

# An international study on implementation and facilitators and barriers for parent-infant closeness in neonatal units

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## ABSTRACT

**Importance:** Parent-infant closeness and active parent participation in neonatal care are important for parent and infant health.

**Objective:** To give an overview of current neonatal settings and gain an in-depth understanding of facilitators and barriers to parent-infant closeness, zero-separation, in 19 countries.

**Methods:** Neonatal intensive care unit (NICU) professionals, representing 45 NICUs from a range of geographic regions in Europe and Canada, were purposefully selected and interviewed June–December 2018. Thematic analysis was conducted to identify, analyze and report patterns (themes) for parent-infant closeness across the entire series of interviews.

**Results:** Parent-infant separation during infant and/or maternity care is very common (42/45 units, 93%), despite the implementation of family integrated care (FICare) practices, including parent participation in medical rounds (17/45, 38%), structured education sessions for parents (16/45, 36%) and structured training for healthcare professionals (22/45, 49%). NICU professionals encountered four main themes with facilitators and barriers for parent-infant closeness on and between the hospital, unit, staff, and family level: *Culture* (jointly held characteristics, values, thinking and behaviors about parental presence and participation in the unit), *Collaboration* (the act of working together between and within different levels), *Capacities* (resources and policies), and *Coaching* (education to acquire and transfer knowledge and skills).

**Interpretation:** Implementing parent-infant closeness in the NICU is still challenging for healthcare professionals. Further optimization in neonatal care towards zero-separation and parent-infant closeness can be achieved by enforcing the 'four Cs for Closeness': *Culture*, *Collaboration*, *Capacities*, and *Coaching*.

## KEYWORDS

Parent-infant closeness, Family centered care, Family integrated care, Couplet-care, Neonatology, Parent-collaboration, Zero-separation

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## INTRODUCTION

Preterm and ill infants can spend considerable time in the neonatal intensive care unit (NICU) after birth before going home with their parents. This period (during infant and/or mother hospitalization) is often characterized by parent-infant separation, limiting emotional and physical closeness between parents and their infants.<sup>1,2</sup> In the NICU, parents sometimes feel they cannot take on typical parenting roles. Parents can suffer from feelings of helplessness, they can experience high levels of stress or trauma, and they can feel unprepared to go home, which all can potentially impact parent and infant health.<sup>2-5</sup>

Minimizing parent-infant separation (for example through parent-led interventions such as skin-to-skin care [SSC]<sup>6</sup> or the implementation of couplet-care<sup>7</sup>) as well as endorsing parent-partnership within the infant's care team, and involvement and integration in neonatal care are associated with health benefits for infants and their parents<sup>3,8-15</sup> and advocated by parent representatives and the World Health Organization.<sup>16-19</sup> Parent-infant closeness and zero-separation have received particular attention over the past years alongside the increasing interest and implementation of family integrated care (FICare).<sup>2,20,21</sup> FICare uses a comprehensive framework that endorses parent-provider partnership and parent-infant interaction by enabling parents as primary caregivers in the neonatal unit and as equal partners in the care team.<sup>11,20</sup> Parent-infant closeness is a core component and outcome of FICare<sup>20</sup> as parents can experience a sense of closeness during NICU care when enacting parental roles, especially autonomously and when making decisions concerning their infant.<sup>4,22</sup> Nevertheless, parents can still experience less empowerment, stress, and separation from their newborn when co-care for the mother-infant dyad is not provided.<sup>23-25</sup>

Little is known about the current state and application of parent-infant closeness in European NICUs. Above, it is unclear which barriers healthcare professionals encounter to keep families close and enable them to participate in neonatal care during the NICU stay.<sup>6</sup> Previous studies have mainly described access policies for families in the NICU, availability of single bed units, compliance with the baby-friendly hospital initiative, and actual parental presence, SSC, or participation in medical rounds.<sup>26-31</sup> Other work has focused on the concept, pathways, and feelings of closeness from parents' perspectives,<sup>4,22,32</sup> insights into perceptions and aspirations of highly motivated medical staff to physical closeness<sup>33</sup> and facilitators and barriers for family-centered care from staff employed in hospitals from three European countries.<sup>34</sup> To our knowledge, no data or qualitative analysis is

currently available considering facilitators to implement parent-infant closeness and achieve zero-separation in neonatal care covering a vast majority of European countries.

The objective of this study was therefore to give a comprehensive overview and gain an in-depth understanding of current neonatal settings and facilitators and barriers with regard to parent-infant closeness during infant hospitalization in 19 countries.

