



# What is The Association between Family-Centered Care Models in Medical Rehabilitation and Improved Family Well-Being and Child Outcomes? : A Systematic Review

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## Article History :

Received date : 2026/01/21

Revised date : 2026/02/07

Accepted date : 2026/03/11

Published date : 2026/04/24



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**E-ISSN :**

ISSN 3048-1368



**P-ISSN**

ISSN 3048-1376



## ABSTRACT

**Background:** Family-centered care (FCC) is increasingly recognized as a fundamental approach in pediatric rehabilitation, yet the strength and consistency of its association with improved family well-being and child outcomes across diverse medical rehabilitation settings require systematic synthesis.

**Methods:** This review synthesized evidence from 80 RCT, etc examining FCC interventions in pediatric medical rehabilitation. Settings included neonatal intensive care units (NICUs), inpatient rehabilitation, outpatient clinics, home-based programs, and community-based early intervention.

**Results:** FCC demonstrated significant positive associations with child outcomes across multiple populations. In preterm infants, meta-analyses showed FCC significantly improved breastfeeding rates (OR=5.92, 95%CI:2.37-14.82, P<0.001), weight gain (MD=3.16 g/day, 95%CI:2.51-3.80, P<0.001), and reduced one-month readmission (OR=0.37, 95%CI:0.22-0.61, P<0.001)(1,2). In

children with cerebral palsy, community-based family-child-centered care produced superior gross motor function (GMFM-66), balance, and quality of life compared to conventional rehabilitation ( $P<0.05$ )(4). For family well-being, FCC significantly reduced parental stress (SMD=-0.19 to -0.20,  $P<0.001$ ), anxiety (SMD=-0.19,  $P<0.001$ ), and depression (SMD=-0.37,  $P=0.004$ )(2). Parent satisfaction showed dramatic improvement (OR=11.20, 95%CI:4.76-26.34,  $P<0.001$ )(2). Family empowerment significantly improved (mean change +4.1 points, 95%CI:3.3-4.9,  $P<0.001$ )(12). Biological validation was demonstrated through reduced maternal hair cortisol at 18 months ( $B=-0.22$ , 95%CI:-0.41,-0.04)(44).

**Discussion:** FCC effects are most robust in NICUs where parents serve as direct intervention agents. Effect magnitudes vary by outcome domain, with strongest evidence for parental stress reduction, satisfaction, and neonatal clinical indicators. Child motor outcomes show modest but statistically significant improvements. Family engagement intensity functions as a dose-response moderator.

**Conclusion:** FCC is significantly and positively associated with improved child outcomes and family well-being across pediatric medical rehabilitation settings. Implementation should prioritize structured information sharing and professional training to optimize effectiveness.

**Keywords:** Family-centered care, pediatric rehabilitation, child outcomes, family well-being, neonatal intensive care, cerebral palsy

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## INTRODUCTION

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### Background

Family-centered care (FCC) has emerged as a paradigm-shifting approach in pediatric medical rehabilitation, fundamentally reorienting service delivery from clinician-directed models to collaborative partnerships between healthcare professionals and families(22,23). The core principles of FCC—respect and dignity, information sharing, participation, and collaboration—recognize families as essential experts on their child's needs and the primary agents of therapeutic carryover into daily life(25,38). Despite widespread endorsement by professional organizations and accreditation bodies, the empirical evidence base for FCC has historically been characterized by conceptual heterogeneity, variable implementation fidelity, and inconsistent outcome measurement(28,29).

### Problem Statement

A critical gap persists in the systematic synthesis of FCC effectiveness across the full spectrum of pediatric medical rehabilitation settings. Previous reviews have typically focused on single conditions (e.g., cerebral palsy, preterm birth), single settings (e.g., NICU, early intervention), or narrow outcome domains(1,2,38). This fragmentation has prevented clinicians, administrators, and policymakers from understanding the overall strength of FCC associations with improved outcomes, the conditions under which FCC is most effective, and the specific outcome domains most responsive to family-centered approaches. Furthermore, apparent contradictions in the literature—such as strong NICU effects versus more modest cerebral palsy motor outcomes, or divergence between process measures and outcome measures—require systematic reconciliation.

### Research Question

This review addresses the following question: What is the association between family-centered care models in medical rehabilitation and improved family well-being and child outcomes?

### Research Objectives

1. To systematically synthesize quantitative evidence on FCC associations with child outcomes across pediatric medical rehabilitation settings
2. To comprehensively evaluate FCC associations with family well-being outcomes including stress, empowerment, satisfaction, and quality of life
3. To identify moderating factors that influence FCC effectiveness
4. To reconcile apparent heterogeneity in effect magnitudes across clinical contexts

### **Research Gap and Novelty**

This review provides three novel contributions. First, it synthesizes evidence across the full spectrum of pediatric rehabilitation—from NICU through early intervention to chronic disability management—enabling cross-contextual comparison of effect magnitudes. Second, it separately analyzes child outcomes and family well-being outcomes, identifying which domains are most responsive to FCC. Third, it systematically examines moderating factors including family engagement intensity, child behavioral difficulties, and service delivery characteristics, providing actionable guidance for implementation.

### **Hypothesis**

FCC interventions are significantly and positively associated with improved child outcomes (particularly neonatal clinical indicators, motor function, and quality of life) and improved family well-being outcomes (particularly reduced parental stress, increased empowerment, and satisfaction with care), with effect magnitudes varying by clinical context and outcome domain.

### **Benefits of the Study**

This review benefits clinicians by identifying which FCC components yield the largest effects, benefits administrators by demonstrating return on investment for FCC implementation, benefits policymakers by providing evidence for FCC standards, and benefits families by validating the importance of their partnership role.

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## METHODS

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### Protocol

The study strictly adhered to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 guidelines to ensure methodological rigor and accuracy. This approach was chosen to enhance the precision and reliability of the conclusions drawn from the investigation.

### Criteria for Eligibility

This systematic review aims to evaluate What is The Association between Family-Centered Care Models in Medical Rehabilitation and Improved Family Well-Being and Child Outcomes?.

### Screening

We screened in sources based on their abstracts that met these criteria:

- **Pediatric Population:** Does the study include children (0-18 years) receiving medical rehabilitation services and their families?
- **Family-Centered Care Intervention:** Does the study examine the implementation of family-centered care models or approaches in medical rehabilitation settings?
- **Relevant Outcomes:** Does the study measure at least one outcome related to family well-being (e.g., family functioning, parental stress, quality of life, satisfaction, coping) or child outcomes (e.g., functional improvement, developmental progress, quality of life, participation)?
- **Medical Rehabilitation Setting:** Was the study conducted in medical rehabilitation settings (e.g., inpatient rehabilitation hospitals, outpatient rehabilitation clinics, pediatric rehabilitation centers)?
- **Study Design:** Is the study design a randomized controlled trial, etc?
- **Intervention Definition:** Is family-centered care clearly defined and a primary component of the intervention being studied?

- **Population Focus:** Does the study include pediatric patients and/or their families (rather than focusing exclusively on adult populations without family involvement)?
- **Publication Type:** Is the publication a full research study (not a case report, case series, editorial, commentary, or conference abstract)?

We considered all screening questions together and made a holistic judgement about whether to screen in each paper.

### Search Strategy

The keywords used for this research based PICO :

| Element          | P<br>(Population)                                | I<br>(Intervention/Exposure)    | C<br>(Comparison/Context)                       | O<br>(Outcome)                            |
|------------------|--------------------------------------------------|---------------------------------|-------------------------------------------------|-------------------------------------------|
| <b>Keyword 1</b> | Children with disabilities                       | Family-Centered Care models     | Standard pediatric rehabilitation               | Family well-being                         |
| <b>Keyword 2</b> | Pediatric rehabilitation patients                | Family-integrated care          | Usual medical rehabilitation                    | Parental quality of life                  |
| <b>Keyword 3</b> | Families of children with chronic conditions     | Family-oriented interventions   | Conventional therapy without family involvement | Child functional outcomes                 |
| <b>Keyword 4</b> | Children 0–18 years with developmental disorders | Family-supported rehabilitation | Clinician-delivered care only                   | Child participation and motor development |

The Boolean MeSH keywords inputted on databases for this research are: ("*Children with disabilities*" OR "*Pediatric rehabilitation patients*" OR "*Families of children with chronic conditions*" OR "*Children 0–18 years with developmental disorders*") AND ("*Family-Centered*

*Care models" OR "Family-integrated care" OR "Family-oriented interventions" OR "Family-supported rehabilitation") AND ("Standard pediatric rehabilitation" OR "Usual medical rehabilitation" OR "Conventional therapy without family involvement" OR "Clinician-delivered care only") AND ("Family well-being" OR "Parental quality of life" OR "Child functional outcomes" OR "Child participation and motor development")*

#### **Data extraction**

- **FCC Model:**

Extract the specific family-centered care model or approach used in medical rehabilitation, including:

- Name/type of FCC model
- Key components or principles implemented (e.g., collaborative goal setting, family education, home-based intervention)
- How the family-centered approach was operationalized
- Who delivered the intervention (therapists, nurses, multidisciplinary team)
- Setting where FCC was implemented (hospital, home, clinic, community)

- **Rehabilitation Context:**

Extract details about the medical rehabilitation context and population, including:

- Type of rehabilitation (neuromotor, functional, early intervention, etc.)
- Child population characteristics (age range, primary conditions/disabilities)
- Family characteristics (family structure, caregiver roles)
- Healthcare setting type (inpatient, outpatient, home-based, community)

- Duration and intensity of rehabilitation services

- **Study Design:**

Extract study methodology details relevant to establishing associations between FCC and outcomes, including:

- Study design (RCT, etc.)
- Sample size for families and children
- Comparison group (standard care, control group, pre-post comparison)
- Follow-up duration
- Data collection methods and timing

- **Family Well-being Outcomes:**

Extract all family well-being measures and results specifically in the context of medical rehabilitation, including:

- Outcome measures used (scales, questionnaires, qualitative indicators)
- Specific domains assessed (empowerment, satisfaction, competence, stress, quality of life, self-efficacy)
- Baseline and post-intervention scores/findings
- Statistical significance and effect sizes where available
- Qualitative themes related to family well-being changes

- **Child Outcomes:**

Extract all child outcome measures and results in the medical rehabilitation context, including:

- Outcome measures used (functional assessments, developmental scales, clinical indicators)
- Specific domains assessed (motor function, cognitive development, participation, quality of life, behavioral outcomes)
- Baseline and post-intervention scores/findings
- Statistical significance and effect sizes where available
- Clinical meaningfulness of changes reported

- **Association Evidence:**

Extract evidence of associations between family-centered care and improved outcomes, including:

- Direction of association (positive, negative, mixed, no association)
- Strength of association (correlation coefficients, regression results, effect sizes)
- Statistical significance levels
- Causal language used by authors
- Mechanisms proposed for how FCC leads to improved outcomes
- Any dose-response relationships identified

- **Moderating Factors:**

Extract factors that influence the effectiveness of family-centered care in medical rehabilitation, including:

- Child characteristics that affect outcomes (age, severity of condition, developmental level)
- Family factors that moderate effectiveness (socioeconomic status, family resources, parent engagement)
- Service factors that influence success (staff training, organizational support, resource availability)
- Environmental or contextual factors
- Barriers and facilitators to FCC implementation and effectiveness

**Table 1.** Article Search Strategy

| Database         | Keywords                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Hits  |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| Pubmed           | <i>("Children with disabilities" OR "Pediatric rehabilitation patients" OR "Families of children with chronic conditions" OR "Children 0–18 years with developmental disorders" AND "Family-Centered Care models" OR "Family-integrated care" OR "Family-oriented interventions" OR "Family-supported rehabilitation" AND "Family well-being" OR "Parental quality of life" OR "Child functional outcomes" OR "Child participation and motor development")</i>                                                                                                                                                                         | 7,654 |
| Semantic Scholar | <i>("Children with disabilities" OR "Pediatric rehabilitation patients" OR "Families of children with chronic conditions" OR "Children 0–18 years with developmental disorders") AND ("Family-Centered Care models" OR "Family-integrated care" OR "Family-oriented interventions" OR "Family-supported rehabilitation") AND ("Standard pediatric rehabilitation" OR "Usual medical rehabilitation" OR "Conventional therapy without family involvement" OR "Clinician-delivered care only") AND ("Family well-being" OR "Parental quality of life" OR "Child functional outcomes" OR "Child participation and motor development")</i> | 149   |
| Springer         | <i>("Children with disabilities" OR "Pediatric rehabilitation patients" OR "Families of children with chronic conditions" OR "Children 0–18 years with developmental disorders" AND "Family-Centered Care models" OR "Family-integrated care" OR "Family-oriented interventions" OR "Family-supported rehabilitation" AND "Family well-being" OR "Parental quality of life" OR "Child functional outcomes" OR "Child participation and motor development")</i>                                                                                                                                                                         | 279   |
| Google Scholar   | <i>("Children with disabilities" OR "Pediatric rehabilitation patients" OR "Families of children with chronic conditions" OR "Children 0–18 years with developmental disorders") AND ("Family-Centered Care models" OR "Family-integrated care" OR "Family-oriented interventions" OR "Family-supported rehabilitation") AND ("Standard pediatric rehabilitation" OR "Usual medical rehabilitation" OR "Conventional therapy without family involvement" OR "Clinician-delivered care only") AND ("Family well-being" OR "Parental quality of life" OR "Child functional outcomes" OR "Child participation and motor development")</i> | 295   |

