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Review Article

The impact of family centred care interventions in a neonatal or paediatric intensive care unit on parents' satisfaction and length of stay: A systematic review

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ABSTRACT

Objective: To explore the impact of family centred care interventions on parents' satisfaction and length of stay for patients admitted to a paediatric intensive care unit or a neonatal intensive care unit.
Methods: A systematic review was conducted. Searches have been done in Cinahl, Cochrane, Embase and PubMed from February 2016 till October 2017. All included studies were quality appraised. Due to the heterogeneity of interventions findings were narratively reviewed.
Results: Seventeen studies were included in this review of which 12/17 studies investigated parents' satisfaction and 7/17 length of stay. For this review two types of interventions were found. Interventions improving parents-professional collaboration which increased parents' satisfaction, and interventions improving parents' involvement which decreased length of stay. Overall quality of the included studies was weak to good.
Conclusions: Strong evidence was found for a significant decrease in length of stay when parents where participating in caring for their infant in a neonatal intensive care unit. Moderate evidence was found in parents' satisfaction, which increased when collaboration between parents and professionals at a neonatal intensive care unit improved. Studies performed in a paediatric intensive care setting were of weak to moderate quality and too few to show evidence regarding parents satisfaction and length of stay.

Implications for clinical practice

- Research shows many benefits of Family Centred Care interventions in paediatric and neonatal intensive care, but implementation remains a challenge.
- Involving parents in the care of their infant in a neonatal intensive care might decrease length of stay.
- Parent satisfaction might increase when collaboration with professionals improves. Therefore, parent-professional collaboration, as in decision-making, should be included in models of care in both paediatric and neonatal intensive care.

Introduction

Family centred care (FCC) emphasises the importance of a family as a fundamental source of support and it considers involvement of family members in all aspects of the patient's health care (Mikkelsen and Frederiksen, 2011; Shields et al., 2006). It is seen as a holistic care model, but different definitions are used in research and application in health care (Kuo et al., 2012;

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Mikkelsen and Frederiksen, 2011). FCC is often one term used including wording such as: partnership with parents, patient centered care and family integrated care. However, in the USA several organisations have agreed on the definition of the Institute for Patient- and Family-Centered Care where it is defined as an approach to the planning, delivery, and evaluation of health care that is grounded in mutually beneficial partnerships among health care providers, patients and families (Eichner, 2012). Core concepts of FCC are: dignity and respect, information sharing, participation and collaboration (Eichner, 2012).

These broad core concepts can be applied in different settings of healthcare in paediatrics, which results in a variable application of FCC in different countries (Finlayson et al., 2014; Kuo et al., 2012). Nowadays, in general paediatric inpatient settings, the involvement of parents in care is a very common phenomenon, however parental involvement in paediatric intensive care units (PICU) or neonatal intensive care units (NICU) is not common in every PICU or NICU globally. This is due to the different environment and circumstances of intensive care units compared to general paediatric wards, e.g. medical equipment and intensive treatments. Moreover, admission to a critical care setting, as NICU and PICU, has a greater impact to admitted children and their parents compared to a general paediatric inpatient setting which can be a barrier to be involved in FFC (Foster et al., 2015; Shields et al., 2006).

Evidence for improved health care outcome among FCC interventions in paediatrics and adults exists. (Davidson et al., 2007; Davidson et al., 2017; Gooding et al., 2011; Greene et al., 2015; Hibbard and Greene, 2013; Hojat et al., 2011; Kuhlthau et al., 2011; Rakel et al., 2011; Shields, 2012). However, to study the effectiveness of the FCC care concept in total, including all the principles, is a challenge (Jolley and Shields, 2009; Kuo et al., 2012; Shields, 2012). In addition the different circumstances in which FCC is applied and the various interventions make it difficult to compare results (Kuo et al., 2012; Mikkelsen and Frederiksen, 2011). Insight into the effectiveness of FCC is important to ensure that children receive care in ways that improve their recovery and minimise emotional stress (Eichner, 2012; Kuo et al., 2012; Shields, 2012). Systematic reviews could deliver an important contribution to strengthen evidence of outcomes.

In this review, a parent related outcome and an infant related outcome are chosen: parental satisfaction and length of stay (LoS).

Satisfaction has been defined as patients'or parents' needs, experiences in care and perception of care (Latour et al., 2011; Wagner & Bear, 2009). Parents' satisfaction is expected to increase when FCC is used in healthcare. Since a central principle in FCC is to promote diverse modalities of parental involvement, the opinions of parents are important for assessing and improving FCC interventions (Dall'Oglio et al., 2018).

