined parent participants as a dyad of the mother with her designated support person. Median parent sample size was 63, ranging 7–482. This was higher for RCT (108 studies) compared with non-RCT (61 studies).

Study participants included parents of babies across the full range of gestations (23–42 weeks). Overall, 24/32 (75%) of studies involved preterm infants, 5/32 (16%) term infants and 7 studies did not state the gestational age of infants involved. Most studies (19, 59%) involved only preterm infants (up to 37 weeks); only one study (3%) involved only term infants and five studies (16%) involved both preterm and term infants. Preterm infants were included in 44% of RCT vs 63% of non-RCT.

Most studies were reported as conducted in level III neonatal units (17 studies), followed by level not stated (9 studies), level II–III (3 studies), level II (2 studies) and level I (1 study). Definitions of neonatal levels of care are not standardised but vary across different countries; none of the included studies have explicitly stated which definition applies to them.

Tables 1–3 show the key characteristics of included studies. They include a description of each study’s parent and infant sample, study design and intervention, outcome measures (timing and methods), results, parent input into intervention design and study impact on parent satisfaction.

Parent satisfaction
Outcome measures
All 32 studies reported they measured parent satisfaction as an a priori outcome. Only one study confirmed this through a protocol. Overall, 18/32 (56%) of studies (4/10, 40% RCT and 14/22, 64% non-RCT) reported a higher level of parent satisfaction associated with the intervention studied. Multiple different outcome measures within the domain of parent satisfaction were used; we grouped these into four categories: i) parent satisfaction (no additional description); ii) parent satisfaction with NICU care; iii) parent satisfaction related to specific components such as communication, staff or information; iv) parent satisfaction with a specific intervention.

Timing of measurement
Parent satisfaction was mostly measured ‘during infant admission only’ (24 studies; between 1 and 4 times), followed by ‘after infant discharge only’ (5 studies; 1 time) and ‘both during admission and after discharge’ (3 studies; between 1 and 3 times). In the majority of studies (19/32, 59%), no preintervention parent satisfaction measurements were conducted in the same parent groups with available postintervention data (ie, paired parent data for satisfaction levels did not exist). Instead, impact of interventions was determined comparing intervention/ control group measurements in different time periods (tables 1–3).

Method of measurement
Parent satisfaction was assessed using 32 different methods: 29 different questionnaires, 2 different single questions and by structured interview in 1 study; in total, 334 different questions were used to assess parent satisfaction. Only 6/29 (21%) of questionnaires were reported to be fully validated (both content validation and reliability testing); 23/29 (79%) questionnaires were partially or completely unvalidated. The most commonly used questionnaire was the validated Neonatal Index of Parent Satisfaction questionnaire (three studies).

Interventions and impact on parent satisfaction
We grouped included studies into five intervention themes: parent involvement (14 studies); information provision/communication (8 studies); clinical care (7 studies); parent emotional support (2 studies); other (1 study). Parent involvement interventions were more commonly assessed in RCT compared with non-RCT.

We categorised interventions as effective or not effective based on whether a statistically significant difference between intervention and control groups was reported for parent satisfaction (boxes 1 and 2). None of the
### Table 1: Included randomised controlled trials (RCTs)

| Author (date), country | Parents’ gender/ sample size | Infants’ gestation age in weeks/ NICU level | Study design | Intervention | Outcome measures | Timing of measurement | Method of measurement | Results | Parent co-design? | Improved parent satisfaction? |
|------------------------|-----------------------------|---------------------------------|-------------|-------------|----------------|----------------------|-----------------------|---------|----------------|-----------------------------|
| 1. Northrup et al (2016), USA | Mothers and fathers /116 | <28/level III | RCT | Intervention: free parking. Parents received seven parking vouchers at a time (value: US$10 each) and continued to receive vouchers until infant discharge. Each voucher allowed free entry and exit for 24 hours. Control: parents received the standard care and did not receive vouchers. | Parent satisfaction with NICU care. After babies were discharged (once): | | Satisfaction questionnaire | Validation: no content validity or reliability testing reported. Eleven questions: | The groups did not differ significantly with respect to satisfaction. | No | 2 |
| 2. Abdel-Latif et al (2015), Australia | Mothers and fathers /63 | 25–42/level III | Cross-over RCT | Intervention: parental Presence at Clinical Bedside Rounds (PPCBR). Parents attended bedside clinical rounds. Parents had opportunity to ask questions about their baby’s condition and management. Control: parents received the standard care with no parental presence at bedside clinical rounds. | Parent satisfaction assessed by questions of three domains: 1. Knowledge and understanding. 2. Communication and collaboration. 3. Privacy and confidentiality. During babies’ admission (once): | | Satisfaction questionnaire | Validation: no content validity or reliability testing reported. Number and format of questions: not stated. | PPCBR had significantly higher adjusted mean (95% CI) scores for some questions from domains 1 and 2. Domain 3 was comparable between the two study groups. | No | 1 |
| Author (date), country | Parents’ gender/ sample size | Infants’ gestation age in weeks/ NICU level | Study design | Intervention | Outcome measures | Timing of measurement | Method of measurement | Results | Parent co-design? | Improved parent satisfaction? |
|-----------------------|-----------------------------|------------------------------------------|-------------|--------------|-----------------|----------------------|----------------------|---------|----------------|--------------------------|
| 3. Bastani et al. (2015), Iran | Mothers /100 | 30–37 (Mean (SD) 33.90 (2.33)) | RCT (block randomisation) | Intervention: family centred care (FCC). Mothers allowed access to their baby at any time, participated in the care process and were provided with information about neonatal care. | Maternal satisfaction relating to three themes: 1. Parental presence. 2. Participation in neonatal care. 3. Information about neonatal care. | During babies’ admission (twice): 24 hours after admission, At the time of discharge. | Satisfaction questionnaire (validated) A modified satisfaction questionnaire was used, based on a parental satisfaction instrument developed for measuring satisfaction in paediatric intensive care units. 18 questions Graded 0 (very dissatisfied) to 4 (very satisfied). The overall satisfaction rate was classified based on the mean scores (score <50%, between 75%–50% and >75%). | In the FCC group, preintervention and postintervention difference in maternal satisfaction was statistically significant, p<0.001. | Unclear | 1 |
| 4. Clarke-Pounder et al. (2015), USA | Mothers and fathers /19 families | 23–39/level III | RCT | Intervention: sharing information obtained from parent interviews with the primary NICU provider. Parents interviewed using the NICU-adapted Decision-Making Tool (N-DMT). Information obtained was placed in the electronic medical record (EMR) and shared with the primary neonatal provider via email. Daily rounds on all infants were audio-recorded for 3 days after enrolment to see if information from the N-DMT was incorporated into daily care planning. | Parent satisfaction with care. | During babies’ admission (once): 2 weeks after study entry. No preintervention parent satisfaction data available for comparison. | Satisfaction questionnaire An N-DMT-specific questionnaire was used. Validation: partially reported. Authors stated reliability testing took place; no information on content validity provided. Eight questions: for example, “My baby’s doctors considered my goals and hopes for my baby during decision-making “. Likert scale (1 strongly agree–4 strongly disagree). Total N-DMT score range 8–32. | There was no significant difference in satisfaction with care as measured by the N-DMT scale between the control group and intervention groups in a univariable model or multiple variable model controlling for gestational age. | Yes | 2 | Information obtained from parents using the N-DMT was placed in the EMR and shared with the primary NICU provider via email (forming the intervention).
### Table 1  Continued

