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IMPACT OF FAMILY-CENTERED CARE AND PARENTAL EDUCATION PROGRAMS IN NEONATAL UNITS ON INFANT OUTCOMES AND PARENTAL STRESS: A SYSTEMATIC REVIEW

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Abstract

Background: Family centered care (FCC) and structured parental education in neonatal intensive care units (NICUs) aim to improve infant outcomes and reduce parental stress. Contemporary FCC models typically combine parent training, coaching, mentorship, and opportunities for parents to participate in non-medical infant care. Evidence is growing but heterogeneous across settings and intervention designs. We aimed to synthesize evidence on the effects of NICU-based FCC and parental education programs on infant clinical outcomes and parental stress, psychological outcomes. **Methods:** We conducted a PRISMA-aligned systematic review of PubMed Central full-text original studies evaluating NICU FCC and, or parental education interventions with comparative designs (randomized, cluster randomized, or pre–post). Primary outcomes were parental stress and infant clinical outcomes. Risk of bias was assessed using RoB 2 for randomized trials and ROBINS-I for non-randomized studies. Where feasible, a random-effects meta-analysis was performed. **Results:** Ten original PMC studies were included (randomized, cluster randomized and quasi-experimental, pre–post). FCC, FIC approaches that increased parent presence and direct participation were associated with improved infant feeding and growth-related metrics and reduced respiratory support time in some studies. A pre–post FIC study in two Chinese children's hospitals reported higher breastfeeding rates and weight gain and lower respiratory support time following implementation. Meta-analysis (2 studies) of parental stress outcomes showed substantial heterogeneity and no statistically significant pooled effect. **Conclusion:** NICU FCC and parental education programs, especially multi-component FIC models, may improve selected infant outcomes; effects on parental stress are inconsistent and highly heterogeneous. Future trials should standardize parental stress outcomes, report implementation fidelity, and evaluate longer-term infant and family outcomes.

Keywords: Family-Centered Care; Family Integrated Care; Parental Education; Neonatal Intensive Care Unit; Parental Stress; Breastfeeding; Preterm Infants; Systematic Review; Meta-Analysis.

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INTRODUCTION

NICU hospitalization is a high-stress experience for parents, driven by uncertainty, role disruption, and exposure to intensive monitoring and procedures. FCC has evolved to address these challenges by reframing parents as partners in care, improving communication, supporting parent–infant bonding, and building parental caregiving competence. Conceptual and scoping work emphasizes that FCC in neonatal settings is not a single activity, but a set of relational and organizational practices (1-7).

FICare is a prominent FCC implementation model designed to reduce barriers between parents and NICU teams by combining parent education, staff training, psychosocial support, and NICU environmental, operational adjustments. In clinical settings where parental access is restricted, implementation of FIC models is frequently positioned as a strategy to improve infant outcomes (feeding, growth, respiratory outcomes) and enhance parent confidence (8-12).

Although recent syntheses suggest potential benefits of FCC, FIC interventions, the literature remains heterogeneous in populations (very preterm, BPD, mixed NICU cohorts), outcome definitions, and intervention intensity, which complicates firm conclusions on parental stress and mental health outcomes (2-8).

Given ongoing interest in scalable NICU FCC and parental education programs, an updated synthesis focused on PMC-accessible original studies can help clarify: which infant outcomes show consistent improvement, and whether parental stress reduction is a reliable effect across programs. We aimed to systematically review the impact of NICU FCC and parental education programs on infant outcomes and parental stress, psychological outcomes.

METHODS

Protocol and reporting

This review followed PRISMA 2020 principles for transparent reporting (screening, eligibility, and synthesis), including prespecified outcomes, clear inclusion criteria, and structured risk-of-bias assessment.

Eligibility criteria (PICO)

Population: Parents, caregivers of neonates admitted to NICU, special care nurseries (preterm or term), and their infants.

Intervention: FCC and, or structured parental education programs delivered during NICU admission (including multi-component FICare models, parent coaching, discharge readiness training, psychosocial, education packages).

Comparator: Usual care, historical pre-implementation care (pre–post), or alternative NICU care models without the structured FCC, education component.

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Outcomes:

Primary: Parental stress (validated scales), parental anxiety, depression, PTSD symptoms.

Secondary: Infant clinical outcomes (breastfeeding rates, duration, weight gain, respiratory support duration, length of stay, feeding milestones), and resource outcomes where reported.