Length of stay is defined as the time between admission and discharge of a patient in a hospital and is expected to decrease. LoS is an appropriate marker of something related to child's health. As a result of FCC interventions, LoS is expected to decrease. Additionally, the LoS of an admitted child has a great impact on parents, but is also very meaningful for hospital management and policy-makers (Dyson et al., 2017).

The aim of this systematic review is to explore the impact of family centered care interventions on parents' satisfaction and length of stay of patients admitted to a PICU or NICU a systematic search and review of the literature.

Methods

This systematic review was conducted according to the guidelines of the Preferred Reporting Items for Systematic review and Meta Analyses (PRISMA) (Moher et al., 2009).

To explore all the relevant studies, the following electronic databases were systematically searched for eligible articles between 5th February 2016 and 4th March 2016: PubMed, CINAHL, Embase and the Cochrane library. The following search/MESH terms were used: child (preschool), infant (newborn), adolescent, paediatric intensive care unit, neonatal intensive care unit, family-centred care, collaboration, participation, decision making, involvement, effect, outcome, length of stay, (parent-) satisfaction (Table 1). In October 2017, again a search was done. The results from all databases were screened on title and abstract, selection was based on the inclusion criteria. After this initial selection, duplicates were removed and the full text of the articles was retrieved to assess correspondence with the inclusion criteria. The selection of articles was done by two researchers (L.S and I. E). The characteristics of included studies were recorded on a data extraction form (Table 2).

Inclusion criteria

Published articles that reported on children and adolescents from 0 to 18 years, admitted on a PICU or NICU and that had a quantitative design were included.

Furthermore only articles that focused on one of the family centred care core items (dignity and respect, information sharing,

Table 1
Search terms.

	Search terms	
Domain = patients in a NICU or PICU	AND: Determinant = family centred care interventions	AND: Outcome = parents' satisfaction, length of stay
MeSH-terms/Thesauris terms Emtree/Cinahl headings:	*MeSH-terms/Thesauris terms Emtree/Cinahl headings:*	*MeSH-terms/Thesauris terms Emtree/Cinahl headings:*
Child*	Family-cent* care	Length of stay
Child, preschool	Decision making	*Synonyms:*
Child, hospitalised	Family decision making	Effect*
Infant*	*Synonyms:*	Outcome*
Infant, newborn	Family nursing	Satisfaction
Infant, premature	Family-integrated care	Parent satisfaction
Adolescent*	Collaboration	
Adolescent*, hospitalised	Involvement	
Synonyms:	Participation	
Child, critical ill		
AND:		
MeSH-terms/Thesauris terms Emtree/Cinahl headings:		
Neonatal intensive care unit*		
Paediatric intensive care unit*		
Newborn intensive care		
Synonyms:		
Paediatric critical care		

Table 2
Study characteristics.