## METHODS

### Ethical approval

Ethical permission to undertake the study was given by the Institutional Review Board of Amsterdam UMC, location AMC, the Netherlands.

### Interview

It is difficult to understand neonatal care practices (specifically mother-infant care) and to interpret care models from survey data in the absence of validated questionnaires and clear definitions. Therefore, we used a qualitative study design, conducting in-depth interviews with NICU professionals. The data collection tool was a semi-structured interview guide developed in collaboration with parents (see Supporting Information). Parent-infant closeness (zero-separation) was defined as "the possibility to be together (emotionally and physically) under all (medical) circumstances and according to parents' preferences, approximating the situation in full-term infants and the family is home." Parent participation in neonatal care was defined as previously.<sup>35</sup>

### Participants

We aimed to include a geographically and culturally diverse sample with  $\geq 2$  hospitals per European country. Healthcare professionals (mainly pediatricians/neonatologists) of NICUs, able to provide care to infants <30 weeks of gestation, were contacted by e-mail through the international network of one of the authors (Johannes B. van Goudoever, former board member of the European Society of Pediatric Research and the European Society of Pediatric Gastroenterology, Hepatology and Nutrition). This resulted in participants from 11 countries. We used a purposive sampling methodology with additional snowballing to either include experts in parent-partnered neonatal care (PPNC) models<sup>6</sup> or to contact units in neighboring countries. Examples of experts included were the Close Collaboration with Parents research group<sup>36</sup> and hospitals in Sweden and Denmark known for their PPNC practices. We included the

Canadian site as they have a unique pioneering role concerning worldwide implementation and dissemination of FICare,<sup>11</sup> and therefore their view was indispensable for our research question. Even though they were not situated in Europe, we decided to include them for richness of data. PPNC experts were units with peer-reviewed publications on PPNC models and/or units that trained other sites on PPNC.

### Data collection

With participants' permission, interviews were audio- and video-recorded between June and December 2018. Interviewees were invited to elaborate on answers, and follow-up and probing questions were asked when limitations and possibilities for parent-infant closeness were encountered. The interviews lasted approximately 30–60 min and were conducted by one interviewer and were video-recorded with Zoom (Zoom Video Communications, San Jose, CA, USA). The interviewer had no prior relationship with the interviewees. All interviews were conducted in English, except for two interviews with professionals from Ukraine, for which a person fluent in Russian and Ukrainian translated during interviews (see Acknowledgments).

### Data analysis

Thematic analysis was used to identify, analyze and report patterns (themes) across the entire series of interviews. Data analysis started after all interviews were transcribed verbatim and transcripts were returned for comment and/or correction from participants. Data analysis was performed by Nicole R. van Veenendaal (NRvV) and Nanon H.M. Labrie (NHML) and reviewed with a parent representative (Silke Mader). For details on the research team, see the Supporting Information.

We followed the six steps as outlined by Braun and Clarke<sup>37</sup> and used MAXQDA 2007 (VERBI Software Consult Sozialforsch GmbH, German, 2017) with a hierarchical coding structure to code interviews. Two investigators iteratively developed the coding scheme. We used a combined inductive and deductive approach. Sensitizing topics for the deductive approach were logistics and architecture of the unit, parent participation, education of parents, and education of staff based on previous literature and clinical experience of the multidisciplinary team. Additionally, we coded with new codes if new facilitators and barriers were encountered in the interviews (inductive approach). To avoid interpretative bias, the first three interviews were independently coded and then discussed. Following, another 3 interviews were independently coded to refine

the codebook, and again discussed to resolve discrepancies. After, NRvV and NHML discussed with the primary author group the final codebook. One author (NRvV) coded all remaining interviews. We believe data saturation was achieved as no new codes arose. Subsequently, NRvV and NHML discussed all codes and grouped them into themes, and discussed the relation and inter-relatedness between themes within an iterative process. Identified themes were reviewed by the research team to help contextualize and reorganize the themes from a multidisciplinary perspective.

### Use of checklists

We used the Consolidated criteria for reporting qualitative research checklist for interviews and focus groups<sup>38</sup> and the Guidance for Reporting Involvement of Patients and the Public short-form reporting checklist.<sup>39</sup>

## RESULTS

### Participants

Healthcare professionals from 46 hospitals were asked to participate. Forty-five (98%) consented to collaborate, representing 19 countries (18 countries were situated in Europe, Figure 1, Table 1, Supporting Information) and mainly medical doctors working in the neonatal unit (91%).