Study designs: Randomized controlled trials (individual or cluster), quasi-experimental, and pre–post intervention studies with a comparator.

Setting: NICU or equivalent neonatal inpatient units.

Other: Full-text original studies available in PubMed Central . Systematic reviews were used only for background (not included-study synthesis).

Information sources and search strategy

We focused on PMC full-text studies to ensure verifiability and reproducibility with open-access content. We identified candidate studies via targeted PMC, PubMed Central full-text searches using combinations of: (neonatal OR NICU) AND (“family centered care” OR “family-centred care” OR “family integrated care” OR FICare) AND (education OR training OR intervention OR program) AND (stress OR anxiety OR depression OR breastfeeding OR outcomes).

Study selection: Titles, abstracts were screened for: NICU setting, FCC, parent education intervention, comparative design, and reporting infant and, or parent outcomes. Full texts were reviewed to confirm eligibility.

Data extraction

A standardized extraction approach captured: country, setting, population, intervention components (education, parent participation expectations, staff training), comparator, outcomes measured, timing, and key findings.

Risk of bias assessment: Randomized, cluster randomized trials: Cochrane RoB 2 domains (randomization, deviations from intended interventions, missing outcome data, outcome measurement, selective reporting). Non-randomized, pre–post studies: ROBINS-I domains (confounding, selection, classification, deviations, missing data, measurement, reporting).

RESULTS

Included studies

Ten original PMC studies met inclusion criteria (Table 1). They included randomized trials, cluster randomized trials, and pre–post or quasi-experimental evaluations. Interventions commonly combined: parent education, training modules, supported parent participation in routine non-medical care, and varying degrees of staff coaching and unit process

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changes. For example, a Chinese pre–post FIC implementation trained nurses and required parents to be present and care for infants at least 3 hours, day (12).

Table 1: Characteristics and main findings of included original studies

Study	Design, Setting	Population	Intervention	Key parent outcomes	Key infant outcomes
Abdeyazdan et al. (9)	RCT; NICU	Parents of hospitalized neonates	Family support intervention	Post-intervention stress scores lower in intervention vs control (tabled results)	Not primary focus
Mianaei et al. (10)	RCT; NICU	Parents of preterm infants	COPE program (education + parent participation support)	Parenting stress decreased vs control at follow-up (tabled results)	Not primary focus
Glazebrook et al. (11)	Cluster RCT; 6 NICUs	Infants <32 weeks + mothers	PBIP (nurse-delivered supportive, educational program)	No significant difference in PSI stress at 3 months	No measurable short-term neurobehavioral benefit
He et al. (12)	Pre–post; 2 hospitals	Preterm infants with BPD	FIC implementation: nurse training + parent education, support + ≥3h, day parent caregiving	Parent-reported outcomes recommended for future research	↑breastfeeding rates; ↑ weight gain; ↓ respiratory support time
Chen et al. (13)	Comparative study; NICU	Preterm infants	FICare model	Reported improvements in parent domains (study-specific)	Improved infant prognosis indicators (study-specific)
Alsadaan et al. (14)	Quasi-experimental pre–post	High-risk neonates	Integrated FCC + developmental care principles	Not primary focus	Examined neurodevelopmental outcomes and length of stay
Tiryaki & Çınar et al. (15)	RCT; NICU	Parents of preterm infants (Turkey)	1-week FICare training + staff training + supported caregiving	Improved discharge readiness of mothers, fathers	Positive effects on weight gain and breastfeeding status (conclusion)
Mousavi et al. (16)	RCT, controlled; NICU	Mothers with hospitalized neonates	Maternity support program	Reduced maternal stress (reported mean±SD)	Not primary focus

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Study	Design, Setting	Population	Intervention	Key parent outcomes	Key infant outcomes
Ansari et al. (17)	Pilot study; NICU	Parents of critically ill infants	FICare Plus feasibility	Feasibility, acceptability outcomes	Noted clinical outcome tracking (pilot)
Rajabzadeh et al. (18)	Trial; NICU	Parents of NICU infants	FCC educational intervention	Improved parent psychological outcomes (study-specific)	Not primary focus

In the He et al. pre–post study (two hospitals in China), implementation of FIC was associated with higher breastfeeding rates (83% vs 71%), longer breastfeeding time, higher daily weight gain (29 g, day vs 23 g, day), and lower respiratory support time (16 vs 25 days), with several outcomes statistically significant (12).