Author/Year	Design/ sample size/ setting	Aim	Intervention	Outcome: Satisfaction (instrument)/LoS	Other outcomes	Quality appraisal
Byers et al., 2006	Quasi experimental design 114 NICU	To measure effect individual NIDCAPinformation on infant growth, stress, phys. variable, parental perception and overall satisfaction	Individual NIDCAP information for parents	Satisfaction: NICU satisfaction tool LoS:+	Phys. var.: Heart rate, respiratory rate, and oxygen saturation. Behavioral stress cues, return to sleep state, progress, complication rate, costs	moderate
Clarke-Pounder et al., 2015	RCT 10/9 NICU	To encourage consideration of family concerns/preferences	Decision making tool	Satisfaction: Fin-PED, N-DMT LoS: –	Anxiety (stat-trait anxiety) (Fin-PED)	weak
De Bernardo et al., 2017	Cohort pre/post 24/24 NICU	To support parents in taking care of their infants	Involvement of parents in care, extension of visiting hours,	Satisfaction: validated by Abdel-Latif LoS: –	Parental stress, weight of infant	weak
Ebrahim et al., 2013	Observational 64 PICU	To conduct a survey, to evaluate factors associated with parental satisfaction	No intervention, -association satisfaction/ involvement -be present or not resuscitation	Satisfaction: self-developed survey, face validity LoS: –	Association involvement-presence resuscitation	weak
Ladak et al., 2013	N-RCT pre/post 41/41 PICU	To evaluate impact bedside rounds on satisfaction, length of stay	Involvement of family on bedside rounds	Satisfaction: Parent satisfaction scale (Landry) LoS:+	Healthcare workers satisfaction, duration bedside rounds	moderate
Lester et al., 2016	Cohort pre/post 93/123 NICU	To determine association between neurodevelopmental outcomes and increased parental involvement	Single Family Rooms and increased involvement of parents in care	Satisfaction: – LoS:+	Neurodevelopmental outcomes	moderate
Mello et al., 2004	N-RCT 94/33 PICU	To facilitate critical decision making and improve satisfaction	Involvement of parents in decision making	Satisfaction: Questions from Famcare scale LoS: –	Decision making	weak
Melnyk et al 2006	RCT 109/138 NICU	To evaluate efficacy educational/ behavioural program to reduce length of stay	Education for parents about child behaviour and parenthood	Satisfaction: – LoS:+	Parental stress/ anxiety/beliefs	good
October et al., 2016	Crossectional 39 PICU	To evaluate association between physicians FCC communication and parents satisfaction	Communication of physicians in family conferences	Satisfaction: Family Satisfaction (FS-ICU II) with decision-making survey LoS: –		moderate
Örtenstrand et al., 2010	RCT 183/183 NICU	To measure effect parental involvement on length of stay	Rooming in and involvement of parents in care	Satisfaction: – LoS:+	Short term infant morbidity	good
Penticuff and Arbeart, 2005	N-RCT pre/post 77/77 NICU	To measure effect strengthen parent/ professional collaboration	Improve parent-professional collaboration	Collaboration/ satisfaction about care scale decisions (Baggs) LoS: –	Comprehension of medical information	weak
Saunders et al., 2003	pre/post 11 centra NICU	To improve family centred care	Family centered care program, different interventions	Satisfaction: – LoS: +	Feeding outcomes	weak
Sannino et al 2016	N-RCT pre/post 21/21 NICU	To evaluate the effectiveness of NIDCAP	NIDCAP information to support mothers	Satisfaction: – LoS:+ Nurse parent support tool	Neurofunctional assessment Breastfeeding Full oral feeding	moderate
Stevens et al., 2011	Cohort pre/post 58/89 NICU	To assess parents satisfaction in open and single room	Single-family room vs open bay (rooming in)	Satisfaction: Valid instrument LoS: –		moderate
Trujillo et al., 2017	Cohort pre/post 1 center NICU	To improve parent experience of physician communication	Interdisciplinary family conferences	Satisfaction: AVATAR surveys LoS: –		weak
Voos et al., 2011	Cohort pre/post 36/36 NICU	To evaluate impact bedside rounds on provider satisfaction Sec.: effect FCR on parental satisfaction and stress	Involvement family on bedside rounds	Satisfaction: Neonatal instr. of parent satisfaction LoS: –	Parental stress scale	weak
Weiss et al., 2010	Cohort Pre/post 50/33 NICU	To assess improvements staff/parents communication on satisfaction	Improve staff/parents communication	Satisfaction: Picker institute LoS: –		moderate

Table 3
Critical appraisal; the McMaster tool for quantitative studies.

Study	Byer	Clark	De Bernardo	Ebrahim	Ladak	Lester	Mello	Melnyk	October	Ortenstrand	Penticuff	Sannino	Saunders	Stevens	Trujillo	Voos	Weiss
Purpose	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Literature	+	–	+	+	+	+	–	+	+	+	+	+	+	+	+	+	+
Design	+	–	+	+	+	+	–	+	+	+	+	+	–	+		+	+
Sample detail	+	+	+	+	+	+	+	+	+	+	+	+	+	+		–	+
Sample justified	–	–	–	–	–	–	–	+	–	+	–	+	–	–	–	–	–
Outcome reliable	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Outcome valid	+	+	+	–	+	+	+	+	+	+	+	–	+	+	+	+	+
Intervention	+	+	+	+	+	+	+	+	+	–	+	+	+	+	+	+	+
Contamination	–	–	–	–	–	–	–	+	–	+	–	+	–	–		–	–
Co intervention	–	–	–	–	–	–	–	+	–	–	–	–	–	–	–	–	–
Results	+	–	+	+	+	+	+	+	+	+	+	+	–	+	+	+	+
Analysis	–	–	–	–	+	+	+	+	+	+	–	–	–	–	–	–	+
Clinical implications	+	–	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Drop outs	+	+	+	+	+	+	+	+	+	+	–	+	–	+	+	+	–
Conclusion	+	+	–	+	+	+	+	+	+	+	–	+	+	+	+	+	+
Total	11/15	7/15	10/15	10/15	12/15	12/15	10/15	15/15	12/15	13/15	9/15	12/15	7/15	11/15	9/15	10/15	11/15