| Author (date), country       | Parents/gender/sample size | Infants’ gestation age in weeks/NICU level | Study design | Intervention                                                                                     | Outcome measures                                                                                       | Timing of measurement                                                                 | Method of measurement            | Results                                                                 | Parent co-design? | Improved parent satisfaction? |
|------------------------------|-----------------------------|------------------------------------------|--------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|---------------------------------|----------------------------------------------------------------------|------------------|-------------------------------|
| 5. Holditch-Davis et al (2013), USA | Mothers                         | 208                                      | RCT          | Postintervention testing only                                                                 | Interventions: 1. Mothers were taught how to massage infants with auditory, tactile, visual and vestibular stimulation. 2. Kangaroo care. Control: attention control group. Mothers spent a similar amount of time with the study nurse. The equipment needed for preterm infant care was provided. Study nurses provided education and support for all three groups. Mothers were not prevented from engaging in interventions of the other groups but did not receive formal education from the study nurse on the other interventions. | During admission period and postdischarge:  ➤ At the time of discharge.  ➤ At 2 months corrected age. No preintervention parent satisfaction data available for comparison. | Satisfaction questionnaire            | No significant differences occurred between the groups. | No     | 2                             |

| 6. Franck et al (2011), UK    | Mothers and fathers            | 169                                      | Cluster RCT  | Intervention: increasing parental involvement in infant pain management in the NICU. Parents received a booklet providing evidence-based information about pain and comforting infants in the NICU setting. Parents received two visits from a research nurse showing them how to apply the comforting techniques described in the booklet. Control: as part of usual care, parents in both the intervention and control groups received a detailed booklet with generic information about NICU care. Parents in the control group also received two visits from a research nurse listening to what parents had to say about their NICU experience (attention placebo). | At baseline: Parent satisfaction with NICU care. One week after the intervention:  1. Satisfaction with information about pain control.  2. Satisfied nurses make infant comfortable.  3. Satisfied pain medicines help infant. | During babies’ admission (twice):  ➤ At baseline (within 3–7 days of admission).  ➤ 1 week after the intervention. | Individual questions | At baseline: there was no significant difference in satisfaction between intervention and control group. | Yes     | 1                             |

At baseline: there was no significant difference in satisfaction between intervention and control group.

**Intervention Control**

- **Mean**: 1.45 (0.71)
- **SD**: 1.51 (0.76)
- **P value**: missing

1 week after the intervention: intervention parents were more satisfied with the information about pain control received than control parents.

**Intervention Control**

- **Mean**: 2.10 (0.97)
- **SD**: 3.28 (1.27)
- **P value**: 0.001
### Table 1 Continued

| Author (date), country | Parents' gender/sample size | Infants' gestation age in weeks/ NICU level | Study design | Intervention | Outcome measures | Timing of measurement | Method of measurement | Results | Parent co-design? | Improved parent satisfaction? |
|------------------------|-----------------------------|--------------------------------------------|--------------|--------------|------------------|-----------------------|----------------------|---------|------------------|-------------------------------|
| 7. Livingston et al (2009), USA | Mothers /12 | Mean (SD) | RCT | Intervention: touch and massage. | 1. Caregiver satisfaction with their infant's care. | During babies' admission (three times): | Satisfaction questionnaire | It is unclear in the report if specific between-group comparisons and statistical analysis were conducted. | No | 3 |
| | | Control: 33.4 (8.4) | | | | | At baseline | Two questionnaires were developed by the research team. | | | |
| | | Intervention: 38.5 (3.1) | | | | | On completing the 7 day massage programme. | Validation: no content validity or reliability testing reported. | | | |
| | | /level III | | | | | 1 month following intervention. | First questionnaire (at baseline): a brief self-report questionnaire about caregiver satisfaction with their infant's care until that moment. No further details reported. | | | |
| | | | | | | | Second questionnaire (on completing the 7-day massage programme and 1 month following intervention): a 10 min satisfaction questionnaire relating to infant's response and caregiver satisfaction with the neonatal unit and the massage therapist. | Slight improvements in satisfaction regarding time the caregiver spent with the infant and the massage programme's impact on that relationship. | | | |
| | | | | | | | Number of questions: not stated. | No differences were found between the two groups in satisfaction with conversations. | No | 1 |
| | | | | | | | Likert scale (1 very satisfied–4 very satisfied); | Mothers of babies with a poor outcome in the tape group were, however, significantly more satisfied with the conversations: | | | |
| | | | | | | | Sample statements: "How satisfied do you feel giving massage to your infant?"; "I feel that massage improved my infant's hospital stay. | Intervention Control | Mean (95% CI) | 115 (104–123.2) 100.5 (94.1–109.4) | P value 0.0051 |
| | | | | | | | Questions related to: satisfaction with amount and quality of information presented, doctors' communication skills, patient's participation in the conversation. | Most (71%–92%) of the mothers given the tapes stated that they helped their understanding, reminded them of what had been said, and helped their family to understand and recall information. | | | |