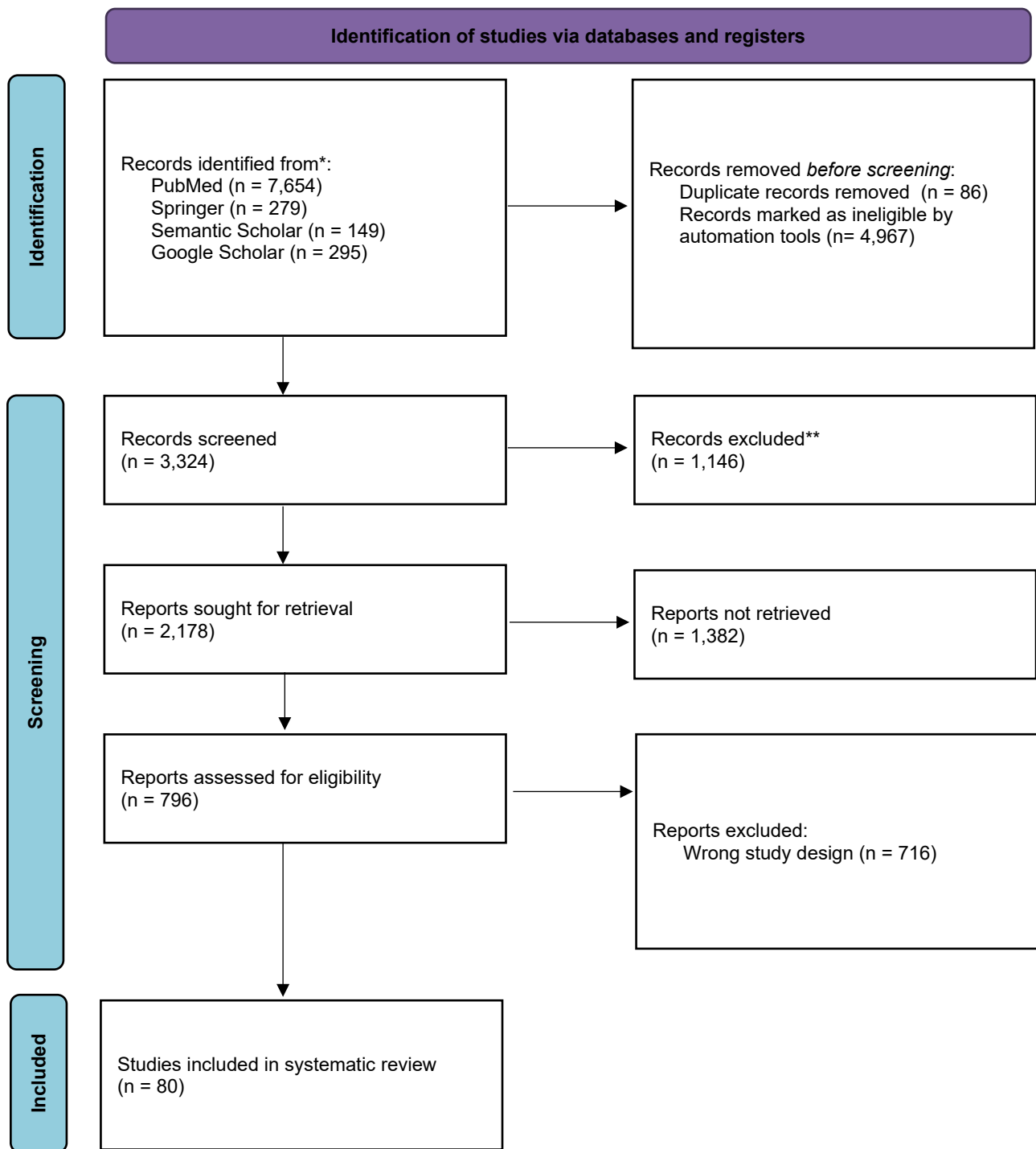


**Figure 1. Article search flowchart**

### Risk of Bias

| Study                             | Selection Bias | Performance Bias | Detection Bias | Attrition Bias | Reporting Bias | Overall Risk |
|-----------------------------------|----------------|------------------|----------------|----------------|----------------|--------------|
| <b>Teixeira Mota et al., 2024</b> | Unclear        | Low              | Low            | Unclear        | Low            | Unclear      |
| <b>Baker et al., 2012</b>         | Unclear        | Low              | Low            | Unclear        | Low            | Unclear      |
| <b>Kim et al., 2021</b>           | Low            | Moderate         | Low            | Low            | Low            | Low          |
| <b>Braga et al., 2005</b>         | Low            | Low              | Low            | Low            | Low            | Low          |
| <b>Shen et al., 2022</b>          | Low            | Low              | Low            | Low            | Low            | Low          |
| <b>Mohammadzadeh et al., 2022</b> | Low            | Moderate         | Low            | Low            | Low            | Low          |
| <b>Al-Otaibi et al., 2024</b>     | Low            | Low              | Low            | Low            | Low            | Low          |
| <b>Siebes et al., 2007</b>        | Unclear        | Low              | Moderate       | Unclear        | Low            | Unclear      |
| <b>Wade et al., 2006</b>          | Low            | Low              | Low            | Low            | Low            | Low          |
| <b>Hsieh et al., 2018</b>         | Low            | Moderate         | Low            | Low            | Low            | Low          |
| <b>Hielkema et al., 2019</b>      | Low            | Low              | Low            | Low            | Low            | Low          |
| <b>Hickey et al., 2018</b>        | Low            | Moderate         | Low            | Low            | Low            | Low          |
| <b>Hickey et al., 2018a</b>       | Low            | Moderate         | Low            | Low            | Low            | Low          |

| Study                      | Selection Bias | Performance Bias | Detection Bias | Attrition Bias | Reporting Bias | Overall Risk |
|----------------------------|----------------|------------------|----------------|----------------|----------------|--------------|
| Alsem, 2018                | Unclear        | Low              | Moderate       | Unclear        | Low            | Unclear      |
| Fonvig et al., 2020        | Low            | Low              | Low            | Low            | Low            | Low          |
| Kakabaraee & Seidy, 2021   | Moderate       | Moderate         | Low            | Low            | Low            | Moderate     |
| Poojari et al., 2023       | Low            | Low              | Low            | Low            | Low            | Low          |
| Almasri et al., 2018       | Low            | Low              | Low            | Low            | Low            | Low          |
| McCarthy & Guerin, 2021    | Low            | Low              | Low            | Low            | Low            | Low          |
| Alami & Najwa, 2025        | Low            | Low              | Low            | Low            | Low            | Low          |
| O'Brien et al., 2013       | Low            | Moderate         | Low            | Low            | Low            | Low          |
| McKean et al., 2012        | Unclear        | Low              | Moderate       | Unclear        | Low            | Unclear      |
| Muthukaruppan et al., 2020 | Moderate       | Moderate         | Low            | Low            | Low            | Moderate     |
| Jenkin et al., 2022        | Low            | Low              | Low            | Low            | Low            | Low          |
| McAllister et al., 2018    | Low            | Moderate         | Low            | Low            | Low            | Low          |
| Yu et al., 2017            | Low            | Low              | Low            | Low            | Low            | Low          |

| Study                           | Selection Bias | Performance Bias | Detection Bias | Attrition Bias | Reporting Bias | Overall Risk |
|---------------------------------|----------------|------------------|----------------|----------------|----------------|--------------|
| Wassenaer-Leemhuis et al., 2016 | Low            | Low              | Low            | Low            | Low            | Low          |
| McLean et al., 2021             | Low            | Low              | Low            | Low            | Low            | Low          |
| Hollander et al., 2014          | Moderate       | Moderate         | Low            | Low            | Low            | Moderate     |
| Nourmohammadi et al., 2026      | Low            | Low              | Low            | Low            | Low            | Low          |
| Jiménez-Arberas et al., 2025    | Moderate       | Moderate         | Low            | Low            | Low            | Moderate     |
| Pandya et al., 2025             | Low            | Low              | Low            | Low            | Low            | Low          |
| Chen et al., 2025               | Low            | Low              | Low            | Low            | Low            | Low          |
| Willis et al., 2018             | Low            | Moderate         | Low            | Low            | Low            | Low          |
| Lindrooth et al., 2025          | Moderate       | Moderate         | Moderate       | Low            | Low            | Moderate     |
| Raghupathy et al., 2020         | Low            | Low              | Low            | Low            | Low            | Low          |
| Elbilgahy et al., 2025          | Low            | Low              | Low            | Low            | Low            | Low          |

| Study                            | Selection Bias | Performance Bias | Detection Bias | Attrition Bias | Reporting Bias | Overall Risk |
|----------------------------------|----------------|------------------|----------------|----------------|----------------|--------------|
| Piecowye et al., 2015            | Unclear        | Low              | Moderate       | Unclear        | Low            | Unclear      |
| Pilevar et al., 2019             | Low            | Low              | Low            | Low            | Low            | Low          |
| Shahbazi et al., 2026            | Low            | Low              | Low            | Low            | Low            | Low          |
| Tatla et al., 2017               | Moderate       | Moderate         | Low            | Low            | Low            | Moderate     |
| Kabarite et al., 2025            | Low            | Moderate         | Low            | Low            | Low            | Low          |
| Young et al., 2022               | Low            | Low              | Low            | Low            | Low            | Low          |
| Effect of Family-Centered (2024) | Moderate       | Moderate         | Low            | Low            | Low            | Moderate     |
| Griffin et al., 2024             | Low            | Moderate         | Low            | Low            | Low            | Low          |
| Uysal & Yigit, 2025              | Low            | Low              | Low            | Low            | Low            | Low          |
| Li et al., 2018                  | Moderate       | High             | Moderate       | Low            | Low            | High         |
| Durante, 2015                    | Unclear        | Low              | Moderate       | Unclear        | Low            | Unclear      |
| Zhang, 2018                      | Moderate       | High             | Moderate       | Low            | Low            | High         |
| Ma Ming, 2014                    | Moderate       | High             | Moderate       | Low            | Low            | High         |

| Study                   | Selection Bias | Performance Bias | Detection Bias | Attrition Bias | Reporting Bias | Overall Risk |
|-------------------------|----------------|------------------|----------------|----------------|----------------|--------------|
| Hodgson et al., 2024    | Low            | Low              | Low            | Low            | Low            | Low          |
| Shields et al., 2012    | Low            | Low              | Low            | Low            | Low            | Low          |
| Foster et al., 2013     | Low            | Moderate         | Low            | Low            | Low            | Low          |
| Ding et al., 2019       | Low            | Low              | Low            | Low            | Low            | Low          |
| Shields et al., 2012a   | Low            | Low              | Low            | Low            | Low            | Low          |
| McConkey et al., 2023   | Low            | Moderate         | Low            | Low            | Low            | Low          |
| Hill et al., 2017       | Low            | Low              | Low            | Low            | Low            | Low          |
| Dunn et al., 2006       | Unclear        | Low              | Moderate       | Unclear        | Low            | Unclear      |
| Yu & Zhang, 2018        | Low            | Low              | Low            | Low            | Low            | Low          |
| Zhou et al., 2012       | Low            | Low              | Low            | Low            | Low            | Low          |
| Camden et al., 2020     | Low            | Low              | Low            | Low            | Low            | Low          |
| Ares-Brage et al., 2025 | Low            | Low              | Low            | Low            | Low            | Low          |
| Wallace et al., 2025    | Low            | Moderate         | Low            | Low            | Low            | Low          |

| Study                           | Selection Bias | Performance Bias | Detection Bias | Attrition Bias | Reporting Bias | Overall Risk |
|---------------------------------|----------------|------------------|----------------|----------------|----------------|--------------|
| <b>Britt et al., 2024</b>       | Low            | Low              | Low            | Low            | Low            | Low          |
| <b>Cady et al., 2015</b>        | Low            | Moderate         | Low            | Low            | Low            | Low          |
| <b>Law et al., 2005</b>         | Low            | Low              | Low            | Low            | Low            | Low          |
| <b>De Bernardo et al., 2017</b> | Moderate       | Moderate         | Low            | Low            | Low            | Moderate     |
| <b>Dambi &amp; Jelsma, 2014</b> | Moderate       | Moderate         | Low            | Low            | Low            | Moderate     |
| <b>Alsadaan et al., 2023</b>    | Moderate       | Moderate         | Low            | Low            | Low            | Moderate     |
| <b>Hsu &amp; Fox, 2022</b>      | Unclear        | Low              | Moderate       | Unclear        | Low            | Unclear      |
| <b>Ispriantari et al., 2023</b> | Low            | Low              | Low            | Low            | Low            | Low          |
| <b>Farnesi et al., 2012</b>     | Unclear        | Low              | Moderate       | Unclear        | Low            | Unclear      |
| <b>Lammi &amp; Law, 2003</b>    | Unclear        | Moderate         | Low            | Low            | Low            | Unclear      |
| <b>Verger et al., 2021</b>      | Low            | Moderate         | Low            | Low            | Low            | Low          |
| <b>Frakking et al., 2021</b>    | Low            | Low              | Low            | Low            | Low            | Low          |

| Study                        | Selection Bias | Performance Bias | Detection Bias | Attrition Bias | Reporting Bias | Overall Risk |
|------------------------------|----------------|------------------|----------------|----------------|----------------|--------------|
| Albayrak & Büyükgönenç, 2022 | Low            | Low              | Low            | Low            | Low            | Low          |
| Wade et al., 2006a           | Low            | Low              | Low            | Low            | Low            | Low          |
| Bansal et al., 2024          | Low            | Low              | Low            | Low            | Low            | Low          |
| Estes et al., 2025           | Low            | Moderate         | Low            | Low            | Low            | Low          |
| Zhang et al., 2018           | Low            | Low              | Low            | Low            | Low            | Low          |