The subsequence of the following items were assessed: 1. Was the study purpose stated clearly? 2. Was relevant background literature reviewed? 3. Was the design appropriate for the study question? 4. Was the sample described in detail? 5. Was the sample size justified? 6. Were the outcome measures reliable? 7. Were the outcome measures valid? 8. Was the intervention described in detail? 9. Was contamination avoided in the intervention group? 10. Was co-intervention avoided? 11. Were the results reported in term of statistical significance? 12. Were the analysis method(s) appropriate? 13. Was clinical importance reported? 14. Were drop-outs reported? 15. Were conclusion appropriate given study methods and results?

participation, collaboration of families/parents) and measured satisfaction with a validated survey or/and measured length of stay were included. Articles not written in Dutch, English, French or German were excluded. There were no restrictions on the date the paper was published in.

Methodological quality and synthesis

The methodological quality of each article was assessed by two researchers, using the McMaster tool for quantitative studies (Table 3) (Law et al., 2003). Disagreements were resolved by discussion until consensus was reached. The tool consists of fifteen criteria that assessed the study quality. A 'yes' was scored if the concerning criteria was met or a 'no' if the criterion was insufficiently met. Each 'yes' generated one point, with a maximum of fifteen points.

In order to be able to give a weight to the quality of the studies, a score of twelve and higher was regarded as good quality, a score of nine till eleven as moderate quality and a score under nine was found weak quality.

Given the different designs of the selected studies and the heterogeneity of the interventions, it seemed unfeasible to pool the results in a meta-analysis. Instead, a narrative account of the study, grouped by the different outcomes: length of stay and parents' satisfaction, and a best-evidence synthesis was conducted (Proper et al., 2011). Three levels of evidence were differentiated: (1) strong evidence: consistent findings in multiple (two) high quality studies; (2) moderate evidence: consistent findings in one high quality study and at least one low-quality study, or consistent findings in multiple low quality studies; (3) insufficient evidence: only one study available or inconsistent findings in multiple (two) studies.

Results

Study selection

In this review, at first 13 studies were included. A total of 1367 records were emerged from the search strategy in all databases. After screening title and abstract 76 articles left, 34 articles left when duplicates removed. All these articles were screened, 21 articles were excluded during this screening process because they didn't meet the inclusion criteria or there was no full-text. A new search was done in October 2017 and 4 studies were included. Finally, 17 studies were included in this systematic review with a total of 4742 patients involved in these studies. The flow-chart of the study selection is presented in Fig. 1.

Study characteristics

Designs used in the 17 included studies, were quasi experimental, cross sectional, randomised control trial, observational and cohort, pre-post studies, see Table 2.

Thirteen of the studies were conducted in a NICU and four studies took place in a PICU (Ebrahim et al., 2013; Ladak et al., 2013; Mello et al., 2004; October et al., 2016). The sample size of the studies ranged from 19 to 3022.

Each study investigated one type of FCC intervention, except one (Saunders et al., 2003). Though the type of FCC interventions implemented varied between the studies, taken together FCC interventions could be divided into two main groups. One group of interventions were directed to improve the participation of parents in the care of their child, such as rooming in and involved in the newborn individualised care and assessment program (NIDCAP) (Bernardo et al., 2017; Byers et al., 2006; Lester et al., 2016; Melnyk et al., 2006; Örtenstrand et al., 2010). The other group of interventions were directed to enhance the involvement of parents in policy and to improve professional collaborations such as participation bedside rounds, communication and decision-making interventions (Clarke-Pounder et al., 2015; Ebrahim et al., 2013; Ladak et al., 2013; Mello et al., 2004; October et al., 2016; Penticuff and Arbeart, 2005; Trujillo et al., 2017; Voos et al., 2011; Weiss et al., 2010). The study characteristics are presented in Table 2.