8. Koh et al (2007), Australia

| Author (date), country | Parents' gender/sample size | Infants' gestation age in weeks/ NICU level | Study design | Intervention | Outcome measures | Timing of measurement | Method of measurement | Results | Parent co-design? | Improved parent satisfaction? |
|------------------------|-----------------------------|--------------------------------------------|--------------|--------------|------------------|-----------------------|----------------------|---------|------------------|-------------------------------|
| | Mothers /200 | Not stated/not stated | RCT | Intervention: provision of taped conversations with neonatologists to mothers. | Satisfaction with conversations held with the neonatologist. | During admission period and postdischarge: | Individual questions and a satisfaction scale | No differences were found between the two groups in satisfaction with conversations. | No | 1 |
| | | | | | | | At 10 days. | | Mothers of babies with a poor outcome in the tape group were, however, significantly more satisfied with the conversations: | | | |
| | | | | | | | At 4 months. | Intervention Control | Mean (95% CI) | 115 (104–123.2) 100.5 (94.1–109.4) | P value 0.0051 |
| | | | | | | | At 12 months. | Questions related to: satisfaction with amount and quality of information presented, doctors' communication skills, patient's participation in the conversation. | Most (71%–92%) of the mothers given the tapes stated that they helped their understanding, reminded them of what had been said, and helped their family to understand and recall information. | | | |
| Author (date), country | Parents' gender/ sample size | Infants' gestation age in weeks/ NICU level | Study design | Intervention | Outcome measures | Timing of measurement | Method of measurement | Results | Parent co-design? | Improved parent satisfaction? |
|------------------------|-------------------------------|--------------------------------------------|--------------|--------------|-----------------|----------------------|----------------------|---------|-----------------|-----------------------------|
| Mitchell-DiCenso et al (1996), Canada | Mothers and fathers/ 482 | Mean (SD) | RCT | Intervention: clinical nurse specialist/neonatal practitioner team (CNS/ NP) care. | Parent satisfaction with care. | During admission period and post-discharge (twice): | Satisfaction questionnaire (validated): | No statistically significant difference between groups. | No | 2 |
| | Control: 35 (4.3) | | | Infants of intervention parents were assigned to be cared for by the CNS/NP team during the day and by paediatric residents during the night. | | | The study team developed and used the validated NIPS questionnaire. | | |
| | /level III | | | Control: paediatric residents cared for infants of control parents around the clock. Neonatologists supervised both teams. | | | Number of questions: not stated. | | |
| | | | | | | | NIPS score range (27–189); higher scores indicating greater satisfaction with care. | | |
| | | | | | | | No pre-intervention parent satisfaction data available for comparison. | | |
| | | | | | | | | | |
| Broyles et al (1992), USA | Mothers/25 | Mean (SD) | RCT | Intervention: Detailed consent. | Maternal satisfaction with the information provided about mechanical ventilation. | During babies' admission (once): | An interview evaluating maternal satisfaction with the information provided about mechanical ventilation. | This study is measuring and comparing satisfaction with two different interventions (detailed vs flexible consent process), neither of which formally represent the usual routine care for all babies (no control). | No | 3 |
| | Control: 34 (4) | | | Mothers were given information about mechanical ventilation. Detailed risk/benefit disclosure was provided both verbally and in writing. | | | Validation: a psychiatrist with a special interest in interviewing techniques was consulted in designing and standardising this assessment. | Small numbers. No data indicating statistical analysis conducted or evidence of statistically significant results. | |
| | Intervention: 33.4 (4) | | | Control: mothers were given a brief verbal description about mechanical ventilation supplemented with detailed verbal and written disclosure if desired by them (flexible consent). | | | A research nurse conducted the interview, “checking” each mother against one option regarding Amount of information: | Detailed Flexible | |
| | /level III | | | | | | ► Right amount–too much–too little. | Too 75% mothers little amount of information | |
| | | | | | | | ► Information made coping: more difficult-easier-no effect-uncertain. | Made 67% mothers 69% coping easier | |

NICU, neonatal intensive care unit; NIPS, Neonatal Index of Parent Satisfaction.
## Table 2  Included prospective cohort studies

| Author (date), country | Parents' gender/sample size | Infants' gestation age in weeks/NICU level | Study design | Intervention | Outcome measures | Timing of measurement | Method of measurement | Results | Parent co-design? | Improved parent satisfaction? |
|------------------------|-----------------------------|------------------------------------------|--------------|--------------|------------------|-----------------------|-----------------------|---------|------------------|-----------------------------|
| 1. De Bernardo et al (2017), Italy | Mothers and fathers/96 | Mean (SD) | Non-randomised, prospective cohort pilot study | Intervention: FCC. Parents had access to NICU for 8 hours/day. The NICU was widened and paediatric nurses taught parents procedures/practices for 10 days. Parents could observe clinical bedside rounds, hold meetings with the physicians, use the rooms and kitchen. Control: parents were permitted to visit their baby in NICU for 1 hour a day. | Parent satisfaction relating to three specific domains: 1. Knowledge and Understanding. 2. Communication and collaboration. 3. Privacy and confidentiality. | During babies’ admission (once) | Satisfaction questionnaire. Validation: the authors state the survey ‘was designed and validated by Abdel-Latif et al’. No content validity or reliability testing reported in the original paper. | 7/9 individual statements in the parent satisfaction questionnaire scored higher in the FCC compared with the NFCC (statistically significant difference). Example statement: “I have received adequate information about my baby’s condition and management”. | No | 1 |
| 2. Petteys et al (2015), USA | Not stated/10 parents included in sample analysis | 24–36+/level III | A prospective cohort design. A feasibility study. Group level effect: Intervention/control groups. Postintervention testing only | Intervention: PC. PC nurses provided important continuity of care for NICU infants clinically requiring PC and at least weekly verbal support of parents. The PC service also coordinated family conferences, provided or requested orders to improve infant symptom management and comfort and addressed parental coping and self-care. Control: usual clinical care for infants not requiring PC. | Overall satisfaction with care received | During babies’ admission (once) | Satisfaction questionnaire. A researcher-created questionnaire based on extensive current literature review. Validation: Partially reported. Authors stated content validity testing took place; no information on reliability testing provided. One question | Parent satisfaction response numbers were small (n=10), thus statistical comparison of parental satisfaction between cohorts was not possible. However, 100% of responding PC parents (n=2) reported being ‘extremely satisfied’ with care, whereas only 50% of responding usual care parents (n=8) reported extreme satisfaction. | No | 3 |