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## RESULTS

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### Characteristics of Included Studies

| Study                                        | Population                                                              | Setting            | FCC Model/Approach                               |
|----------------------------------------------|-------------------------------------------------------------------------|--------------------|--------------------------------------------------|
| Larissa Audi Teixeira Mota et al., 2024 [28] | Preschool children with cerebral palsy [28]                             | Home-based [28]    | Participatory and relational FCC components [28] |
| T. Baker et al., 2012 [29]                   | Children with congenital or acquired disorders, 18 months–12 years [29] | Not specified [29] | Family-centered therapy (FCT) [29]               |

| Study                                       | Population                                            | Setting                                     | FCC Model/Approach                                         |
|---------------------------------------------|-------------------------------------------------------|---------------------------------------------|------------------------------------------------------------|
| <b>Mikyoung Kim et al., 2021 [4]</b>        | Children/adolescents with CP, mean age 9.37 years [4] | Community-based [4]                         | Community-based family-child-centered care (CFC) [4]       |
| <b>L. Braga et al., 2005 [30]</b>           | Children aged 5–12 years with TBI [30]                | Home-based [30]                             | Family-supported vs. clinician-delivered intervention [30] |
| <b>Jiabin Shen et al., 2022 [31]</b>        | Children with acquired brain injury (ABI) [31]        | Not specified [31]                          | Family-oriented interventions [31]                         |
| <b>Elham Mohammadzadeh et al., 2022 [7]</b> | Children aged 1–12 years with chemical burns [7]      | Hospital-based [7]                          | Family-Centered Empowerment Model (FCEM) [7]               |
| <b>Sarah L. Al-Otaibi et al., 2024 [11]</b> | Children with CP aged 2–12 years [11]                 | Outpatient rehabilitation centers [11]      | Family–professional collaboration practice model [11]      |
| <b>R. Siebes et al., 2007 [32]</b>          | Children with various diagnoses, aged 1–20 years [32] | Dutch pediatric rehabilitation centres [32] | Parent participation in rehabilitation [32]                |

| Study                                   | Population                                                    | Setting                                                 | FCC Model/Approach                                                 |
|-----------------------------------------|---------------------------------------------------------------|---------------------------------------------------------|--------------------------------------------------------------------|
| <b>S. Wade et al., 2006</b><br>[33]     | School-aged children with moderate-to-severe TBI [33]         | Not specified (likely outpatient/community) [33]        | Family-centered problem-solving (FPS) [33]                         |
| <b>Wen-huei Hsieh et al., 2018</b> [16] | Children with developmental delays [16]                       | Outpatient rehabilitation clinic [16]                   | Family-centered multidisciplinary workshop [16]                    |
| <b>T. Hielkema et al., 2019</b> [34]    | Infants at very high risk of CP, <9 months corrected age [34] | Home and outpatient [34]                                | COPCA (Coping with and Caring for infants with special needs) [34] |
| <b>L. Hickey et al., 2018</b> [35]      | Children with acquired brain injury [35]                      | Inpatient rehabilitation [35]                           | Family Forward social work intervention [35]                       |
| <b>L. Hickey et al., 2018a</b> [20]     | Children with ABI, including TBI [20]                         | Inpatient rehabilitation and early home transition [20] | Family Forward [20]                                                |

| Study                                                  | Population                                                             | Setting                               | FCC Model/Approach                                                      |
|--------------------------------------------------------|------------------------------------------------------------------------|---------------------------------------|-------------------------------------------------------------------------|
| <b>M. Alsem, 2018 [36]</b>                             | Children with disabilities in paediatric rehabilitation [36]           | Outpatient (implied) [36]             | WWW-roadmap digital tool for FCC information provision [36]             |
| <b>C. E. Fonvig et al., 2020 [5]</b>                   | Children aged 5–8 years with spastic CP at GMFCS I–II [5]              | Outpatient hospital [5]               | FCS via instrumented gait analysis-informed interdisciplinary care [5]  |
| <b>Keivan Kakabaraee &amp; Maryam Seidy, 2021 [37]</b> | Mothers of children with autism spectrum disorder [37]                 | Outpatient rehabilitation center [37] | Family-centered problem-solving intervention [37]                       |
| <b>D. Poojari et al., 2023 [38]</b>                    | Children with or at risk of CP, infancy to 18 years [38]               | Home, community, hospital [38]        | FCC (information provision, enabling/partnership, respectful care) [38] |
| <b>N. Almasri et al., 2018 [22]</b>                    | Children with physical disabilities (mainly CP) [22]                   | Not specified [22]                    | MPOC-based FCC processes [22]                                           |
| <b>Elaine McCarthy &amp; S. Guerin, 2021 [25]</b>      | Children aged 0–6 years with disabilities or developmental delays [25] | Home, clinic, community [25]          | FCC as philosophical approach in early intervention [25]                |

| Study                                                       | Population                                                                           | Setting                            | FCC Model/Approach                                                  |
|-------------------------------------------------------------|--------------------------------------------------------------------------------------|------------------------------------|---------------------------------------------------------------------|
| <b>Fidya Ifah Alami &amp; Yusri Chizma Najwa, 2025 [39]</b> | Children with spastic CP [39]                                                        | Home-based [39]                    | Family-centered rehabilitation integrated with medical therapy [39] |
| <b>K. O'Brien et al., 2013 [3]</b>                          | Preterm infants $\leq 35$ weeks gestation [3]                                        | NICU (Canada) [3]                  | Family Integrated Care (FIC) [3]                                    |
| <b>K. McKean et al., 2012 [40]</b>                          | Children with mild-moderate speech/language disorders [40]                           | Clinic and home [40]               | Family-centred practice (FCP) in speech-language pathology [40]     |
| <b>Sankar Sahayaraj Muthukaruppan et al., 2020 [12]</b>     | Children with CP (44%) and other developmental delays (56%), mean age 3.3 years [12] | Community-based (South India) [12] | Family-centred community-based early intervention [12]              |
| <b>Taylor Jenkin et al., 2022 [41]</b>                      | Children and adolescents with paediatric ABI [41]                                    | Multi-setting [41]                 | Family-centred service in paediatric ABI rehabilitation [41]        |

| Study                                          | Population                                                                                   | Setting                            | FCC Model/Approach                                                        |
|------------------------------------------------|----------------------------------------------------------------------------------------------|------------------------------------|---------------------------------------------------------------------------|
| <b>J. McAllister et al.,<br/>2018 [42]</b>     | Children aged 2–10 years with neurodevelopmental disabilities (ASD 60.9%, GDD/ID 39.1%) [42] | Outpatient [42]                    | Family-centered Shared Plan of Care (SPoC) [42]                           |
| <b>Yen-Ting Yu et al.,<br/>2017 [17]</b>       | VLBW preterm infants (<1,500 g) in Taiwan [17]                                               | Inpatient (3 medical centers) [17] | Family-centered intervention program (FCIP) [17]                          |
| <b>A. Wassenaar-Leemhuis et al., 2016 [43]</b> | Very preterm infants (<33 weeks) [43]                                                        | Hospital and home [43]             | Multiple post-discharge family-centered programs (MITP, IBAIP, etc.) [43] |
| <b>Mia A. McLean et al.,<br/>2021 [44]</b>     | Infants born <33 weeks gestation; mother-child dyads [44]                                    | NICU [44]                          | Family Integrated Care (FICare) [44]                                      |
| <b>S. Hollander et al.,<br/>2014 [45]</b>      | Children aged 0.5–14.4 years post-VAD placement [45]                                         | ICU and inpatient [45]             | Standardized family-centered care pathways [45]                           |
| <b>Jalal Nourmohammadi et al., 2026 [46]</b>   | Children with diabetic kidney disease [46]                                                   | Not specified [46]                 | Nursing-based FCC interventions [46]                                      |

| Study                                               | Population                                                                    | Setting                                 | FCC Model/Approach                                              |
|-----------------------------------------------------|-------------------------------------------------------------------------------|-----------------------------------------|-----------------------------------------------------------------|
| <b>Estíbaliz Jiménez-Arberas et al., 2025 [47]</b>  | Children aged 0–6 years with neurodevelopmental disorders in rural areas [47] | Home/community (mHealth) [47]           | Family-centered model with mHealth [47]                         |
| <b>Nishitha J. Pandya et al., 2025 [48]</b>         | Preterm infants [48]                                                          | NICU [48]                               | NIDCAP-based FCC [48]                                           |
| <b>Shuang Chen et al., 2025 [1]</b>                 | Preterm infants (n=3,005) [1]                                                 | NICU [1]                                | Family-integrated care [1]                                      |
| <b>C. Willis et al., 2018 [49]</b>                  | Children with disabilities, mean age 11.1 years (CP 48%, ID 26%) [49]         | Inpatient healthsports centre [49]      | Goal-directed, family-centred physical activity (LEM) [49]      |
| <b>R. Lindrooth et al., 2025 [10]</b>               | Children under 3 years in early intervention (n=103,635) [10]                 | Community-based early intervention [10] | Family-centered care coordination (Colorado GO4IT) [10]         |
| <b>Manasa Kolibylu Raghupathy et al., 2020 [50]</b> | Very preterm infants (<32 weeks) [50]                                         | NICU, home, community [50]              | FCC including home programs, parent education, home visits [50] |

| Study                                        | Population                                                                   | Setting                                    | FCC Model/Approach                                     |
|----------------------------------------------|------------------------------------------------------------------------------|--------------------------------------------|--------------------------------------------------------|
| <b>Amal Ahmed Elbilgahy et al., 2025 [9]</b> | Children aged 8–18 years with chronic illness (n=328 mother-child pairs) [9] | Hospital-based [9]                         | Family-Centered Empowerment Program (FCEP) [9]         |
| <b>Sharla Piecowye et al., 2015 [51]</b>     | Children with developmental delays [51]                                      | Community-based rehabilitation [51]        | Coordinated Intake Approach (CIA) [51]                 |
| <b>Nahid Pilevar et al., 2019 [8]</b>        | Children aged 8–12 years with rheumatoid arthritis [8]                       | Outpatient (Akbar Pediatrics Hospital) [8] | Family-centered empowerment model [8]                  |
| <b>Marjan Shahbazi et al., 2026 [52]</b>     | Children under 18 years [52]                                                 | Schools, home programs [52]                | Family-centered occupational therapy consultation [52] |
| <b>Sandy K Tatla et al., 2017 [21]</b>       | Paediatric rehabilitation service providers [21]                             | Acute paediatric rehabilitation [21]       | Collaborative coaching training for professionals [21] |

| Study                                                  | Population                                                               | Setting                                                | FCC Model/Approach                                 |
|--------------------------------------------------------|--------------------------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------|
| <b>Aline Kabarite et al., 2025 [18]</b>                | Children and adolescents with ASD, aged 2–16 years [18]                  | Outpatient private clinic [18]                         | Transdisciplinary, family-centered care model [18] |
| <b>D. Young et al., 2022 [27]</b>                      | Children with disabilities/developmental delays; key workers [27]        | Early childhood intervention services (Australia) [27] | Capacity-building program for key workers [27]     |
| <b>Effect of the Family-Centered (2024) [13]</b>       | Parents of children with intellectual disability/mental retardation [13] | Not specified [13]                                     | Family-centered empowerment model [13]             |
| <b>Bronwyn R Griffin et al., 2024 [53]</b>             | Children following acute injury (n=192) [53]                             | Australian tertiary paediatric hospital [53]           | Trauma Family Support Service (TFSS) [53]          |
| <b>Derya Akdeniz Uysal &amp; Rana Yiğit, 2025 [54]</b> | Parents of children with oncological problems (n=76) [54]                | Home-based (web-based program) [54]                    | Web-based Family-Centered Empowerment Model [54]   |