Methodological quality

The methodological quality scores of the included studies varied from seven to fifteen of a total score of fifteen. Two studies

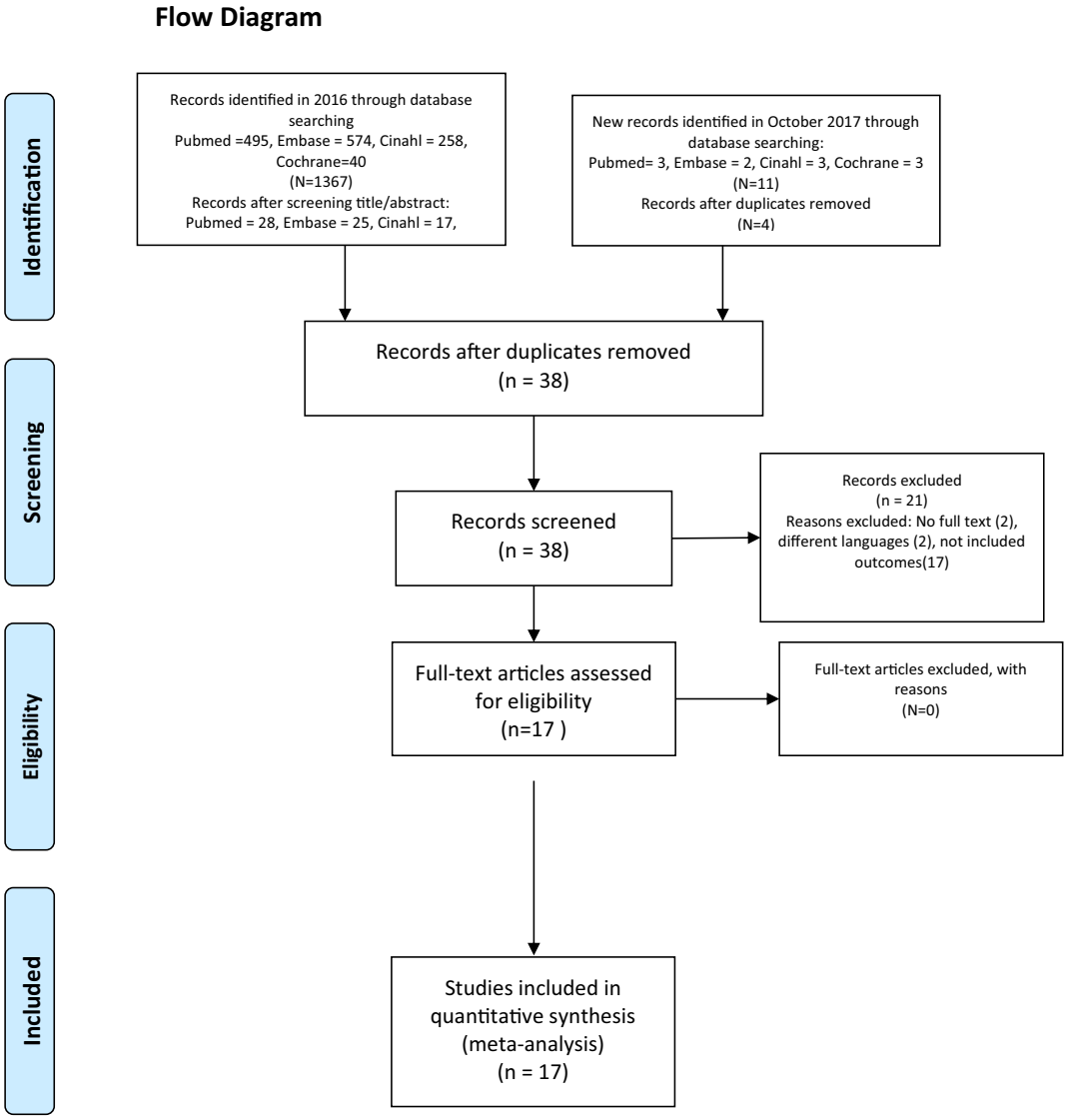

Fig. 1. Flow diagram.

had a score of fifteen (Melnyk et al., 2006; Örtenstrand et al., 2010). Seven studies received a score from eleven to twelve which was moderate quality (Byers et al., 2006; Ladak et al., 2013; Lester et al., 2016; October et al., 2016; Sannino et al., 2016; Stevens et al., 2011; Weiss et al., 2010), and eight studies received a score of weak quality from seven to ten (Bernardo et al., 2017; Clarke-Pounder et al., 2015; Ebrahim et al., 2013; Mello et al., 2004; Penticuff and Arbeart, 2005; Saunders et al., 2003; Trujillo et al., 2017; Voos et al., 2011). Frequently observed weaknesses were lack of sample justification and no clear avoidance of contamination and co-intervention. In a few studies the analysis method was not appropriate. Table 3 gives an overview of the methodological quality of the included studies.