Continued
Table 2 Continued

| Author (date), country | Parents' gender/sample size | Infants' gestation age in weeks/NICU level | Study design | Intervention | Outcome measures | Timing of measurement | Method of measurement | Results | Parent co-design? | Improved parent satisfaction? |
|-----------------------|-----------------------------|------------------------------------------|--------------|--------------|-----------------|----------------------|-----------------------|---------|-------------------|-----------------------------|
| 3. Stevens et al. (2011), USA | Mothers, 147. For the OPBY NICU, 58 surveys were returned. For the SFR NICU, 89 were returned | Mean (SD) Control: 35 (5) Intervention: 34 (5) /level not stated | Cohort trial. The research was part of a large prospective evaluation. | Intervention: SFR NICU for neonatal care. Parents could visit their baby, room-in, do kangaroo care and breast feed at any time, in individual rooms (containing bed, desk, closet, telephone, chair, refrigerator for breast-milk storage). Control: OPBY NICU. The traditional OPBY NICU was typical of facilities built before 1980. All neonates, family members, staff, monitors and equipment were visible for all neonates in each room. Portable partitions were placed around the incubator for breast feeding and kangaroo care. | Parent satisfaction with different elements of NICU: Delivery, Environment, Nurses, Physicians. | After babies were discharged (once) Mailed within 60 days of discharge of parents' infants from the NICU. No preintervention parent satisfaction data available for comparison (different parent groups preintervention and postintervention). | Satisfaction questionnaire A questionnaire from Press Ganey Associates was used. Also included were three questions added by the investigators. Validation: Partially reported. The original questionnaire was validated questionnaire but no content validity or reliability testing was reported regarding the three questions added by the study team. Forty-two questions in total (seven categories): delivery, environment, nurses, physicians, discharge, personal, overall assessment. Likert (1 very poor–5 very good). | Statistically significant improvement was found for the survey categories of Environment, Overall and the Total survey. Estimated numbers from report's figures as numbers not provided: Median SFR OPBY P value Environment 4.7 3.7 0.001 Overall 5.4 3.9 0.018 Total 4.7 4.0 0.045 16 items composite score for FCC: 4.4 4.0 0.017 | Yes | 1 |

FOC, family centred care; NICU, neonatal intensive care unit; OPBY, Open-bay PC, palliative care; SFR, single-family room.
| Author(s), country | Parents’ gender/sample size | Infants’ gestational age in weeks/NICU level | Study design | Intervention | Outcome measures | Timing of measurement | Method of measurement | Results | Parent co-design? | Improved parent satisfaction? |
|-------------------|-----------------------------|---------------------------------------------|-------------|--------------|-----------------|----------------------|----------------------|---------|----------------|-----------------------------|
| 1. Kadivar et al. (2017), Iran | Mothers/68 (30-36) | Non-randomised, convenience sampling. Group level effect: Intervention/control groups. Pre-intervention and post-intervention testing. | Internet-based education. | Mothers used an educational website set up by the research team (i.e., a website). Mothers could visit the website from 17:00 to 18:00 for 10 days. They were also allowed to use the website outside of the above hours and to report the duration of using the website to the researcher. Mothers had to use the website at least 3 times during 10 days, each time for at least 30 minutes. Control: mothers in the control group received the routine education provided in the NICU. | Material satisfaction | During babies’ admission (day 1 of intervention). | Satisfaction questionnaire (validated). The ‘What Being The Parent of a Baby is Like- Revised’ Questionnaire was used. The original English version by Pirhaim and Chang was translated to Farsi. Eleven questions. Total satisfaction score range (11–99). | No | 1 |
| 2. Kadivar et al. (2017), Iran | Mothers/70 | Non-randomised, convenience sampling. Unit level effect: Two different time periods. | Narrative writing. | Mothers did narrative writing at least three times, until the 13th day of admission. Control: mothers in the control group received the routine NICU treatment and care. | Mothers’ satisfaction with medical care provided by physicians, medical students, and nurses during neonatal admission to the NICU. | During babies’ admission (day 3 of intervention). | Satisfaction questionnaire (validated). The National Hospital Patient Satisfaction Questionnaire (NHPS) was used. 24 questions (Likert scale). Likert (1 excellent–5 very poor). A higher score indicates more satisfaction. | No | 1 |
| 3. Garingo et al. (2016), USA | Not stated/9 | Non-randomised, convenience sampling. Group level effect: Intervention/control groups matching only. | Tele-rounding. | Infants of intervention parents were cared for by an OFFSN, who was present via a remote-controlled robot. The OFFSN assessed infants via the robot’s integrated stethoscope, with assistance from the nursing staff. During routine hours, the OFFSN was called to discuss any issues with the patient. Emergencies/out of hours were covered by an ONSN. Control: infants of control parents received ONSN care. The attending neonatologist made daily patient rounds with the NICU team. After patient rounds, the NICU staff, under the supervision of the attending neonatologist, implemented the care plan. | Satisfaction with telemedicine. | During babies’ admission (once). | Satisfaction questionnaire. Validation: no content validity or reliability testing reported. Number of questions: not stated. Likert (1 excellent–5 very poor). Only the intervention group was assessed and only post-intervention. | No | 4 |
| Author (date), country | Parents’ gender/sample size | Infants’ gestation age in weeks/NICU level | Study design | Intervention | Outcome measures | Timing of measurement | Method of measurement | Results | Parent co-design? | Improved parent satisfaction? |
|-----------------------|-----------------------------|------------------------------------------|-------------|--------------|-----------------|----------------------|----------------------|---------|------------------|-----------------------------|
| 4. Globus et al. (2016), Israel | Mothers and fathers/total surveys returned: 178 | ~40% in each group <33/level III | Non-randomised, convenience sampling. | Intervention: SMS. Parents were updated daily regarding the health status of their infant via SMS from the EMR. All SMS messages were sent at 09:00, including one sentence section with updated information (eg, location of the infant’s crib and current weight). Information regarding acute events/deterioration of the infant’s medical condition was not included in the SMS, but was delivered personally to the parents in real time. Control: routine care pre-SMS implementation. | 1. Parent satisfaction related to parent communication with the medical staff. 2. Overall parent satisfaction with treatment and staff attitudes throughout hospitalisation. | During babies’ admission (once): ► pre-SMS cohort and post-SMS cohort. No preintervention parent satisfaction data available for comparison (different parent groups preintervention and postintervention). | Satisfaction questionnaire was used, as well as selected items from a literature review of similar questionnaires, including that by York Hospital and by Conner and Nelson. Validation: no content validity or reliability testing reported. Selected items related to four aspects of the NICU experience. Two out of four directly assessed parent satisfaction: 1. Parental assessment of their communication with the medical staff. Likert scale (1 do not agree at all–5 strongly agree). 2. Overall satisfaction with treatment and staff attitudes throughout hospitalisation. Visual analogue scale (scores range 0–10). Higher scores reflect greater satisfaction. | SMS Pre-SMS Mean (SD) 4.1 (1.0) 3.7 (1.3) | No | 1 |
| 5. Kazemian et al. (2016), Iran | Mothers/230 newborns (assumed 230 mothers) | >37/level not stated | Non-randomised, convenience sampling. | Intervention: rooming-in care. Mothers and babies were admitted to a different atmosphere to the routine care. This facilitated the mothers and neonates with separate beds along with phototherapy devices and nursing clinical supervision. Control: the routine care practiced in this neonatal unit supported partial stay of mothers beside their neonates, while sitting on chairs; however, most of the time the mother–infant dyad was separated. | Material satisfaction with the neonatal care services and hospital stay comfort. | During babies’ admission (once): ► Not stated exactly when. No preintervention parent satisfaction data available for comparison. | Satisfaction questionnaire was employed, which was filled in by some trained midwives. The authors state, “a validated self-made questionnaire was employed which was filled in by some trained midwives”. No further information on validation processes, number of questions or name of the questionnaire was provided. Validation: no content validity or reliability testing performed. At the authors state, “I was pleased with the frequency with which I received information regarding my infant” Specific question: “I was pleased with the frequency with which I received information regarding my infant”. Likert (5 very satisfied–1 dissatisfied). | Overall, in both periods, parents expressed a high degree of satisfaction regarding the medical treatment, the information given and the communication with the medical staff. Overall satisfaction with treatment and with staff attitudes throughout hospitalisation was slightly greater in the post-SMS cohort but did not reach statistical significance. | Post-SMS Pre-SMS Mean (SD) 4.1 (1.0) 3.7 (1.3) P value 0.03 | No | 1 |