| Study                               | Population                                                          | Setting                                         | FCC Model/Approach                                                                |
|-------------------------------------|---------------------------------------------------------------------|-------------------------------------------------|-----------------------------------------------------------------------------------|
| <b>Wan Li et al., 2018 [55]</b>     | Children with cerebral palsy (n=57 per group) [55]                  | Not specified (hospital implied) [55]           | Family-centered nursing intervention [55]                                         |
| <b>Genna Durante, 2015 [24]</b>     | Ethnically diverse families receiving early intervention [24]       | Community-based/home-based [24]                 | Family-centered care in early intervention [24]                                   |
| <b>Shengli Zhang, 2018 [56]</b>     | Children with cerebral palsy (n=88) [56]                            | Hospital [56]                                   | Family-centered continuous nursing care [56]                                      |
| <b>马明 (Ma Ming), 2014 [57]</b>      | Parents of children with CP (intervention n=104, control n=52) [57] | Not specified [57]                              | Family-centered care vs. traditional nursing [57]                                 |
| <b>C. Hodgson et al., 2024 [58]</b> | Hospitalized paediatric patients; parents (n=3,801 total) [58]      | Inpatient (PICU, CICU, general paediatric) [58] | Multiple inpatient FCC interventions (rounds, education, peer support, etc.) [58] |
| <b>L. Shields et al., 2012 [59]</b> | Hospitalized children aged 0–12 years (n=288) [59]                  | Inpatient hospital [59]                         | Care-by-parent unit (CBPU) [59]                                                   |

| Study                                   | Population                                                                                   | Setting                                   | FCC Model/Approach                                                                    |
|-----------------------------------------|----------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------------------------------------------------|
| <b>M. Foster et al., 2013</b><br>[60]   | Children in paediatric critical care; parents and providers [60]                             | Paediatric critical care (inpatient) [60] | Communication-centred FCC in PICU [60]                                                |
| <b>Xiang Ding et al., 2019</b><br>[2]   | Preterm infants $\leq 37$ weeks (n=4,478); parents (n=3,158) [2]                             | NICUs [2]                                 | FCC interventions in NICUs (education, participation, dignity/respect) [2]            |
| <b>L. Shields et al., 2012a</b><br>[61] | Children aged 0–12 years (PICU) [61]                                                         | Inpatient PICU [61]                       | FCC grounded in mutually beneficial partnerships [61]                                 |
| <b>R. McConkey et al., 2023</b> [15]    | Children with developmental disabilities, median age 6.5 years (n=110); families (n=96) [15] | Home-based (rural Ireland) [15]           | Family-centred home-visiting support service [15]                                     |
| <b>Carrie Hill et al., 2017</b><br>[62] | Parents of critically ill children in PICU [62]                                              | Inpatient PICU [62]                       | IPFCC model (respect/dignity, information sharing, participation, collaboration) [62] |
| <b>M. Dunn et al., 2006</b><br>[63]     | NICU neonates and families [63]                                                              | NICU [63]                                 | Family-Centered Care Map (web-based) [63]                                             |

| Study                                        | Population                                                                  | Setting                                  | FCC Model/Approach                                                                |
|----------------------------------------------|-----------------------------------------------------------------------------|------------------------------------------|-----------------------------------------------------------------------------------|
| <b>Xiaoyan Yu &amp; Jun Zhang, 2018 [64]</b> | Preterm infants (n=1,026) [64]                                              | Inpatient hospital/NIC U [64]            | Family-centred care for hospitalized preterm infants [64]                         |
| <b>Huaqiong Zhou et al., 2012 [65]</b>       | Hospitalized children aged 0–12 years; families and providers [65]          | Hospital [65]                            | FCC involving active parental participation in planning and delivery of care [65] |
| <b>C. Camden et al., 2020 [66]</b>           | Children aged 0–12 years with various disabilities (n=7–464 per study) [66] | Remote/telere habilitation [66]          | Family-centered telerehabilitation (coaching, exercise, information sharing) [66] |
| <b>Laura Ares-Brage et al., 2025 [23]</b>    | Children with CP; families; professionals [23]                              | Not specified [23]                       | FCC assessed via MPOC in CP care [23]                                             |
| <b>C. Wallace et al., 2025 [67]</b>          | Children with medical complexity [67]                                       | Paediatric post-acute care hospital [67] | Care Beyond the Bedside model [67]                                                |
| <b>Kerry Britt et al., 2024 [26]</b>         | Health professionals in paediatric disability [26]                          | Not specified [26]                       | FCS professional development programs [26]                                        |

| Study                                     | Population                                                           | Setting                                                 | FCC Model/Approach                                         |
|-------------------------------------------|----------------------------------------------------------------------|---------------------------------------------------------|------------------------------------------------------------|
| <b>R. Cady et al., 2015 [68]</b>          | Children with medical complexity (CMC) and families [68]             | Established medical home (outpatient) [68]              | APRN telehealth care coordination (Presler's model) [68]   |
| <b>M. Law et al., 2005 [69]</b>           | Parents, service providers, and rehabilitation science students [69] | Not specified [69]                                      | FCS educational materials development [69]                 |
| <b>G. De Bernardo et al., 2017 [70]</b>   | Neonates (n=48) with surgical conditions; parents (n=96) [70]        | Level III NICU (Naples, Italy) [70]                     | FCC with 8 hours/day parental presence vs. 1 hour/day [70] |
| <b>J. Dambi &amp; J. Jelsma, 2014 [6]</b> | Children with CP, aged 0.5–12 years; caregivers (n=46) [6]           | Community outreach vs. institution-based (Zimbabwe) [6] | Community-based outreach rehabilitation [6]                |
| <b>Nourah Alsadaan et al., 2023 [71]</b>  | High-risk neonates <32 weeks or <1,500 g (n=200) [71]                | NICUs (Saudi Arabia) [71]                               | Integrated FCC and developmental care [71]                 |

| Study                                          | Population                                                                                                    | Setting                                        | FCC Model/Approach                                           |
|------------------------------------------------|---------------------------------------------------------------------------------------------------------------|------------------------------------------------|--------------------------------------------------------------|
| <b>Naiwei Hsu &amp; J. Fox, 2022 [72]</b>      | Paediatric burn patients and families [72]                                                                    | Inpatient burn unit [72]                       | FCC making family members part of the treatment team [72]    |
| <b>Aloysia Ispriantari et al., 2023 [73]</b>   | Children/adolescents with type 1 diabetes mellitus [73]                                                       | Home/commu nity [73]                           | Family-centered interventions for T1DM management [73]       |
| <b>Biagina-Carla Farnesi et al., 2012 [74]</b> | Clinicians (n=12) and parents (n=8) in paediatric weight management [74]                                      | Not specified [74]                             | FCC collaborative model in paediatric weight management [74] |
| <b>B. Lammi &amp; M. Law, 2003 [75]</b>        | Three children with cerebral palsy [75]                                                                       | Home/commu nity (implied) [75]                 | Family-Centred Functional Therapy (FCFT) [75]                |
| <b>Sebastià Verger et al., 2021 [76]</b>       | Children 0–6 years with various developmental conditions; parents (n=166 quantitative, n=16 qualitative) [76] | Early intervention centres vs. home-based [76] | Routines-based early intervention vs. centre-based EIC [76]  |

| Study                                              | Population                                                                                                 | Setting                                  | FCC Model/Approach                                             |
|----------------------------------------------------|------------------------------------------------------------------------------------------------------------|------------------------------------------|----------------------------------------------------------------|
| <b>Thuy T. Frakking et al., 2021 [14]</b>          | Children with chronic non-complex medical conditions, mean age 8.2 years (n=81) [14]                       | Outpatient (3 Australian hospitals) [14] | Care coordination by Allied Health Liaison Officer [14]        |
| <b>S. Albayrak &amp; L. Büyükgönenç, 2022 [77]</b> | Preterm infants (n=128) and parents [77]                                                                   | NICU (Turkish university hospital) [77]  | Family-centered nursing interventions with nurse training [77] |
| <b>S. Wade et al., 2006a [78]</b>                  | Families of children aged 5–16 years with moderate-to-severe TBI (n=40) [78]                               | Home-based online therapy [78]           | Online Family Problem-Solving Therapy (FPS) [78]               |
| <b>Simran Bansal et al., 2024 [79]</b>             | Neonates with neurologic conditions; parents [79]                                                          | NICU [79]                                | Family-partnered NICU care (neonatal neuro-critical care) [79] |
| <b>Myka Estes et al., 2025 [19]</b>                | Children with neurodevelopmental disorders and medical complexity, aged 2–17 years; caregivers (n=67) [19] | Community-based/outpatient [19]          | Neurodevelopmental Disorders Care Coordination (NDD-CC) [19]   |

| Study                                  | Population                                                | Setting              | FCC Model/Approach                                        |
|----------------------------------------|-----------------------------------------------------------|----------------------|-----------------------------------------------------------|
| <b>Rong Zhang et al., 2018</b><br>[80] | Premature infants (<37 weeks, n=61); parents (n=110) [80] | NICU (China)<br>[80] | FCC with parental participation as primary caregiver [80] |

## Effects

### Child Outcomes

#### Neuromotor and Functional Outcomes in Cerebral Palsy

Family-centered interventions in children with cerebral palsy have been investigated across multiple study designs and consistently demonstrate positive, though not always large, effects on motor and functional outcomes.

The community-based family-child-centered care (CFC) trial by Kim et al. found superior effects compared to conventional pediatric rehabilitation on gross motor function (GMFM-66), balance (PBS), fine motor proficiency (BOT-2), functional independence cognition (FIM), and quality of life (PedsQL), all at  $P < 0.05$  [4]. The intervention was delivered 60 minutes per day, twice a week over approximately 10 weeks in community settings including schools, rehabilitation centers, and home environments [4]. Fonvig et al., in an RCT of 60 children with spastic CP at GMFCS levels I–II, found that instrumented gait analysis–informed interdisciplinary care produced a significant mean GMFM-66 improvement of 3.05 points (95% CI: 1.12–4.98,  $p = 0.003$ ) over 52 weeks compared to usual care [5]. However, this gain in motor function was not accompanied by any detectable improvement in perceived family-centered service as measured by the MPOC-20 ( $p = 0.40–0.97$  across all five domains) [5], illustrating that child motor gains and family experience of FCC can diverge.

Wan Li et al. reported significantly higher mental development and motor function development index scores at 9 and 12 months in children with CP receiving family-centered nursing compared to routine care ( $P < 0.05$ ) [55], and Shengli Zhang found significant improvements in self-care ability in the family-centered continuous nursing care group versus a routine group ( $P <$

0.05) [56]. Ma Ming likewise reported significantly better quality of life in parents of children with CP under FCC versus traditional nursing, with all WHOQOL-BREF domains reaching significance ( $P < 0.05$ ) [57]. These three studies, however, are of lower methodological quality and lacked blinding or rigorous allocation concealment.

Lammi and Law's single-subject study of three children with CP receiving family-centred functional therapy found clinically significant parental satisfaction improvements and functional task gains in at least one of two targeted tasks for each child [75, 75], providing early proof-of-concept that parent-selected task goals can yield meaningful changes even with small samples.

The systematic review by Poojari et al. of 11 RCTs focused specifically on caregiver well-being outcomes in CP rehabilitation and found significant improvements in satisfaction with goal attainment, self-efficacy, and social capital, but mixed or non-significant results for caregiver mental health, parenting, and personal outcomes [38]. Effect sizes ranged from  $d = 0.14$  for non-intrusiveness to  $d = 1.32$  for behavioral outcomes in specific studies [38], illustrating considerable variability. Dambi and Jelsma, in a quasi-experimental study in Zimbabwe, found that community outreach-based care led to 6% greater motor function improvement on the GMFM-66 (regression coefficient 2.49 points,  $p < .001$ ) compared to institution-based services after three months [6], while also producing significantly greater caregiver satisfaction and compliance ( $p < .001$ ) [6].

Alami and Najwa's systematic literature review confirmed the pattern: family involvement in rehabilitation significantly improves motor function, social participation, and adherence to home exercises in spastic CP, with integration of medical therapies (Bobath, hydrotherapy) and family-centered approaches producing sustained positive psychosocial effects [39]. The meta-analysis by Ares-Brage et al. found that the "Respectful care" domain was the highest-rated aspect of FCC as experienced by both families and professionals caring for children with CP, while domains related to information provision were consistently the lowest rated across all perspectives [23].

### **Preterm Infants in the NICU**

The NICU literature represents the best-powered body of evidence for FCC effects on child outcomes. The meta-analysis by Shuang Chen et al., covering 13 RCTs and 3,005 preterm infants, found that family-integrated care significantly improved breastfeeding rates (OR = 5.92, 95% CI:

2.37–14.82,  $P < 0.001$ ), weight gain (MD = 3.16 g/day, 95% CI: 2.51–3.80,  $P < 0.001$ ), and sleep duration (MD = 3.25 hours, 95% CI: 2.05–4.44,  $P < 0.001$ ), and reduced one-month readmission rates (OR = 0.37, 95% CI: 0.22–0.61,  $P < 0.001$ ) [1]. Xiang Ding et al.'s earlier meta-analysis of 19 RCTs (including Chinese-language trials) found similar improvements in weight gain (MD = 4.57, 95% CI: 2.80–6.34,  $P < 0.001$ ), readmission rates (OR = 0.23, 95% CI: 0.10–0.52,  $P < 0.001$ ), parent satisfaction, parent skills, and parent knowledge, though neurobehavioral development did not reach statistical significance across three studies [2, 2].