Results of individual studies

Parents' satisfaction. Twelve studies investigated parents' satisfaction, (table 4) (Bernardo et al., 2017; Byers et al., 2006; Clarke-Pounder et al., 2015; Ebrahim et al., 2013; Ladak et al., 2013; Mello et al., 2004; October et al., 2016; Penticuff and Arbeart, 2005; Stevens et al., 2011; Trujillo et al., 2017; Voos et al., 2011; Weiss et al., 2010). To assess satisfaction, each study used a different questionnaire. From these 12 studies, three studies conducted an intervention to improve participation in childcare and nine studies an intervention to improve collaboration with professionals. A significantly higher parental satisfaction was found in the intervention group in seven studies (Bernardo et al., 2017; Ladak et al., 2013; Örtenstrand et al., 2010; Penticuff and Arbeart, 2005; Stevens et al., 2011; Trujillo et al., 2017; Voos et al., 2011; Weiss et al., 2010). One study found an association between physician's patient-centred communication patterns and parental satisfaction (October et al., 2016).

In these studies, parental satisfaction was investigated in relation to the specific FCC intervention and also across multiple facets of care. A significant increase in measured satisfaction was always reported in relation of the FCC intervention. When the investigated intervention was focused on collaboration of parents-professional, parents were satisfied about involvement, decision making and input or communication (Ladak et al., 2013; October et al., 2016; Penticuff and Arbeart, 2005; Trujillo et al., 2017; Voos et al., 2011; Weiss et al., 2010).

The eight studies that found a significantly higher satisfaction in the intervention group had a weak to moderate quality (Bernardo et al., 2017; Ladak et al., 2013; October et al., 2016; Penticuff and

Table 4
Results.

Parents' satisfaction			
Author, year	Setting	Intervention: childcare related	Result
Byers et al., 2006	NICU	Individual NIDCAP information for parents	No sig. difference: both groups very high satisfaction, intervention little higher
De Bernardo et al., 2017	NICU	Involvement of parents in care, extension of visiting hours,	Sig. higher: intervention group satisfaction knowledge and understanding, communication and collaboration, privacy and confidentially ($p < 0.05$)
Stevens et al., 2011	NICU	Single-family room vs open bay (rooming in)	Sig. higher: intervention group satisfaction overall (p 0.018), environment ($p < 0.001$) No sig. difference: personal, nursing, physician
Intervention: parents-professional collaboration related			
Clarke-Pounder et al., 2015	NICU	Decision-making tool for parents	No sig. difference: control group higher satisfaction
Ebrahim et al., 2013	PICU	No intervention, -association satisfaction/involvement -be present or not resuscitation	No sig. association satisfaction/involvement, both groups high satisfaction, No sig. difference satisfaction parental presence/non presence
Ladak et al., 2013	PICU	Involvement of family on bedside rounds	Sig. higher: Intervention satisfaction: involvement (p 0.03), decision making care (p 0.01), simple language (p 0.002), preference FCR (p 0.001) No sig. diff. with care
Mello et al., 2004	PICU	Involvement of parents in decision making	No sig. difference: intervention group satisfaction overall higher (p 0.11), Both groups high satisfaction No sig. difference: intervention group satisfaction information/involvement lower, (p 0.38, p 0.48)
October et al., 2016	PICU	Communication of physicians in family conferences	Sig. association between high physician's patient-centered communication patterns and parental satisfaction ($p < 0.001$)
Penticuff and Arbeart, 2005	NICU	To measure effect strengthen parent/ professional collaboration	Sig. higher: intervention group satisfaction process (p 0.001), decision input (p 0.16) No sig. diff: care (p 0.47), relationships (p 0.96), made decisions (p 0.7)
Trujillo et al., 2017	NICU	Interdisciplinary family conferences	Sig. increase of satisfaction with physicians communication after implementation intervention (p 0.057)
Voos et al., 2011	NICU	Involvement family on bedside rounds	Sig. higher: intervention group satisfaction communication ($p < 0.01$) No sig. diff.: overall satisfaction
Weiss et al., 2010	NICU	Improve staff/parents communication	Sig. higher: intervention group satisfaction overall (p 0.01), quantity (p 0.01) No sig. diff.: understanding (p 0.52), possibility asking questions (p 0.24)