Continued
Table 3 Continued

| Author (date), country | Parents' gender/sample Size | Infants' gestational age in weeks: NICU level | Study design | Intervention | Outcome measures | Timing of measurement | Method of measurement | Results | Parent co-design | Improved parent satisfaction? |
|-----------------------|-----------------------------|---------------------------------------------|--------------|-------------|-----------------|----------------------|-----------------------|---------|-----------------|-------------------------------|
| Van de Vijver and Evans (2015), UK | Not stated/105 | Not stated/Not stated | Non-randomised, convenience sampling. | Intervention: baby diary. Each parent received a communication diary on their infant's admission to the unit. Staff wrote in infant's status updates and kept an infant interaction log with parents. The unit was closed to parents during nurse change of shift in mornings and evenings. Control: routine care, before implementation of the diaries. | Satisfaction with communication from neonatal staff. | During babies' admission (twice): | Satisfaction questionnaire | Small numbers. No data indicating statistical analysis conducted or evidence of statistically significant results. | Yes. | The intervention concept was created by the project readers following analysis of baseline survey results and used after multi-disciplinary input and discussion with staff and parents. |
| Voss and Park (2014), USA | Not stated/62 | Not stated/level III | Non-randomised, convenience sampling. | Intervention: OUpolicy. Parents were allowed access to their baby 24 hours a day, 7 days a week. Parents pre-OU implementation received routine care. The unit was closed to parents during nurse change of shift in mornings and evenings. Control: parents pre-OU implementation received routine care. | Parent satisfaction with how much time parents get to spend with their baby. | After babies were discharged (once): | Single question (from a validated questionnaire) | Small numbers. No data indicating statistical analysis conducted or evidence of statistically significant results. | Yes. | The NICU has a Family-centred care committee including parents, which conducted this project. |
| Segre et al. (2013), USA | Mothers/23 | Mean (SD) 31.57 (3.50)/level II | For the outcome of parent satisfaction: | Intervention: LV. Mothers met with the LV provider for up to six 30 min LV sessions, conducted in a private hospital, every 2–3 days, within 1 month. Walls entitled parent, debriefing, updating on current issues, working an agenda through listening and problem solving and providing closure through summary. Control: women who did not meet the specific criteria (eg, minimum score on depression scale) were not invited to join the treatment trial and received routine NICU care/usual care/lead. | Satisfaction with the treatment and the outcome. | During babies' admission (once): | Satisfaction questionnaire | Only the intervention group was assessed and only post-intervention. | No | The authors reported: “The majority of women who received LVs were highly satisfied with the intervention.” | |
| Palma et al. (2012), USA | Not stated/20 families returned the survey containing the satisfaction measure | Not stated/level II | Non-randomised, convenience sampling. | Intervention: YBDU. A daily parent update letter generated from the EMR. Parents were given daily YBDU reports, printed automatically from the EMR. The YBDU included information about an infant's status during the past 24 hours and a handwritten update by the infant's care provider. Control: parents received routine care and usual verbal updates (6 months pre-adoption of YBDU). | Satisfaction with YBDU. | During babies' admission (once): | Satisfaction questionnaire | Only the intervention group was assessed and only post-intervention. | No | The authors reported: “When asked to rate the statement ‘I like receiving ‘Your Baby’s Daily Update’ (95% of families who used YBDU as an information source responded with the highest rating, ‘always’).” |
Table 3 Continued