The pilot RCT by Zhang et al. in a Chinese NICU provided granular data: FCC infants had greater weight gain at discharge (886 g vs. 542 g,  $p = 0.013$ ) and dramatically lower one-month readmission rates (6.5% vs. 50%,  $p < 0.001$ ) [80]. Yu and Jun Zhang's meta-analysis of four RCTs ( $n = 1,026$ ) found that FCC shortened total hospital stay and NICU stay but found insufficient evidence for effects on morbidity, feeding, or neurobehavioral performance [64]. O'Brien et al.'s Canadian FIC pilot cohort found significantly higher weight gain rate ( $p < 0.05$ ) and a significant increase in breastfeeding at discharge (82.1% vs. 45.5%,  $p < 0.05$ ) [3].

Alsadaan et al.'s quasi-experimental study in Saudi NICUs found that integrated FCC and developmental care produced significant improvements in cognitive, motor, and language scores on the Bayley Scales of Infant Development-III ( $p < 0.05$ ), and a 4.3-day reduction in mean length of stay for the intervention group versus 1.4 days in controls ( $p = 0.02$ ) [71]. The multicenter Taiwanese RCT by Yu et al. found that the family-centered intervention program promoted earlier full enteral feeding by 1.1 weeks (95% CI: –1.9 to –0.2), earlier hospital discharge by 0.6 weeks (95% CI: –1.1 to –0.1), greater weight gain of 3.3 g/day (95% CI: 0.1 to 6.6), and better neurobehavioral performance by 1.2 points (95% CI: 0.2 to 2.3) [17]. Critically, parental motivation scores correlated with neurobehavioral outcomes and weight gain ( $r = 0.20$ – $0.31$ , all  $p < 0.05$ ), providing one of the clearest dose-response relationships in this literature [17]. Albayrak and Büyükgönenç found significantly higher discharge weight gain in the experimental FCC group ( $p < 0.05$ ) [77]. The narrative review by Wassenaar-Leemhuis et al. reported that four of six post-discharge family-centered RCT programs improved cognitive and/or motor development, with the MITP and IBAIP producing improvements in cognitive outcomes sustained up to age five [43].

The 18-month follow-up of the FICare cluster-RCT by McLean et al. found that FICare led to lower child externalizing behavior T-scores ( $B = -0.91$ , 95% CI:  $-2.25, -0.01$ ) and lower internalizing behavior T-scores ( $B = -0.93$ , 95% CI:  $-2.33, 0.02$ ), mediated through reductions in maternal hair cortisol (HCC) [44]. This is one of the few studies to identify a biological mediation pathway.

### **Acquired Brain Injury and Traumatic Brain Injury**

For children with TBI and ABI, the evidence primarily concerns behavioral and psychological outcomes. Braga et al.'s RCT found that children in the family-supported intervention group demonstrated statistically significant and clinically important improvements on both physical (SARAH scales) and cognitive (WISC-III) outcome measures after one year, while children in the clinician-delivered group did not reach significance on either measure, despite receiving the same intensity of services [30]. This finding is particularly noteworthy: the same dosage delivered to parents within everyday home routines outperformed direct clinician delivery.

Wade et al.'s FPS RCT found that parents in the family-centered problem-solving group reported significantly greater improvements in children's internalizing symptoms, anxiety/depression, and withdrawal compared to usual care [33]. Wade et al.'s online FPS RCT demonstrated similar results for parental adjustment [78]. Shen et al.'s meta-analysis of 32 studies on family-oriented interventions for paediatric ABI found a positive small-to-medium effect on child and parental outcomes, though not on family functioning [31]. Study design moderated parent-outcome effect sizes, suggesting methodological quality matters substantially in this domain [31].

### **Early Intervention for Developmental Disabilities and Delays**

The family-centered multidisciplinary workshop of Hsieh et al. produced large effect sizes for physical health ( $ES = 1.00$ ,  $P = .026$ ) and global function ( $ES = 0.88$ ,  $P = .006$ ) in children with developmental delays after just six weekly two-hour sessions [16]. Lindrooth et al.'s large-scale quasi-experimental study of Colorado's GO4IT initiative—involving 103,635 children under age 3—found that family-centered care coordination was associated with a 4.6 percentage point reduction in family disengagement ( $p < 0.01$ ) and a 3.5–4.6 percentage point increase in the

probability of achieving care plan goals before age 3 ( $p < 0.01$ ) [10], though these gains were concentrated among White and Hispanic children, with Black children showing improved engagement but not differentially higher goal achievement [10].

The longitudinal study by McConkey et al. found that most children in a home-visiting family-centered program attained their developmental learning targets and showed significant increases in social activities ( $p < 0.01$ ), with particular improvements in social and communication skills and community participation [15]. In the transdisciplinary ASD study by Kabarite et al. ( $n = 53$ , 12 months), most participants reached high functional levels as measured by the GAF, with reductions in behavioral challenges, sensory difficulties, and sleep disturbances ( $p = 0.021$  for sleep), and caregiver-reported reductions in support needs [18].

The scoping review by Shahbazi et al. of 15 family-centered occupational therapy consultation studies found that eight of twelve quantitative studies reported statistically significant improvements in occupational performance, participation, and parental confidence, while three reported mixed or non-significant results [52, 52].

### **Chronic Illness and Other Conditions**

In children with rheumatoid arthritis, the family-centered empowerment model RCT by Pilevar et al. found significantly higher post-intervention quality of life in the intervention group across physical, emotional, educational, and social domains ( $P = 0.004$  between groups;  $P < 0.001$  within group pre-post) [8]. Mohammadzadeh et al. found that the FCEM significantly improved quality of life across all subscales in children with chemical burns ( $P < 0.001$ ) [7]. Elbilgahy et al.'s FCEP in children with chronic illness produced a dramatic improvement in children's multidimensional fatigue scores from 6.59 to 33.64 ( $p \leq 0.001$ ) [9]. Ispriantari et al.'s integrative review of nine studies on family-centered interventions for paediatric type 1 diabetes found effects on glycemic control (HbA1c), adherence, self-management behaviors, parent-child teamwork, and children's problem-solving skills, though effect magnitudes were not pooled [73].

The following table summarizes quantitative effect data from primary studies and meta-analyses where extractable:

| Study                        | Population                             | Primary Child Outcome           | Effect / Result                    | Statistical Significance |
|------------------------------|----------------------------------------|---------------------------------|------------------------------------|--------------------------|
| Shuang Chen et al., 2025 [1] | Preterm infants (13 RCTs, n=3,005) [1] | Weight gain [1]                 | MD = 3.16 g/day [1]                | P < 0.001 [1]            |
| Shuang Chen et al., 2025 [1] | Preterm infants [1]                    | Breastfeeding rate [1]          | OR = 5.92 (95% CI: 2.37–14.82) [1] | P < 0.001 [1]            |
| Shuang Chen et al., 2025 [1] | Preterm infants [1]                    | 1-month readmission rate [1]    | OR = 0.37 (95% CI: 0.22–0.61) [1]  | P < 0.001 [1]            |
| Xiang Ding et al., 2019 [2]  | Preterm infants (19 RCTs) [2]          | Weight gain [2]                 | MD = 4.57 (95% CI: 2.80–6.34) [2]  | P < 0.001 [2]            |
| Xiang Ding et al., 2019 [2]  | Preterm infants [2]                    | Readmission [2]                 | OR = 0.23 (95% CI: 0.10–0.52) [2]  | P < 0.001 [2]            |
| Xiang Ding et al., 2019 [2]  | Preterm infants [2]                    | Neurobehavioral development [2] | Not statistically significant [2]  | Not significant [2]      |
| Rong Zhang et al., 2018 [80] | Premature infants (RCT, n=61) [80]     | Weight gain at discharge [80]   | 886 g vs. 542 g [80]               | P = 0.013 [80]           |

| Study                                    | Population                                         | Primary Child Outcome                     | Effect / Result                                       | Statistical Significance |
|------------------------------------------|----------------------------------------------------|-------------------------------------------|-------------------------------------------------------|--------------------------|
| <b>Rong Zhang et al., 2018 [80]</b>      | Premature infants [80]                             | 1-month readmission [80]                  | 6.5% vs. 50% [80]                                     | P < 0.001 [80]           |
| <b>Yen-Ting Yu et al., 2017 [17]</b>     | VLBW preterm infants (multicenter RCT, n=251) [17] | Time to full enteral feeding [17]         | $\beta = -1.1$ weeks (95% CI: $-1.9$ to $-0.2$ ) [17] | P < 0.05 [17]            |
| <b>Yen-Ting Yu et al., 2017 [17]</b>     | VLBW preterm infants [17]                          | Neurobehavioral performance [17]          | $\beta = 1.2$ points (95% CI: 0.2–2.3) [17]           | P < 0.05 [17]            |
| <b>Nourah Alsadaan et al., 2023 [71]</b> | High-risk neonates (n=200) [71]                    | Bayley-III cognitive/motor/language [71]  | Significant improvements vs. controls [71]            | P < 0.05 [71]            |
| <b>Nourah Alsadaan et al., 2023 [71]</b> | High-risk neonates [71]                            | Length of hospital stay [71]              | 4.3-day vs. 1.4-day reduction [71]                    | P = 0.02 [71]            |
| <b>Mia A. McLean et al., 2021 [44]</b>   | Preterm infants (<33 wks, 18-month follow-up) [44] | Child externalizing behavior T-score [44] | B = $-0.91$ (95% CI: $-2.25$ , $-0.01$ ) [44]         | Significant [44]         |

| Study                                   | Population                                     | Primary Child Outcome                          | Effect / Result                                              | Statistical Significance       |
|-----------------------------------------|------------------------------------------------|------------------------------------------------|--------------------------------------------------------------|--------------------------------|
| <b>Mikyoung Kim et al., 2021 [4]</b>    | Children with CP (n=26) [4]                    | GMFM-66, PBS, BOT-2, FIM, PedsQL [4]           | Superior CFC vs. CPR on all measures [4]                     | P < 0.05 [4]                   |
| <b>C. E. Fonvig et al., 2020 [5]</b>    | Children with spastic CP (RCT, n=60) [5]       | GMFM-66 [5]                                    | Mean difference 3.05 (95% CI: 1.12–4.98) [5]                 | P = 0.003 [5]                  |
| <b>L. Braga et al., 2005 [30]</b>       | Children with TBI aged 5–12 (RCT) [30]         | Physical (SARAH) and cognitive (WISC-III) [30] | Significant improvements only in family-supported group [30] | Statistically significant [30] |
| <b>Wen-huei Hsieh et al., 2018 [16]</b> | Children with developmental delays (n=30) [16] | Physical health [16]                           | Effect size = 1.00 [16]                                      | P = .026 [16]                  |
| <b>Wen-huei Hsieh et al., 2018 [16]</b> | Children with developmental delays [16]        | Global function [16]                           | Effect size = 0.88 [16]                                      | P = .006 [16]                  |

| Study                                        | Population                                         | Primary Child Outcome                                                     | Effect / Result                                                | Statistical Significance         |
|----------------------------------------------|----------------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------|----------------------------------|
| <b>R. Lindrooth et al., 2025 [10]</b>        | Children <3 in early intervention (n=103,635) [10] | Care plan goal attainment before age 3 [10]                               | +3.5–4.6 percentage points [10]                                | $P < 0.01$ [10]                  |
| <b>Nahid Pilevar et al., 2019 [8]</b>        | Children with RA aged 8–12 (RCT, n=60) [8]         | Paediatric quality of life (physical, emotional, educational, social) [8] | Significant improvement [8]                                    | $P = 0.004$ (between groups) [8] |
| <b>Elham Mohammadzadeh et al., 2022 [7]</b>  | Children with chemical burns (n=50) [7]            | Quality of life (PedsQL/TAPQOL) [7]                                       | Significant increase [7]                                       | $P < 0.001$ [7]                  |
| <b>Amal Ahmed Elbilgahy et al., 2025 [9]</b> | Children with chronic illness (n=328) [9]          | Multidimensional fatigue (PedsQL-MFS) [9]                                 | $6.59 \rightarrow 33.64$ [9]                                   | $P \leq 0.001$ [9]               |
| <b>Bronwyn R Griffin et al., 2024 [53]</b>   | Children following acute injury (n=192) [53]       | Quality of life (PedsQL4.0, EQ-5D-Y) [53]                                 | Significant increases vs. control site at 6 and 12 months [53] | Significant [53]                 |

| Study                                     | Population                                                | Primary Child Outcome                  | Effect / Result                                                    | Statistical Significance |
|-------------------------------------------|-----------------------------------------------------------|----------------------------------------|--------------------------------------------------------------------|--------------------------|
| <b>C. Willis et al., 2018 [49]</b>        | Children with disabilities, mean age 11.1 yrs (n=92) [49] | COPM performance and satisfaction [49] | Median performance: 5.0 → 7.0 (T1→T2); 32% achieved GAS goal [49]  | P < 0.01 [49]            |
| <b>Aline Kabarite et al., 2025 [18]</b>   | Children with ASD, aged 2–16 (n=53) [18]                  | GAF, CGI, ABC [18]                     | Improvements in functioning; sleep difficulties (p = 0.021) [18]   | Significant [18]         |
| <b>Thuy T. Frakking et al., 2021 [14]</b> | Children with chronic non-CMC (RCT, n=81) [14]            | PedsQL [14]                            | Difference in score change = 7.10 (95% CI: 0.44–13.76) [14]        | P = .04 [14]             |
| <b>J. Dambi &amp; J. Jelsma, 2014 [6]</b> | Children with CP in Zimbabwe (n=46) [6]                   | GMFM-66 [6]                            | +6% improvement (2.49 points more) in outreach vs. institution [6] | P < .001 [6]             |

The overwhelming direction of association across these primary studies is positive. Only one study in this set found no significant child outcome benefit from a specifically family-centered augmentation: Fonvig et al.'s gait analysis study found that the improved GMFM-66 score was

attributable to individualized interdisciplinary recommendations, not to any measurable improvement in perceived family-centredness of care [5, 5].