Length of stay			
Author	Setting	Intervention: childcare related	Result: control vs intervention
Byers et al., 2006	NICU	Individual NIDCAP information for parents	Mean diff. −0.69 day, p 0.914: no sig. difference
Lester et al., 2016	NICU	Single Family Rooms and increased involvement of parents in care	Involvement: mean diff: −11 days, p 0.023. Involvement + single room: mean diff: −15 days, p 0.024
Melnyk et al., 2006	NICU	Education for parents about child behaviour and parenthood	NICU: mean diff: −3.8 days, p:0.05 Total LoS: mean diff: −3,9 days, p:0.02: sig. difference
Örtenstrand et al., 2010	NICU	Rooming in and involvement of parents in care	NICU: mean diff: −4,7 days, p:0.2 Total LoS: −5.3 days, p:0.5: sig. difference
Sannino et al., 2016	NICU	NIDCAP information to support mothers	Mean diff: -0.8 days, no statistical analysis
Intervention: parents-professional collaboration related			
Ladak et al., 2013	PICU	Involvement of family on bedside rounds	Median diff. −19 days, p 0.002: sig. difference
Intervention: childcare and collaboration elements			
Saunders et al., 2003	NICU	Family centered care program, different interventions	Mean diff. −0.4 day, no statistical analysis

Arbeart, 2005; Stevens et al., 2011; Trujillo et al., 2017; Voos et al., 2011; Weiss et al., 2010). Six of these studies conducted interventions related to parents-professionals collaboration on the NICU, but the type of interventions investigated and the measurement instruments utilised were heterogeneous. The evidence regarding parents' satisfaction was, therefore, found to be moderate for only this sort of interventions and in this setting.

Length of stay. Seven studies investigated length of stay (LoS), (Table 4) (Byers et al., 2006; Ladak et al., 2013; Lester et al., 2016; Melnyk et al., 2006; Örtenstrand et al., 2010; Sannino et al., 2016; Saunders et al., 2003). All studies found a shorter LoS, but in three studies, the difference was shorter than a day, and therefore reported as not significant (Byers et al., 2006; Sannino et al., 2016; Saunders et al., 2003).

A significant decrease of LoS in the intervention group was observed in four studies, of which three were in NICU and one in PICU. Outcome varied from a mean of 3.8 to 19 days, (Ladak et al., 2013; Lester et al., 2016; Melnyk et al., 2006; Örtenstrand et al., 2010; Stevens et al., 2011). Three studies conducted an intervention to improve participation of parents in child care. The study of Ladak et al., conducted an intervention of parental presence at bedside rounds on a PICU in Pakistan (Ladak et al., 2013). This study was not comparable with the other three studies because of the different reasons as intervention, setting and culture.

LoS in the studies of Lester et al, Melnyk et al. and Ortenstrand et al., varied from 3.8 to 11 days. The studies took place in the same setting and two of them had a high quality (Melnyk et al., 2006; Örtenstrand et al., 2010). Although the interventions were diverse among studies, they were all focused on parents' participation in caring for their child. (Lester et al., 2016; Melnyk et al., 2006; Örtenstrand et al., 2010). According to Proper there is strong evidence that childcare related interventions decrease LoS of patients admitted to a NICU, because two studies were of high quality showing evidence in the same directions (Proper et al., 2011).

Discussion

This systematic review, aimed to explore the impact of family centred care interventions on parents' satisfaction and length of stay in patients admitted to PICU or NICU. Two out of four studies carried out in a PICU found a significant higher satisfaction and one

of these four a significant decrease of LoS when improving parent-professional collaboration. However these studies were of weak to moderate quality. In contrary, evidence was found in NICU studies showing an increase in parents' satisfaction and a decrease in length of stay.

Although there is evidence about improving healthcare outcomes through FCC interventions in general, little is known about the evidence of FCC interventions for hospitalised children in PICU and NICU (Kuo et al., 2012; Shields et al., 2007; Shields, 2012). Shields et al. included one study in a Cochrane review in 2012, assessing the effects of family-centred models of care for hospitalised children on general wards (Shields, 2012). A significantly higher parents' satisfaction was found in the intervention group as shown in this review. Another systematic review, investigating the evidence of family-centred care for children with special health care needs, found that FCC is associated with an increase of parents' satisfaction (Kuhlthau et al., 2011). This is similar to the studies investigating parents' satisfaction in this review where the outcome is also comparable taking into account the diversity of the population. Also Davidson et al. recommended in Guidelines for Family-Centred Care in the Neonatal, Paediatric, and Adult ICU, routine interdisciplinary family conferences to improve family satisfaction, however the evidence was weak (Davidson et al., 2017).