“Other” non-RCT by publication year

| Author (date), country | Parents’ gender/sample size | Infants’ gestation age in weeks/NICU level | Study design | Intervention | Outcome measures | Timing of measurement | Method of measurement | Results | Parent co-design? | Improved parent satisfaction? |
|------------------------|-----------------------------|------------------------------------------|--------------|--------------|-----------------|----------------------|-----------------------|---------|-----------------|-----------------------------|
| 10. Voos et al. (2011), USA | Not stated/38 | Not stated/level not stated | Non-randomised, convenience sampling | FCRs | Global satisfaction with the NICU experience. | During babies’ admission (twice): | Satisfaction questionnaire (Validated NIPS). 24 questions: looking at satisfaction in different areas of the NICU (medical caregivers, communication, tests and procedures). | No 1 | 1 |
| 11. Wais et al. (2010), USA | Mothers/94 | Pre- and post-intervention group: 32 IV-IV; 69 | Non-randomised, convenience sampling | FCRs | Parent satisfaction with physician and nurse practitioner communication. | During babies’ admission (twice): | Satisfaction Questionnaire (Validated NIPS). A pilot survey written by Press Ganey and the Picker Institute was used and revised based on parent responses. | No 1 | 1 |
| 12. Foster et al. (2008), Australia | Mothers and fathers/93 | 5 special care nurseries | Non-randomised, convenience sampling | FCRs | Parent satisfaction relating to: | During babies’ admission (twice): | Satisfaction with treatment (ie, headbox oxygen or CPAP). | No 1 | 1 |
| 13. Byers et al. (2008), USA | Only mothers reported/38 | Preterm infants | Non-randomised, convenience sampling | FCRs | Parent satisfaction relating to: | During babies’ admission (twice): | Satisfaction questionnaire (e.g., Headbox CPAP). | No 1 | 1 |
| Author (date), country | Parents’ gender/sample size | Infants’ gestation age in weeks/NICU level | Study design | Intervention | Outcome measures | Timing of measurement | Method of measurement | Results | Parent co-design? | Improved parent satisfaction? |
|-----------------------|----------------------------|------------------------------------------|-------------|--------------|-----------------|---------------------|----------------------|---------|-----------------|-----------------------------|
| 14. Mills et al., (2006), USA | Not stated/not stated | Not stated/level not stated | Implementation project, PDSA quality improvement testing. | Intervention: 5 PBPs in the area of discharge planning. The project team iteratively implemented 5 PBPs: 1. Created an easy-to-use, easy-to-access discharge planning tool kit. 2. Restructured communication tools and processes to reflect a 'plan for the day, the stay and the way' to discharge. 3. Maximized the impact and use of caregiver educational tools, and updated materials and delivery systems for caregiver education. 4. Used various continuous quality improvement tools and processes to ensure parent/caregiver and staff satisfaction. 5. Analyzed and enhanced interactions with and transfers into the community. | General satisfaction: ▶ With care Parents’ feelings about preparedness for discharge ▶ Ability and confidence in feeding ▶ Familiarity with their infant Feeding like a parent Participation in care Adequacy of information from staff about medical and care issues. | During babies’ admission (four times): Not reported exactly when. | The internet-based parent satisfaction survey ‘howparentsifyou.com’ that was developed, especially for this NICU population was used. | Validation: no content validity or reliability testing reported. | | |
| 15. Wielenga et al. (2006), The Netherlands | Mothers and fathers/46 | Mean (SD) Control: 24.5 (26.0–29.9) Interv: 28.3 (25.6–29.9) | Non-randomised, convenience sampling | Intervention: NIDCAP. Infants received care according to NIDCAP principles and parents were taught how to provide it. Caregiving plans were designed based on the infant’s current development stage, medical condition and family needs. Caregivers learnt to watch sensitively and note the infant’s reactions to different types of handling and care, making continuous adjustments. Control: infants received traditional neonatal care practised at that time. | Parent satisfaction relating to: ▶ Overall rating ▶ Care of the baby Communication with staff Involved in care - Being prepared Support Being a parent Being near your baby Total score. | After babies were discharged (on day of discharge/transfer): The NCU-PSF was used and translated from English to Dutch. Sixty-two questions. Closed and open-ended questions. Different rating scales used (5-point rating scale from ‘extremely satisfied’ to ‘not at all satisfied’ or ‘excellent’ to ‘poor’). Total score range (50–243 points). | Satisfaction questionnaire (Validated) | The intervention group’s mean total score was significantly higher than the control. Interv Control Mean (SD) 185.67 (17.34) 174.04 (20.98) P value 0.041 | No | |
| 16. | | | | | | | | | | |

Continued
Table 3 Continued

| Author (date), country | Parents’ gender/sample size | Infants’ gestation age in weeks/NIU level | Study design | Intervention | Outcome measures | Timing of measurement | Method of measurement | Results | Parent co-design? | Improved parental satisfaction? |
|-----------------------|-----------------------------|------------------------------------------|--------------|--------------|------------------|-----------------------|----------------------|---------|-----------------|-----------------------------|
| 16. Penticuff and Arheart (2005), USA | Dyads (both parents or mother with her support person)/122 mothers | Not stated/level III | A repeated measures design: | Intervention: *The newborn individualized IPC-CPM intervention.* | Satisfaction with participation in decision making was measured by five collaboration indices: | During babies’ admission (three times): | Three satisfaction questionnaires | The intervention group was more satisfied with the amount of decision input they had (3) and with the process by which medical decisions were made (4). | No | 1 |
|                      |                             |                           | First 2 years (control group data collection). | Year 3 (staff training). | Year 4 (implementing the intervention). | Year 5 (collecting data from the intervention group). | Control: during the control phase, professionals carried out usual communication and interaction with control group parents. | Control: 29 (2.00) | Interv: 28.9 (2.42) | Not statistically significant differences in their parental satisfaction scores, except for higher baseline parental satisfaction scores (p=0.029) in the co-bedded group. |

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17. Byers et al. (2003), USA | Mothers/19 | Mean (SD) | Control: 29 (2.00) | Interv: 28.9 (2.42) | **For the outcome of parent satisfaction:** | Parent satisfaction related to: | **Satisfaction questionnaire:** | The NICU’s standard parental satisfaction tool was used. | **Interv Control P value** | Mean 1.90 (2.83) | **Independent t-test:** | Mean 4.90 (3.89) | 0.023 |
|                      |                             | |                           | | Non-randomized, convenience sampling | | | | No | 1 |
|                      |                             | |                           | | Group level effect: Intervention/control groups | | | | | | Independent t-tests comparing the co-bedded and control group parental scores found no significant differences in their parental satisfaction scores, except for higher baseline parental satisfaction scores (p=0.029) in the co-bedded group. |
|                      |                             | |                           | | Post-intervention and post-intervention testing. | | | | | | The only significant difference for a participant intervention item was a higher score for the item ‘Attempts were made to create a quiet environment for my baby.’ |

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| Infants’ gestation age in weeks/NIU level | Study design | Intervention | Outcome measures | Timing of measurement | Method of measurement | Results | Parent co-design? | Improved parental satisfaction? |
|------------------------------------------|--------------|--------------|------------------|-----------------------|----------------------|---------|-----------------|-----------------------------|
| 1. Infants’ gestation age in weeks | 'Other' non-RCT by publication year | | | | | | | |
| 2. Study design | | | | | | | | |
| 3. Intervention | | | | | | | | |
| 4. Outcome measures | | | | | | | | |
| 5. Timing of measurement | | | | | | | | |
| 6. Method of measurement | | | | | | | | |
| 7. Results | | | | | | | | |
| 8. Parent co-design? | | | | | | | | |
| 9. Improved parental satisfaction? | | | | | | | | |