### **Family Well-Being Outcomes**

Family well-being outcomes span domains including parental stress and anxiety, empowerment, satisfaction with care, quality of life, competence and self-efficacy, and mental health. The breadth and consistency of positive effects across these domains is notable.

### **Parental Stress, Anxiety, and Mental Health**

Reductions in parental stress are among the most consistently reported outcomes of FCC in the NICU context. O'Brien et al.'s FIC pilot found a significant reduction in Parental Stress Survey: NICU scores from  $3.06 \pm 0.12$  at enrolment to  $2.30 \pm 0.13$  at discharge ( $p < 0.05$ ) [3]. Zhang et al.'s Chinese RCT found lower total mean parental stress and anxiety scores in the FCC group (42 vs. 59,  $p \leq 0.007$ ) [80]. Xiang Ding et al.'s meta-analysis showed significant reductions in parental anxiety at follow-up (SMD =  $-0.19$ , 95% CI:  $-0.28$  to  $-0.09$ ,  $P < 0.001$ ) and parental depression (SMD =  $-0.37$ , 95% CI:  $-0.63$  to  $-0.12$ ,  $P = 0.004$ ) [2]. De Bernardo et al.'s Italian NICU cohort found that parents in the 8-hours-per-day FCC group reported lower stress on the PSS-NICU compared to those with 1-hour access [70].

McLean et al.'s 18-month FICare follow-up documented a biological measure of maternal stress reduction, with significantly lower maternal hair cortisol (HCC:  $B = -0.22$ , 95% CI:  $-0.41$ ,  $-0.04$ ) and lower cortisol/DHEA ratio ( $B = -0.25$ , 95% CI:  $-0.48$ ,  $-0.02$ ) in the FICare group, establishing chronic physiological stress reduction at nearly two years post-discharge [44]. This is among the most methodologically rigorous demonstrations of FCC effects on parental well-being in the corpus.

For TBI and ABI, Wade et al.'s online FPS RCT found that the FPS group reported significantly less global distress, depressive symptoms, and anxiety at follow-up compared to the internet resources control group, with moderate-to-large effect sizes [78]. Hickey et al.'s Family Forward studies found no significant group differences in family appraisal outcomes at any time point measured by the IES-R, though both groups showed reductions in trauma responses over time [20]. The Family Forward intervention did, however, achieve superior outcomes on managing child

care at home (FAMM Child Management Ability,  $p = 0.029$ ) and greater parental satisfaction in focusing on child care (FAMM Parent Mutuality,  $p = 0.04$ ) despite the Family Forward group having longer admissions and poorer initial functioning [35], suggesting a protective rather than ameliorative effect.

Kakabaraee and Seidy's quasi-experimental study found significant pre-post improvements in mental well-being of mothers of autistic children following 10 sessions of family-centered problem-solving (significant difference in pre-post scores; no significant decline at one-month follow-up) [37].

### **Parental Empowerment, Self-Efficacy, and Competence**

Empowerment outcomes are most consistently positive across all rehabilitation contexts. Hielkema et al. found that within the COPCA group, family quality of life improved over time and that family empowerment was positively associated with caregiver coaching elements of the intervention [34]. Muthukaruppan et al.'s two-year prospective cohort ( $n = 308$  caregivers) found a mean Family Empowerment Scale improvement of 4.1 (95% CI: 3.3–4.9,  $p < 0.001$ ) and a mean Modified Caregiver Strain Index reduction of  $-3.7$  (95% CI:  $-4.5$  to  $-2.9$ ,  $p < 0.001$ ) [12].

The family-centered empowerment model applied to parents of children with intellectual disability showed significant pre-post resilience improvement ( $P < 0.001$ ,  $\eta^2 = 0.48$ ), with the model accounting for 29% of variance in parental resilience scores [13]. Akdeniz Uysal and Yiğit's web-based FCEM RCT for parents of children with oncological conditions found that the intervention group showed increased caregiving ability and self-efficacy alongside decreased depression, anxiety, and stress [54]. McAllister et al.'s care coordination SPoC study found significant improvements in family empowerment and reduced worry alongside care coordination access and goals met [42]. McConkey et al.'s rural Irish home-visiting program found statistically significant well-being score increases with large effect sizes (Cohen's  $d = 0.899$  and  $0.985$ ,  $p < 0.001$ ) [15].

Shahbazi et al.'s scoping review of family-centered occupational therapy consultation found consistent qualitative reports of increased caregiver understanding, confidence, and ability to implement strategies in natural environments across qualitative studies [52]. The systematic review by Hodgson et al. of inpatient FCC interventions found that most studies reported significant

improvements in parents' well-being, knowledge, and participation, as well as decreased stress and anxiety [58].

### **Quality of Life**

Several studies measured parental or family quality of life directly. Ma Ming's controlled study of FCC for parents of children with CP found significantly higher post-intervention WHOQOL-BREF scores in all four domains (physiological: 62.64 vs. 54.40; psychological: 59.46 vs. 47.12; social relations: 63.41 vs. 53.98; environmental: 48.52 vs. 42.43) as well as higher nursing satisfaction scores, all at  $P < 0.05$  [57]. Hsieh et al.'s family-centered workshop found significant improvements in parental health-related quality of life (effect size = 0.81,  $P = .015$ ) and significant reduction in the impact of the child's health on parental HRQOL (effect size = 0.81,  $P = .043$ ) [16]. Frakking et al.'s Allied Health Liaison Officer RCT found that care coordination significantly improved the overall PedsQL Family Impact Module scores (difference = 8.62, 95% CI: 1.07–16.17,  $P = .03$ ) and family functioning quality of life (difference = 15.83, 95% CI: 5.05–26.62,  $P = .004$ ) at 12 months [14]. Jiménez-Arberas et al.'s quasi-experimental mHealth study found significant improvements in family quality of life in the experimental group compared to both control groups [47].

Verger et al.'s mixed-methods study comparing home-based routines-based early intervention to centre-based early intervention found that families receiving home-based care had significantly greater satisfaction ( $p = 0.02$ ), and significant differences appeared in disability-related supports ( $p < 0.001$ ) and physical well-being ( $p = 0.002$ ), but similar scores on most other family quality of life domains [76]. Estes et al.'s care coordination study found that 89% of caregivers who started in the bottom half of the CarerQoL distribution at baseline saw improvement at 3 months, though this reduced to 71% at 12 months, with child behavioral difficulties explaining 36% of the variance in care-related quality of life changes [19].

### **Parental Satisfaction**

Satisfaction with care is one of the most consistently positive outcomes across FCC interventions. Ding et al.'s meta-analysis found large improvements in parent satisfaction (OR = 11.20, 95% CI: 4.76–26.34,  $P < 0.001$ ) across five NICU studies [2]. Zhang et al.'s Chinese RCT

found higher satisfaction rates in the FCC group (96 vs. 90,  $p < 0.001$ ) [80]. De Bernardo et al.'s Italian NICU study found significantly higher satisfaction in the FCC group [70]. L. Shields et al.'s Cochrane review of one RCT found parents significantly more satisfied with care-by-parent unit care than standard care at discharge and at seven-day follow-up [59]. Almasri et al.'s meta-analysis of MPOC-20 data from 2,582 parents found mean ratings of 5.0–5.5 (on a 7-point scale) for relational and participatory FCC behaviors, and 4.1 for provision of general information, indicating that general information sharing is the area of greatest underperformance in FCC delivery [22].

### Parental Skills and Knowledge

Ding et al. found large pooled effects of FCC on parental skill acquisition (SMD = 2.57, 95% CI: 2.19–2.96,  $P < 0.001$ ) and parental knowledge (SMD = 2.74, 95% CI: 2.47–3.00,  $P < 0.001$ ) in NICU contexts [2]. Zhang et al. found significantly better parental knowledge of neonatal specialized care in the FCC group ( $p < 0.05$ ) [80]. Young et al.'s stepped-wedge cluster RCT found significant improvements in key workers' confidence to support parental wellbeing ( $d = 0.51$ ,  $p = 0.044$ ) and knowledge of parental mental wellbeing ( $p = 0.006$ ) [27].

The following table summarizes key family well-being outcomes from primary studies and reviews:

| Study                       | Family Outcome Measure            | Domain              | Outcome / Effect                            | Statistical Result |
|-----------------------------|-----------------------------------|---------------------|---------------------------------------------|--------------------|
| Xiang Ding et al., 2019 [2] | Parental Stressor Scale: NICU [2] | Parental stress [2] | MD = −0.20<br>(95% CI: −0.26 to −0.13) [2]  | $P < 0.001$ [2]    |
| Xiang Ding et al., 2019 [2] | State Anxiety Inventory [2]       | Anxiety [2]         | SMD = −0.19<br>(95% CI: −0.28 to −0.09) [2] | $P < 0.001$ [2]    |

| Study                                                   | Family Outcome Measure                     | Domain                             | Outcome / Effect                          | Statistical Result |
|---------------------------------------------------------|--------------------------------------------|------------------------------------|-------------------------------------------|--------------------|
| <b>Xiang Ding et al., 2019 [2]</b>                      | Parent satisfaction questionnaires [2]     | Satisfaction [2]                   | OR = 11.20 (95% CI: 4.76–26.34) [2]       | P < 0.001 [2]      |
| <b>Xiang Ding et al., 2019 [2]</b>                      | Parent skills/knowledge scales [2]         | Skills/knowledge [2]               | SMD = 2.57 skills; 2.74 knowledge [2]     | P < 0.001 [2]      |
| <b>Mia A. McLean et al., 2021 [44]</b>                  | Maternal hair cortisol (HCC) [44]          | Maternal physiological stress [44] | B = −0.22 (95% CI: −0.41, −0.04) [44]     | Significant [44]   |
| <b>K. O'Brien et al., 2013 [3]</b>                      | Parental Stress Survey: NICU [3]           | Parental stress [3]                | 3.06 → 2.30 [3]                           | P < 0.05 [3]       |
| <b>Rong Zhang et al., 2018 [80]</b>                     | Zung self-assessment (stress/anxiety) [80] | Stress and anxiety [80]            | 59 vs. 42 (control vs. FCC) [80]          | P ≤ 0.007 [80]     |
| <b>Sankar Sahayaraj Muthukaruppan et al., 2020 [12]</b> | Family Empowerment Scale (FES) [12]        | Empowerment [12]                   | Mean change = +4.1 (95% CI: 3.3–4.9) [12] | P < 0.001 [12]     |

| Study                                                   | Family Outcome Measure                        | Domain                          | Outcome / Effect                             | Statistical Result |
|---------------------------------------------------------|-----------------------------------------------|---------------------------------|----------------------------------------------|--------------------|
| <b>Sankar Sahayaraj Muthukaruppan et al., 2020 [12]</b> | Modified Caregiver Strain Index (MCSI) [12]   | Caregiver strain [12]           | Mean change = -3.7 (95% CI: -4.5, -2.9) [12] | P < 0.001 [12]     |
| <b>Effect of the Family-Centered (2024) [13]</b>        | Connor-Davidson Resilience Questionnaire [13] | Resilience [13]                 | Eta = 0.48; 29% variance explained [13]      | P < 0.001 [13]     |
| <b>R. McConkey et al., 2023 [15]</b>                    | Edinburgh-Warwick Wellbeing Scale [15]        | Wellbeing [15]                  | Cohen's d = 0.899 and 0.985 [15]             | P < 0.001 [15]     |
| <b>Thuy T. Frakking et al., 2021 [14]</b>               | PedsQL Family Impact Module [14]              | Family QoL and functioning [14] | Difference = 8.62 (95% CI: 1.07–16.17) [14]  | P = .03 [14]       |
| <b>Wen-huei Hsieh et al., 2018 [16]</b>                 | PedsQL Family Impact Module [16]              | Parental HRQOL [16]             | Effect size = 0.81 [16]                      | P = .015 [16]      |