In Turkey, a randomized trial evaluating a structured FICare discharge preparation program reported improved discharge readiness among both mothers and fathers, and the authors concluded positive effects on infant weight gain and breastfeeding-related outcomes (15).

Two studies provided extractable post-intervention stress outcomes with sufficient data for standardized effect estimation: COPE program RCT (parenting stress outcome reported in tabulated form) (10). PBIP cluster RCT (PSI stress reported at 3 months adjusted age) (11). Meta-analysis (random-effects, SMD, Hedges g): pooled effect was not statistically significant and demonstrated extreme heterogeneity (Hedges g −0.69, 95% CI −2.56 to 1.17; I^2=98%). Differences in intervention content, timing, stress instruments, and populations likely contributed to inconsistency (10,11).

DISCUSSION

This systematic review found that NICU FCC and parental education interventions are commonly multi-component and context-dependent, with the strongest and most consistent signals appearing in certain infant outcomes (feeding and growth-related metrics) rather than uniformly in parental stress reduction. This aligns with broader syntheses noting variability in intervention design and outcome measurement across neonatal FCC studies (2,4,5,8).

Interpretation of infant outcome findings

The pre–post FIC implementation in China reported improvements in breastfeeding, enteral feeding time, daily weight gain, and reduced respiratory support time (12). These outcomes are clinically meaningful in NICU practice because feeding progression and respiratory support duration are linked to morbidity risk and family burden, and they are also sensitive to caregiving processes that FIC explicitly targets (parent presence, supported caregiving, and parent education).

Similarly, discharge-focused FICare education in Turkey reported improved readiness for home care (both mothers and fathers) and suggested beneficial effects on breastfeeding

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and weight gain (15). Readiness-for-discharge outcomes may serve as practical proximal indicators of FCC effectiveness because they reflect whether parents have gained competence and confidence, core aims highlighted in FCC frameworks (3,6,7,15).

Why parental stress effects were inconsistent

The meta-analysis did not show a clear pooled reduction in stress and had very high heterogeneity (10,11). This reflect: Measurement diversity: studies used different stress instruments (PSS variants vs PSI) and assessed at different timepoints (10,11). Intervention intensity and mechanisms: some programs emphasize interaction coaching and sensitivity (PBIP), while others emphasize knowledge and role restoration (COPE, FIC), which may influence stress through different pathways (10,11,12). Context and baseline policies: the impact of FCC may be larger in settings with restricted parental access before implementation (12), whereas in settings with more established parental involvement, incremental changes might be smaller.

Implementation and reporting implications

Recent scoping and mapping work underscores that FCC, FIC interventions should report their components and implementation fidelity (required parent presence, staff training hours, psychosocial supports), because “FCC” is otherwise too heterogeneous for reliable replication (3,6,7). The He et al. study described explicit training and minimum parent presence requirements (≥3 hours, day), which may help explain observable infant outcome changes (12).

Limitations

Outcomes, instruments, and follow-up timing varied, limiting pooling and increasing uncertainty. Only two studies had extractable stress summary statistics suitable for pooled estimation, and scales differed, increasing heterogeneity. Several studies were pre–post or quasi-experimental and may be vulnerable to confounding and secular trends, emphasizing the need for robust controlled designs where feasible.

CONCLUSION

NICU FCC and structured parental education programs, particularly multi-component FIC models, may improve selected infant outcomes such as breastfeeding metrics, weight gain, and respiratory support duration in some settings. Evidence for reducing parental stress is inconsistent and highly heterogeneous, with limited poolable data. Standardized parent-reported outcomes, stronger study designs, and detailed implementation reporting are needed to clarify the true magnitude and reproducibility of benefits.

List of Abbreviations

BPD: Bronchopulmonary dysplasia

COPE: Creating Opportunities for Parent Empowerment

FCC: Family-centered care

FIC: Family Integrated Care

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FICare: Family Integrated Care model

NICU: Neonatal intensive care unit

PBIP: Parent Baby Interaction Programme

PSS: Parental Stress Scale (NICU-related variants)

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses

PSI: Parenting Stress Index

RCT: Randomized controlled trial

SMD: Standardized mean difference

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