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| Infants’ gestation age in weeks/NIU level | Study design | Intervention | Outcome measures | Timing of measurement | Method of measurement | Results | Parent co-design? | Improved parental satisfaction? |
|------------------------------------------|--------------|--------------|------------------|-----------------------|----------------------|---------|-----------------|-----------------------------|
| 1. Infants’ gestation age in weeks | 'Other' non-RCT by publication year | | | | | | | |
| 2. Study design | | | | | | | | |
| 3. Intervention | | | | | | | | |
| 4. Outcome measures | | | | | | | | |
| 5. Timing of measurement | | | | | | | | |
| 6. Method of measurement | | | | | | | | |
| 7. Results | | | | | | | | |
| 8. Parent co-design? | | | | | | | | |
| 9. Improved parental satisfaction? | | | | | | | | |

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| Infants’ gestation age in weeks/NIU level | Study design | Intervention | Outcome measures | Timing of measurement | Method of measurement | Results | Parent co-design? | Improved parental satisfaction? |
|------------------------------------------|--------------|--------------|------------------|-----------------------|----------------------|---------|-----------------|-----------------------------|
| 1. Infants’ gestation age in weeks | 'Other' non-RCT by publication year | | | | | | | |
| 2. Study design | | | | | | | | |
| 3. Intervention | | | | | | | | |
| 4. Outcome measures | | | | | | | | |
| 5. Timing of measurement | | | | | | | | |
| 6. Method of measurement | | | | | | | | |
| 7. Results | | | | | | | | |
| 8. Parent co-design? | | | | | | | | |
| 9. Improved parental satisfaction? | | | | | | | | |
### Table 3  Continued

| Author (date), country | Parents/ gender/sample size | Infants’ gestation age in weeks/NICU level | Study design | Intervention | Outcome measures | Timing of measurement | Method of measurement | Results | Parent co-design? | Improved parent satisfaction? |
|-----------------------|-----------------------------|------------------------------------------|--------------|--------------|------------------|----------------------|-----------------------|---------|------------------|-----------------------------|
| 18. Polizzi et al. (2003), USA | Mothers and fathers/33 | Mean (SD) | A retrospective, comparative, descriptive design. | Intervention: co-bedding multiple-gestation infants in the NICU. Multiple-gestation infants were nursed in the same incubator or crib. The intervention was evaluated retrospectively after implementation of a co-bedding practice protocol. Control: traditionally bedded group (babies were routinely placed in separate incubators or cribs). | Parental satisfaction as measured by nine questions relating to parent perceptions and their baby’s care. | After babies were discharged (once): | Satisfactory questionnaire | Mothers reported overall satisfaction with the NICU care and staff, as well as adequacy of their ability to care for their infants after discharge, with scores ranging from 4.19 to 4.71. The only survey item score “I was encouraged by the hospital staff to bond with my babies” that was significantly different between groups was for the item Intervention: control group mean (SD) = 4.36 (1.3) and the clinical experience of the investigators. | No | 1 |
| 19. Legault and Goulet (1995), Canada | Mothers/61 completed both tests | Mean (range) | Time-series design | Group level effect: Same group exposed to both methods with postmethod testing only. | Intervention: Kangaroo method of removing an infant from an incubator. Mothers were taught the ‘kangaroo method’ (skin-to-skin contact). Infant wears a diaper and is placed in a vertical position on the parent’s bared chest. A blanket covers the infant and the parent’s clothing is fastened around the infant. The parent sits in a rocking chair, inclined so that the infant’s head is at 60°. Control: traditional method. Newborns wearing a diaper and a head cap, are wrapped in a blanket and placed in their parent’s arms. | Mothers’ satisfaction with: | During babies’ admission phase: | Satisfactory questionnaire | Regardless of the method tested, mothers expressed high levels of satisfaction (it was the first time since giving birth that they could hold their infants). Three statements proved more powerful in discriminating between the methods: Rated higher after the kangaroo method test: “I like the contact with my baby’s skin” (p=0.0001) Rated higher after the traditional method test: “I like to talk to and whisper to my baby” (p=0.015) “I looked into my baby’s eyes and stared at his/her face” (p=0.0001) | No | 1 |
Box 1  ‘Effective’ interventions in themes

Theme: parent involvement
More NICU access, parents on WRs, education (De Bernardo et al, Italy, 2017)
Rooming-in care (Kazemian et al, Iran, 2016)
Parental presence at clinical bedside rounds (Abdel-Latif et al, Australia, 2015) RCT
More NICU access, care involvement, education (Bastani et al, Iran, 2015) RCT
Education regarding pain management (Franck et al, UK, 2011) RCT
Single-family NICU rooms (Stevens et al, USA, 2011)
Family centered rounds (Voos et al, USA, 2011)
Newborn Individualised Developmental Care and Assessment Programme (Wielenga et al, The Netherlands, 2006)
Infant progress charts filled by parents and three care planning meetings (Penticuff and Arheart, USA, 2005)
Kangaroo care (Legault and Goulet, Canada, 1995)

Theme: information provision / communication
Internet-based education (Kadivar et al, Iran, 2017)
Daily SMS from electronic patient record (Globus et al, Israel, 2016)
Staff education, staff contact card given to parents, staff poster at NICU reception (Weiss et al, USA, 2010)
Provision of taped conversations with neonatologists to mothers (Koh et al, Australia, 2007) RCT

Theme: clinical care
a. Headbox oxygen for respiratory distress
b. Continuous oxygen positive airway pressure for respiratory distress (Foster et al, Australia, 2006)
Co-bedding infants in incubators (prospective) (Byers et al, USA, 2003)
Co-bedding infants in incubators (retrospective) (Polizzi et al, USA, 2003)

Theme: parent emotional support
Narrative writing (Kadivar et al, Iran, 2017)
Interventions where parent satisfaction was reported to be statistically significantly higher in the intervention group.
NICU, neonatal intensive care unit; RCT, randomised controlled trial; WR, ward round

Box 2  ‘Ineffective’ interventions in themes

Theme: parent involvement
a. Massage with auditory, tactile, visual and vestibular stimulation
b. Kangaroo care (Holditch-Davies et al, USA, 2013) RCT
Individualised, developmentally supportive family centred care interventions (Byers et al, USA, 2006)

Theme: information provision / communication
Sharing information obtained from parent interviews with the primary NICU provider (Clarke-Pounder et al, USA, 2015) RCT

Theme: clinical care
Clinical nurse specialist/neonatal practitioner team care (Mitchell-DiCenso et al, Canada, 1996) RCT

Theme: other
Free parking (Northrup et al, USA, 2016) RCT

Interventions where parent satisfaction was not reported to be statistically significantly different in the intervention group.
RCT, randomised controlled trial.