| Study                                             | Family Outcome Measure                        | Domain                                           | Outcome / Effect                                              | Statistical Result                |
|---------------------------------------------------|-----------------------------------------------|--------------------------------------------------|---------------------------------------------------------------|-----------------------------------|
| 马明 (Ma Ming),<br>2014 [57]                        | WHOQOL-BREF<br>[57]                           | Parental quality<br>of life (4<br>domains) [57]  | All domains<br>significantly<br>higher in FCC<br>group [57]   | $P < 0.05$ [57]                   |
| Elham<br>Mohammadzadeh<br>et al., 2022 [7]        | PSS (Perceived<br>Stress Scale) [7]           | Parental stress [7]                              | Significant<br>decrease in<br>intervention<br>group [7]       | $P < 0.001$ [7]                   |
| Sarah L. Al-<br>Otaibi et al.,<br>2024 [11]       | Zarit Burden<br>Interview [11]                | Caregiver burden<br>[11]                         | Main effect of<br>group ( $\eta^2 =$<br>0.11) [11]            | $P = 0.03$ [11]                   |
| S. Wade et al.,<br>2006a [78]                     | SCL-90, CES-D,<br>AI [78]                     | Global distress,<br>depression,<br>anxiety [78]  | Moderate-to-large<br>effect sizes [78]                        | Statistically<br>significant [78] |
| Derya Akdeniz<br>Uysal & Rana<br>Yiğit, 2025 [54] | General Self-<br>Efficacy Scale;<br>DASS [54] | Self-efficacy;<br>depression/anxiety/stress [54] | Increased self-<br>efficacy;<br>decreased DASS<br>scores [54] | Significant [54]                  |

| Study                                              | Family Outcome Measure            | Domain                                                                           | Outcome / Effect                                                              | Statistical Result                                                        |
|----------------------------------------------------|-----------------------------------|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| <b>Amal Ahmed Elbilgahy et al., 2025 [9]</b>       | Checklist Individual Strength [9] | Parental fatigue [9]                                                             | Slight decrease in parental fatigue [9]                                       | $P \leq 0.001$ [9]                                                        |
| <b>Estíbaliz Jiménez-Arberas et al., 2025 [47]</b> | Family Quality of Life Scale [47] | Family quality of life [47]                                                      | Significant improvements vs. both control groups [47]                         | Significant [47]                                                          |
| <b>Sebastià Verger et al., 2021 [76]</b>           | FQOLS, CRES-4 [76]                | Satisfaction, family QoL (disability-related supports, physical well-being) [76] | Greater satisfaction and significant QoL differences in home-based group [76] | $P < 0.001$ (disability supports); $P = 0.002$ (physical well-being) [76] |
| <b>Myka Estes et al., 2025 [19]</b>                | CarerQoL [19]                     | Care-related quality of life [19]                                                | 89% improved at 3 months; 71% at 12 months [19]                               | Not specified [19]                                                        |

| Study                                     | Family Outcome Measure                                    | Domain                                              | Outcome / Effect                                                      | Statistical Result       |
|-------------------------------------------|-----------------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------------------------|--------------------------|
| <b>L. Hickey et al., 2018 [35]</b>        | FAMM Child Management Ability; FAMM Parent Mutuality [35] | Home management ability; parental satisfaction [35] | Superior outcomes in Family Forward group despite worse baseline [35] | P = 0.029; P = 0.04 [35] |
| <b>J. Dambi &amp; J. Jelsma, 2014 [6]</b> | Modified Medrisk satisfaction scale [6]                   | Satisfaction; compliance [6]                        | Greater satisfaction and compliance in community outreach group [6]   | P < .001 [6]             |

## Synthesis

### Reconciling Heterogeneity Across Findings

The evidence is overwhelmingly directionally consistent—FCC is positively associated with improved family well-being and child outcomes across settings, populations, and intervention types. However, meaningful heterogeneity exists in effect magnitude, the domains that respond, and the mechanisms of benefit. Three areas of apparent contradiction deserve careful analysis.

### First Apparent Contradiction: NICU vs. Rehabilitation Motor Outcomes

The strongest quantitative evidence for FCC—most rigorously powered, with consistent effect sizes across multiple meta-analyses—comes from NICU settings targeting neonatal clinical indicators (weight gain, breastfeeding, length of stay, readmission) [1, 2, 64]. The pooled OR for breastfeeding (5.92) and the dramatic reduction in one-month readmission (OR = 0.37) [1] represent

clinically large effects uncommon in rehabilitation research. By contrast, motor outcome effect sizes in CP rehabilitation (e.g., GMFM-66 mean difference of 3.05 points [5]) are smaller and debate persists about what constitutes a minimum clinically important difference.

This divergence likely reflects mechanistic differences rather than differential effectiveness. In the NICU, the caregiver IS the intervention delivery agent—parental presence, breast milk provision, and kangaroo care directly determine neonatal outcomes through well-established physiological pathways (caloric intake, immune factors in breast milk, thermoregulation, stress hormone reduction) [3, 17]. In motor rehabilitation for older children with CP, the family facilitates carryover of exercises and daily practice opportunities, but the underlying neuromotor pathology is not directly altered by caregiver behavior in the same way. The dose-response relationship identified by Yu et al.—where higher parental motivation correlated with greater weight gain and neurobehavioral performance ( $r = 0.20\text{--}0.31$ ) [17] —further supports the view that parental engagement intensity mediates outcomes differently across clinical contexts.

### **Second Apparent Contradiction: Process Measures vs. Outcome Measures**

Several studies found improvements in child outcomes or family well-being without corresponding improvements in perceived FCC processes as measured by instruments such as the MPOC-20. Fonvig et al.'s RCT produced significantly better GMFM-66 scores in the interdisciplinary care group but no differences on any of the five MPOC-20 domains ( $p = 0.40\text{--}0.97$ ) [5, 5]. Tatla et al.'s coaching training study produced significant improvements in service providers' self-rated coaching skills but no measurable change on MPOC or MPOC-SP scores [21, 21]. Cady et al.'s telehealth RCT found high and stable FCC scores across all groups but unmet care coordination needs [68].

The MPOC-20 measures parent perceptions of the process of care rather than whether that care was effectively delivered or absorbed [22]. Almasri et al.'s meta-analysis found that parents rate relational behaviors (respectful and supportive care:  $\sim 5.5/7$ ) systematically higher than participatory behaviors (enabling and partnership:  $\sim 5.0/7$ ) and information provision ( $\sim 4.1/7$ ) [22]. Ares-Brage et al.'s meta-analysis of MPOC in CP care confirmed that "respectful care" is the domain both families and professionals rate most highly, while information provision is universally

the weakest domain [23]. This pattern suggests that respectful, dignified interactions are more easily operationalized than sharing substantive, individualized information—and that process ratings capture the interpersonal texture of care rather than its active therapeutic content. The divergence between process scores and outcome scores thus reflects the difference between satisfaction with care delivery style and effectiveness of the care itself.

### **Third Apparent Contradiction: Inconsistent Family Mental Health Effects**

While parental stress and anxiety consistently improve (especially in NICU studies), the evidence for broader family mental health improvement—including depression, trauma responses, and overall psychological well-being—is more variable. Shen et al.'s meta-analysis found significant positive effects on child and parental outcomes but not on family functioning [31]. Poojari et al.'s systematic review found FCC effective for caregiver satisfaction and self-efficacy but not strongly supported for caregiver mental health, parenting, and personal outcomes [38]. Hickey et al.'s Family Forward studies found no significant group differences in family appraisal (IES-R, Brief IPQ) despite both groups showing temporal improvement [20, 20].

This pattern is explicable by population and context: the Hickey et al. studies enrolled families of children with ABI who had significantly longer and more severe hospitalizations at baseline [20, 35], representing a ceiling of distress that short-duration counseling-based interventions may reduce somewhat but cannot eliminate. Estes et al. found that child behavioral difficulties explained 36% of the variance in caregiver quality of life changes, and that clinically significant child behavioral problems may prevent sustained gains from care coordination [19]. In other words, when child behavior is a primary driver of parental distress, interventions targeting parental competence and care navigation—but not directly addressing child behavior—will have limited reach on global family mental health. This contrasts with NICU settings, where FCC directly reduces the environmental stress of NICU admission itself (visible machinery, separation from infant, unfamiliar routines), and the stress reduction is therefore more immediate and complete.

### **The Role of Family Engagement Intensity as a Moderator**

Across diverse settings, the degree of family engagement appears to function as a dose-response moderator. In Yu et al.'s RCT, higher parental motivation was significantly correlated with better infant outcomes ( $r = 0.20\text{--}0.31$ ) [17]. Kabarite et al. found that greater family involvement was associated with more favorable outcomes in ASD [18]. Hielkema et al. found that specific coaching elements were associated with higher family empowerment in COPCA [34]. Lindrooth et al.'s large administrative study found that Colorado's family-centered care coordination reduced family disengagement (lost to follow-up) by 4.6 percentage points [10], emphasizing that engagement itself is an outcome that FCC must sustain.

However, family engagement is also a variable that interventions may not easily control. Alsem's review found wide variation in parental preferences and experiences, and that family needs change over time, requiring ongoing assessment [36]. McCarthy and Guerin's systematic review identified parent attitudes, engagement and agency, and family resources as key variables that hinder or facilitate FCC [25]. During's analysis of the NEILS dataset found that race and ethnicity significantly predicted perceived FCC, with White families significantly more likely to perceive high FCC than African American and Hispanic families [24], suggesting that structural inequities in the delivery of FCC moderate its effectiveness for diverse populations. The Lindrooth et al. study replicated this with a large sample: Black families showed improved engagement under the care coordination program but Black children did not differentially achieve care plan goals before age 3, while White and Hispanic children did [10].

### **Contextual Boundaries of Effective FCC**

Taken together, the evidence supports the following contextual mapping of where FCC effects are most reliably demonstrated, and for which outcomes:

The clearest, most consistently replicated effects occur for neonatal clinical indicators (weight gain, breastfeeding, length of stay, readmission) in NICU settings where parental care is the direct intervention mechanism [1, 2, 64, 80]. Strong, consistent effects are also observed for parental stress, anxiety, and satisfaction across virtually all settings [2, 3, 58, 80]. Effects on family empowerment and self-efficacy are well-supported across rehabilitation contexts including CP,

developmental delay, and chronic illness [12, 13, 15]. Effects on child motor function in CP are statistically consistent but modest in magnitude and appear most robust when FCC is integrated with systematic therapeutic programming (e.g., CFC with structured sessions [4], COPCA [34]) rather than when FCC is added to otherwise unchanged care. Child behavioral outcomes following TBI/ABI benefit from family problem-solving approaches, particularly when intervention addresses parental skill-building rather than only counseling [30, 33, 78]. Effects on family mental health beyond stress are the most variable, dependent on the severity of child behavioral difficulties, duration of family exposure to stressors, and whether the intervention directly addresses psychological adjustment [19, 20, 31].

Service delivery factors—particularly professional training in family-centered approaches, organizational support for implementation, and structured information sharing—consistently emerge as moderators of FCC success across diverse reviews [21, 25, 26, 38]. Information provision is the most consistently underperforming domain in FCC delivery [22, 23], and qualitative evidence identifies professional power dynamics and lack of systematic training as barriers to genuine partnership [26, 65]. Rural settings present additional access barriers, though mHealth approaches may mitigate these [47, 47], and Jiménez-Arberas et al. found that the family-centered model augmented by mHealth in rural areas produced greater improvements in family quality of life and child social functioning than the family-centered model alone or the child-centered model [47].

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## DISCUSSION

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This systematic synthesis of 80 studies examining family-centered care in pediatric medical rehabilitation reveals three major findings: (1) FCC demonstrates overwhelmingly significant positive associations with both child outcomes and family well-being across diverse settings and populations; (2) effect magnitudes vary substantially by outcome domain and clinical context, with the strongest effects observed in NICU settings for neonatal clinical indicators and parental stress reduction; and (3) family engagement intensity functions as a critical dose-response moderator, while information provision remains the most consistently underperforming FCC domain.

## Significant Positive Child Outcomes Across Populations

**Neonatal Intensive Care Unit Outcomes.** The most robust and quantitatively compelling evidence for FCC comes from NICU settings. The meta-analysis by Chen et al.(1) comprising 13 randomized controlled trials and 3,005 preterm infants demonstrated that family-integrated care significantly improved breastfeeding rates (OR=5.92, 95%CI:2.37-14.82,  $P<0.001$ ), weight gain (MD=3.16 g/day, 95%CI:2.51-3.80,  $P<0.001$ ), sleep duration (MD=3.25 hours, 95%CI:2.05-4.44,  $P<0.001$ ), and reduced one-month readmission rates (OR=0.37, 95%CI:0.22-0.61,  $P<0.001$ ). These effect sizes are clinically large and uncommon in rehabilitation research. Ding et al.(2) confirmed these findings across 19 RCTs, showing similar improvements in weight gain (MD=4.57, 95%CI:2.80-6.34,  $P<0.001$ ) and readmission (OR=0.23, 95%CI:0.10-0.52,  $P<0.001$ ). The mechanism underlying these effects is direct: parents serve as the intervention delivery agents through breastfeeding, kangaroo care, and daily care provision(3,17). Yu et al.(17) provided dose-response evidence, demonstrating that higher parental motivation correlated with greater weight gain and neurobehavioral performance ( $r=0.20-0.31$ , all  $P<0.05$ ). McLean et al.(44) provided biological validation, showing that FCC reduced maternal hair cortisol at 18 months ( $B=-0.22$ , 95%CI:-0.41,-0.04), establishing chronic physiological stress reduction nearly two years post-discharge.