A small amount of research was performed towards investigating the impact of FCC interventions on LoS. Gooding et al. reviewed literature about FCC in the NICU and included two studies (also included in this review) founding a significant decrease of LoS on a NICU (Gooding et al., 2011; Melnyk et al., 2006; Örtenstrand et al., 2010). It can be asked which factor of FCC interventions influenced the LoS. Included studies in this review, investigating LoS on a NICU used different interventions with the same aim, namely to stimulate parental involvement in child care and interaction with their child on a NICU to reduce stress (Lester et al., 2016; Melnyk et al., 2006; Örtenstrand et al., 2010). Stress reduction of parents and children could have a positive impact on the health condition of the children with earlier discharge as a result.

Consistency in outcomes underlines the strength of included studies. Although not all included studies had significant results, none of the studies showed negative outcomes for FCC interventions. Only Clarke et al. found a slight increase in anxiety levels in parents in the intervention group (Clarke-Pounder et al., 2015). Evaluating this review process, there are strengths and limitations. Strength of this review is the consistency in outcomes of included studies. Although not all included studies have significant results, no studies showed negative outcomes for FCC interventions. The evidence of these results show that FCC interventions can improve healthcare outcomes although evidence may be stronger.

A strength of the review process is the methodological quality assessment, which is independently conduct by two researchers. Differences in the scores between the reviewers are resolved through discussion until consensus was reached. The quality of the included studies is taken into account in the final conclusions. In addition, this systematic review is conducted following the steps of the PRISMA statement

A limitation of the included studies is the generally moderate quality of the studies, especially the studies investigating parents' satisfaction. Different studies were weak in sample justification. No sample calculations were given and the studies often had a small sample size, which can result in low statistical power. Furthermore, in a number of studies it was not clear if contamination in the control group and co-interventions with the investigated intervention were avoided, which might have influenced the results (Byers et al., 2006; Clarke-Pounder et al., 2015; Ebrahim et al., 2013; Ladak et al., 2013; Mello et al., 2004; Örtenstrand et al., 2010; Penticuff and Arbeart, 2005; Sannino et al., 2016; Saunders et al., 2003; Stevens et al., 2011; Voos et al., 2011; Weiss et al., 2010).

Another limitation is the lack of a clear definition to describe the concept of satisfaction in the studies. Different satisfaction measurement instruments are used investigating parents' satisfaction with different scopes and none of the studies used a definition of satisfaction. Without clarity in definitions, conclusions about parents' satisfaction remain general. To draw specific conclusions in order to make recommendations for improvement is, in practice, difficult.

It can be concluded that parents in the intervention group were more satisfied when collaboration with professionals improved. Therefore, parent-professional collaboration, as in decision-making, should be included in models of care in NICU's. This is even truer for interventions improving parental involvement in care, because this review shows a strong evidence for decreasing LoS when these interventions were implemented. It is important to investigate which barriers have to be overcome to achieve this.

More studies with high level of evidence like randomized controlled trials are necessary to evaluate FCC interventions in the future with attention to gaps in research in the different domains of FCC. Since FCC is a broad concept, future systematic reviews would benefit from specifying a clinical setting and intervention type.

This review focused on quantitative research, which is important to evaluate interventions. However, qualitative research exploring experiences of parents and patients is also of importance in FCC. It gives more insight into needs and expectations of parent and patients. Both types of research will give directions for future development of FCC.

Conclusion

Studies carried out in a PICU were of weak to moderate quality and too few to show evidence regarding parents satisfaction and length of stay. Moderate evidence was found for FCC interventions improving in parents' satisfaction in the neonatal intensive care unit, which increased when collaboration between parents and professionals improved. In addition strong evidence was found in the NICU for a significant decrease in length of stay as a result of interventions when parents participated in childcare. Implementation of FCC interventions improving parents participation in childcare and parent-professional collaboration on a NICU is recommended.

Future research needs studies of high quality in different domains of FCC to assess the evidence of FCC interventions in both PICU and NICU.

Author contributions

All authors meet the criteria of contributions to study design, collection of data, analysis and interpretation of data as well as drafting the article.

Conflict of interest

None.

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