Box 3  ‘Unclear if effective’ interventions in themes

Theme: parent involvement
Open unit policy: 24/7 NICU access (Voos and Park, USA, 2014)
Touch and massage for 7 days (Livingston et al, USA, 2009) RCT

Theme: information provision / communication
Clinical staff enter updates in baby diary (Van de Vijver and Evans, UK, 2015)
Detailed information provided during consenting (Broyles et al, USA, 1992) RCT

Theme: clinical care
 Palliative care (Petteys et al, USA, 2015)
Five potentially better practices in the area of discharge planning (Mills et al, USA, 2006)

Interventions where small study numbers and/or no statistical analysis performed).
RCT, randomised controlled trial.

DISCUSSION

Parent satisfaction with neonatal care is increasingly recognised as an important measure of parent experience and is being used to evaluate hospitals and healthcare providers; use of interventions to improve parent satisfaction in neonatal units is increasing. This is the largest review of interventions where an outcome was parent satisfaction with neonatal care and includes 32 studies. We find low-quality evidence that interventions targeting ‘parent involvement’ may improve parent satisfaction with neonatal care, but this result must be interpreted cautiously in view of the high risk of bias in included studies.

Overall, our review highlights the complexity of evaluating parent satisfaction. As a multidimensional construct, parent satisfaction can be affected just as much by interventions directly relating to infant care (eg, Kangaroo care) as well as interventions relating to neonatal care facilities (eg. Free parking). By grouping included interventions into themes (boxes 1–4), we have highlighted the variety of interventions available, as well as the majority of interventions being those relating to ‘parent involvement’.

A key reason for only selecting parent satisfaction as the outcome of interest was to focus on a single component of parent experience, in order to reduce outcome heterogeneity and allow direct comparison. Despite this approach, the key methodological limitation identified...
In this review, inconsistency in how parent satisfaction is defined and measured; it is notable that the majority of questionnaires (23/29) lack validation. In keeping with neonatal studies more widely, this study confirms inconsistent outcome selection as a major source of research waste in neonatal studies examining parent experience, and further finds that there is limited involvement of parents in study design.

Strengths of our review include identifying studies with both mother and father participants, inclusion of the full range of infant gestations and a wide range of interventions. We followed a preregistered protocol and report this review in line with PRISMA guidelines. To further aid direct comparison of interventions, we only included studies that evaluated parent experience using ≥1 quantitative outcome of parent satisfaction. One limitation of this approach is that by excluding studies which evaluated parent experience using other measures (eg, stress, anxiety and depression scales), we are unable to comment on interventions that targeted these other components of parent experience.

Another limitation is that we have only included studies in the English language, due to resource and time constraints. By not including studies in other languages, it is possible our results are more focused on work conducted in specific countries. Furthermore, we acknowledge that much of the research in parent experience is qualitatively evaluated. By restricting our review to studies where ≥1 quantitative outcome of parent satisfaction is measured, we have not included any interventions with solely qualitative outcomes. This was in an attempt to enable direct comparison of interventions, which has previously not been possible in any published review. By not including studies evaluated by qualitative measures only, it is possible our results are more focused on a particular type of interventions where quantitative evaluation would be preferable and/or easier. It also means we may not have included all studies ever conducted on a particular intervention, where some were only evaluated qualitatively, making some interventions appear more ‘widespread’ than others.

Although 31% of included studies were RCT, all were assessed as having a high risk of bias. RCTs are traditionally considered the highest-ranking form of evidence, however it is worth considering whether such a design is feasible or desirable to evaluate interventions targeting parent satisfaction. Parents in neonatal care talk to each other, compare notes and invariably create parent-support communities; hence it is inherently difficult to avoid contamination between parents receiving an intervention and those who are not, meaning that blinding of parents or health professionals is near impossible. Furthermore, parent satisfaction is likely to be particularly susceptible to the Hawthorne effect, requiring longer-term follow-up. These factors may explain the low number of RCT identified in our review and the high risk of bias seen in those that were included. In non-RCT studies, the main methodological concern is the degree to which unmeasured and uncontrolled confounders may explain any differences seen between groups. The non-RCT studies included in this review were classed as

### Figure 2
Cochrane Collaboration risk of bias tool assessment (randomised controlled trial). Green: low risk of bias; yellow: unclear risk of bias; red: high risk of bias.

### Figure 3
ROBINS-I risk of bias assessment (non-randomised controlled trial).
having either a serious or critical risk of bias. The overwhelming majority of studies did not adequately report baseline variables or report other interventions during the study period, making it impossible to assess studies for selection bias or treatment bias. Furthermore, limitations such as contamination bias and the Hawthorne effect affect non-RCT as well. Only two non-RCT studies evaluated the outcome of interest (parent satisfaction) both before and after the intervention, in the same group of parents (group level effect), with most studies evaluating different parent groups preintervention and postintervention (unit level effect). An inherent weakness of this latter approach is that it assumes parent satisfaction is a static measure at the unit level, which is unlikely to be true. As a result of these numerous important limitations identified across all included studies, we find only low-quality evidence in support of interventions to improve parent satisfaction with neonatal care, despite a majority of studies reporting a beneficial effect of interventions. These limitations may explain the limited uptake of these interventions by the wider neonatal community.

Changing neonatal unit practices to incorporate any new intervention requires robust evidence. We demonstrate here that such evidence is not currently available for improving parent satisfaction. We highlight the use of non-randomised study designs, inconsistency in definition and measurement of parent satisfaction, the use of unvalidated questionnaires, methodological limitations and a lack of parent involvement as contributors. Our review empirically documents the extent of these issues in studies that use quantitative parent satisfaction surveys, and their contribution to research waste in neonatology.

Given the importance of parent satisfaction for both parent and offspring well-being, higher quality trials that involve parents, use of standardised definitions and validated parent satisfaction measures are needed. Given the nature and challenges of the neonatal care environment and the limitations we have identified in existing research, a cluster RCT may be the most appropriate study design to rigorously evaluate interventions to improve parent satisfaction with neonatal care.

CONCLUSIONS

Many interventions, commonly relating to parent involvement, are reported to improve parent satisfaction with neonatal care but inconsistency in definition and measurement of parent satisfaction and high risk of bias in all studies makes this low-quality evidence. Standardised definitions and validated parent satisfaction measures are needed, as well as higher quality trials of parent experience, involving parents in intervention design.

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Contributors SS and CG conceived this systematic review. The protocol was created by SS and CG. Searches were performed by SS and IA. All search results were reviewed by SS and JW. Coding was completed by SS and JW. Data analysis was completed by SS. The first draft of the manuscript was written by SS, CG and JW edited and reviewed the manuscript. All authors approved the manuscript.

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