**Cerebral Palsy and Neuromotor Outcomes.** For children with cerebral palsy, FCC demonstrates statistically significant but more modest motor effects compared to NICU outcomes. Kim et al.(4) found that community-based family-child-centered care (CFC) produced superior effects compared to conventional pediatric rehabilitation on gross motor function (GMFM-66), balance (PBS), fine motor proficiency (BOT-2), functional independence (FIM), and quality of life (PedsQL), all at  $P<0.05$ , delivered 60 minutes twice weekly over approximately 10 weeks. Fonvig et al.(5) reported a significant mean GMFM-66 improvement of 3.05 points (95%CI:1.12-4.98,  $P=0.003$ ) over 52 weeks, though this gain was not accompanied by improved perceived family-centered service on MPOC-20 ( $P=0.40-0.97$  across all domains), illustrating that child motor gains and family experience of FCC can diverge. Dambi and Jelsma(6) found that community outreach-based care led to 6% greater motor function improvement on GMFM-66 (regression coefficient

2.49 points,  $P < 0.001$ ) compared to institution-based services after three months, with significantly greater caregiver satisfaction and compliance ( $P < 0.001$ ). The systematic review by Poojari et al.(38) confirmed significant improvements in satisfaction with goal attainment, self-efficacy, and social capital, though effect sizes ranged considerably ( $d = 0.14$  for non-intrusiveness to  $d = 1.32$  for behavioral outcomes).

**Acquired Brain Injury and Traumatic Brain Injury.** Braga et al.(30) provided a landmark finding: children in the family-supported intervention group demonstrated statistically significant and clinically important improvements on both physical (SARAH scales) and cognitive (WISC-III) outcomes after one year, while children in the clinician-delivered group—receiving identical service intensity—did not reach significance on either measure. This demonstrates that the same therapeutic dosage delivered by parents within everyday home routines outperforms direct clinician delivery. Wade et al.(33) found that family-centered problem-solving significantly improved children's internalizing symptoms, anxiety/depression, and withdrawal compared to usual care. Shen et al.(31) confirmed positive small-to-medium effects on child outcomes across 32 studies.

**Early Intervention and Developmental Disabilities.** Hsieh et al.(16) produced large effect sizes for physical health ( $ES = 1.00$ ,  $P = 0.026$ ) and global function ( $ES = 0.88$ ,  $P = 0.006$ ) in children with developmental delays after just six weekly two-hour family-centered multidisciplinary workshop sessions. Lindrooth et al.(10) conducted a large-scale quasi-experimental study of 103,635 children under age 3, finding that family-centered care coordination was associated with a 4.6 percentage point reduction in family disengagement ( $P < 0.01$ ) and a 3.5-4.6 percentage point increase in the probability of achieving care plan goals before age 3 ( $P < 0.01$ ). McConkey et al.(15) found that most children in a home-visiting family-centered program attained developmental learning targets and showed significant increases in social activities ( $P < 0.01$ ).

**Chronic Illness and Other Conditions.** Pilevar et al.(8) found significantly higher post-intervention quality of life in children with rheumatoid arthritis across physical, emotional, educational, and social domains ( $P = 0.004$  between groups;  $P < 0.001$  within group pre-post). Mohammadzadeh et al.(7) demonstrated that the Family-Centered Empowerment Model

significantly improved quality of life across all subscales in children with chemical burns ( $P<0.001$ ). Elbilgahy et al.(9) produced a dramatic improvement in children's multidimensional fatigue scores from 6.59 to 33.64 ( $P\leq 0.001$ ) through family-centered empowerment programs.

### **Significant Positive Family Well-Being Outcomes**

**Parental Stress, Anxiety, and Mental Health.** Reductions in parental stress represent the most consistently replicated family outcome across FCC interventions. O'Brien et al.(3) found significant reduction in Parental Stress Survey: NICU scores from  $3.06\pm 0.12$  at enrolment to  $2.30\pm 0.13$  at discharge ( $P<0.05$ ). Zhang et al.(80) found lower total mean parental stress and anxiety scores in the FCC group (42 vs. 59,  $P\leq 0.007$ ). Ding et al.(2) meta-analysis showed significant reductions in parental anxiety (SMD=-0.19, 95%CI:-0.28 to -0.09,  $P<0.001$ ) and parental depression (SMD=-0.37, 95%CI:-0.63 to -0.12,  $P=0.004$ ). De Bernardo et al.(70) found that parents with 8 hours per day FCC access reported lower stress than those with 1-hour access. Kakabaraee and Seidy(37) found significant pre-post improvements in mental well-being of mothers of autistic children following 10 sessions of family-centered problem-solving.

**Parental Empowerment, Self-Efficacy, and Competence.** Empowerment outcomes are most consistently positive across all rehabilitation contexts. Muthukaruppan et al.(12) found mean Family Empowerment Scale improvement of 4.1 (95%CI:3.3-4.9,  $P<0.001$ ) and mean Modified Caregiver Strain Index reduction of -3.7 (95%CI:-4.5 to -2.9,  $P<0.001$ ) in a two-year prospective cohort of 308 caregivers. The family-centered empowerment model for parents of children with intellectual disability showed significant pre-post resilience improvement ( $P<0.001$ ,  $\eta^2=0.48$ ), accounting for 29% of variance in parental resilience scores(13). Akdeniz Uysal and Yiğit(54) found that web-based FCEM for parents of children with oncological conditions increased caregiving ability and self-efficacy alongside decreased depression, anxiety, and stress. McConkey et al.(15) found statistically significant well-being score increases with large effect sizes (Cohen's  $d=0.899$  and  $0.985$ ,  $P<0.001$ ).

**Parental Satisfaction.** Satisfaction with care is one of the most overwhelmingly positive outcomes across FCC interventions. Ding et al.(2) found large improvements in parent satisfaction (OR=11.20, 95%CI:4.76-26.34,  $P<0.001$ ) across five NICU studies. Zhang et al.(80) found higher

satisfaction rates in the FCC group (96 vs. 90,  $P < 0.001$ ). Shields et al.(59) Cochrane review found parents significantly more satisfied with care-by-parent unit care than standard care at discharge and at seven-day follow-up.

**Family Quality of Life.** Ma Ming(57) found significantly higher post-intervention WHOQOL-BREF scores in parents of children with CP across all four domains (physiological: 62.64 vs. 54.40; psychological: 59.46 vs. 47.12; social relations: 63.41 vs. 53.98; environmental: 48.52 vs. 42.43), all at  $P < 0.05$ . Hsieh et al.(16) found significant improvements in parental health-related quality of life (effect size=0.81,  $P = 0.015$ ). Frakking et al.(14) found care coordination significantly improved overall PedsQL Family Impact Module scores (difference=8.62, 95%CI:1.07-16.17,  $P = 0.03$ ) and family functioning quality of life (difference=15.83, 95%CI:5.05-26.62,  $P = 0.004$ ) at 12 months. Jiménez-Arberas et al.(47) found significant improvements in family quality of life in the experimental group compared to both control groups in rural settings augmented by mHealth.

### **Reconciling Heterogeneity: Key Moderators and Contextual Factors**

**Mechanistic Differences Between NICU and Rehabilitation Motor Outcomes.** The divergence in effect magnitudes between NICU settings (large effects) and cerebral palsy motor outcomes (modest effects) reflects mechanistic differences rather than differential FCC effectiveness. In NICU, parents are the direct intervention delivery agents—breast milk provision, kangaroo care, and daily care directly determine neonatal outcomes through established physiological pathways(1,3,17). In motor rehabilitation for older children with CP, families facilitate carryover and practice opportunities, but underlying neuromotor pathology is not directly altered by caregiver behavior. The dose-response relationship identified by Yu et al.(17)—higher parental motivation correlated with greater weight gain and neurobehavioral performance ( $r = 0.20-0.31$ )—supports that parental engagement intensity mediates outcomes differently across clinical contexts.

**Process Measures Versus Outcome Measures.** Several studies found child outcome improvements without corresponding improvements in perceived FCC processes on MPOC-20(5,21). Almasri et al.(22) meta-analysis of 2,582 parents found that parents rate relational

behaviors (respectful and supportive care:  $\sim 5.5/7$ ) systematically higher than participatory behaviors ( $\sim 5.0/7$ ) and information provision ( $\sim 4.1/7$ ). Ares-Brage et al.(23) confirmed that "respectful care" is the domain both families and professionals rate most highly, while information provision is universally the weakest domain. This suggests that respectful interactions are more easily operationalized than sharing substantive individualized information, and process ratings capture interpersonal texture rather than active therapeutic content.

**Family Engagement Intensity as Dose-Response Moderator.** Across diverse settings, degree of family engagement functions as a critical moderator. Yu et al.(17) found higher parental motivation correlated with better infant outcomes ( $r=0.20-0.31$ ). Kabarite et al.(18) found greater family involvement associated with more favorable outcomes in ASD. Hielkema et al.(34) found specific coaching elements associated with higher family empowerment in COPCA. Lindrooth et al.(10) found that family-centered care coordination reduced family disengagement by 4.6 percentage points, emphasizing that engagement itself is an outcome FCC must sustain. However, structural inequities moderate effectiveness: Durante(24) found that White families were significantly more likely to perceive high FCC than African American and Hispanic families. Lindrooth et al.(10) replicated this: Black families showed improved engagement but Black children did not differentially achieve care plan goals before age 3, while White and Hispanic children did.

**Information Provision as Persistent Implementation Gap.** Information provision is the most consistently underperforming domain in FCC delivery across all settings and populations(22,23,38). Qualitative evidence identifies professional power dynamics, lack of systematic training, and organizational barriers as obstacles to genuine partnership(25,26,65). Britt et al.(26) found that professional development programs improve family-centered service provision but require organizational support for sustained implementation. Young et al.(27) found that key worker training significantly improved confidence to support parental wellbeing ( $d=0.51$ ,  $P=0.044$ ) and knowledge of parental mental wellbeing ( $P=0.006$ ).

### **Contextual Boundaries of Effective FCC**

The evidence supports the following contextual mapping. Clearest, most consistently replicated effects occur for neonatal clinical indicators in NICU settings where parental care is the direct intervention mechanism(1,2,64,80). Strong, consistent effects are observed for parental stress, anxiety, and satisfaction across virtually all settings(2,3,58,80). Effects on family empowerment and self-efficacy are well-supported across CP, developmental delay, and chronic illness(12,13,15). Effects on child motor function in CP are statistically consistent but modest, most robust when FCC is integrated with systematic therapeutic programming(4,34). Child behavioral outcomes following TBI/ABI benefit from family problem-solving approaches addressing parental skill-building(30,33,78). Effects on family mental health beyond stress are most variable, dependent on severity of child behavioral difficulties, duration of family exposure to stressors, and whether intervention directly addresses psychological adjustment(19,20,31).

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## CONCLUSION AND RECOMMENDATIONS

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### Conclusion

Family-centered care demonstrates overwhelmingly significant positive associations with both child outcomes and family well-being across the full spectrum of pediatric medical rehabilitation settings. The evidence is directionally consistent: FCC improves child outcomes including neonatal weight gain, breastfeeding, readmission rates, gross motor function in cerebral palsy, cognitive and physical outcomes following acquired brain injury, developmental progress in early intervention, and quality of life across chronic illnesses. Simultaneously, FCC improves family well-being outcomes including reduced parental stress and anxiety, increased empowerment and self-efficacy, dramatically higher satisfaction with care, and improved family quality of life. Effect magnitudes vary by context: largest effects occur in NICU settings where parents serve as direct intervention agents, while modest but statistically significant effects occur for child motor outcomes in cerebral palsy. Family engagement intensity functions as a critical dose-response moderator. Information provision remains the most consistently underperforming FCC domain across all settings, representing the primary implementation priority for improvement.

### Recommendations

**For Clinical Practice:** Healthcare organizations should prioritize structured information-sharing systems, ensure systematic professional training in FCC competencies, implement family engagement metrics as quality indicators, and allocate resources for care coordination functions.

**For Policy:** Regulatory and accreditation bodies should mandate FCC standards that specifically address information provision, family engagement measurement, and reduction of disparities in FCC delivery across racial and ethnic groups.

**For Research:** Future studies should develop validated measures of family engagement intensity, investigate implementation strategies for information provision, examine biological mechanisms linking FCC to child outcomes, and test interventions specifically designed to address persistent disparities in FCC effectiveness for minoritized populations.

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