Despite the implementation of (components of) FICare, parent- and specifically mother-infant separation during maternity and/or neonatal care was very common (93%). We identified four themes for facilitators and barriers around parent-infant closeness at the hospital, unit, staff, and family level: *Culture*, *Collaboration*, *Capacities*, and *Coaching* (Figure 2 and Table 2). *Culture* was the overarching theme in our analyses, encompassing the other themes. Examples of facilitators are depicted in Figure S1.

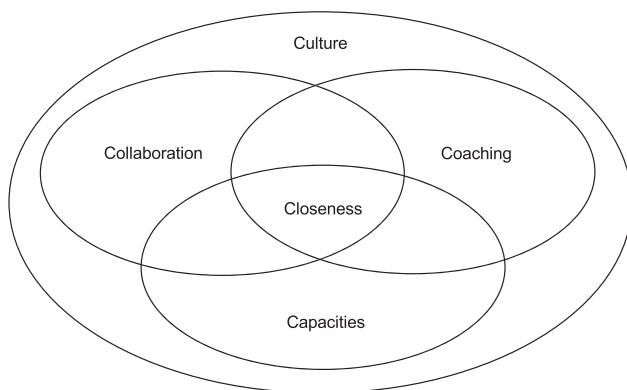
### Culture

*Culture* was described as jointly held characteristics, values, thinking, and behaviors of people in workplaces and organizations. For example, at the organizational (hospital- and unit-) level PPNC expert hospitals regarded parents on hospital or unit boards to be important. For the workplace (unit- or staff-) level, culture included professionals' attitudes towards parental presence and participation in care.

Parents' participation in infant care and continuous parental presence was facilitated if hospital- or unit-management and staff had open mindsets: "The staff know, we try to involve parents. But it's hard for the staff to change their



**FIGURE 1** European countries participating in the Creating Room and Opportunities On Wards for Newborns and their families (CROWN) study.



**FIGURE 2** Themes concerning facilitators and barriers to parent-infant closeness in neonatal care.

mind about it. Step-by-step the department and staff are becoming more open for parents.” [unit 25].

The workplace *Culture* varied from very natural: “It’s within the culture of the unit, the nurses are usually really upset if the parents are not there. They come to the doctor and complain [...] there are alarm clocks ringing if the parents are not there” [unit 37] to reluctant: “I think staff don’t

**TABLE 1** Characteristics of participating neonatal intensive care units (NICUs)

Variable	Characteristic (n = 45)
European NICU	44 (98)
Expert in parent-partnered neonatal care	6 (13)
Pediatrician/neonatologist interviewed	41 (91)
Number of beds in unit	21 (15–37)
Number of births in facility	3400 (2500–6000)
Number of admission to NICU per year	500 (285–1100)
Number of VLBW (<1500 g) per year	100 (55–145)
Level 3 NICU	42 (93)
Able to provide ECMO	7 (16)
Open access policy	32 (71)
Possibility to breast pump on the ward	44 (98)
Reclining chair available next to infant	42 (93)
Webcam available to see infant from home	3 (7)
Rooming-in possible before discharge to home	41 (91)
Single-family room plan	
Yes, for all patients	4 (9)
For specific patient populations	16 (36)
No	25 (55)
Facility near hospital where parents can stay	31 (69)
Early discharge program	9 (20)
Parent participation in medical rounds <sup>†</sup>	17 (38)
Structured education sessions for parents <sup>†</sup>	16 (36)
Structured training for healthcare professionals <sup>†</sup>	22 (49)
Mother-infant separation during infant or maternal care	42 (93)

Data are shown as n (%) or median (interquartile range). <sup>†</sup>Components of family integrated care. ECMO, extracorporeal membrane oxygenation; NICU, neonatal intensive care unit; VLBW, very low birthweight.

want parents around, because parents look on their hands” [unit 4]. Also, parents could feel unwelcome on the unit due to negative professional attitudes: “Sometimes there can be a nurse, that is not so nice, and parents feel not good unfortunately. It is the attitude of everyone how welcome you feel” [unit 4].

A *Culture* change was needed on the staff level, influencing current beliefs of power and hierarchical structures between professionals and parents to promote parent-infant closeness: “It’s so easy for the medical staff to dictate parents what to do, you keep the same [hierarchical] power structure. It’s hard for us to give the power to the family and ask them what they want to do and create a welcoming atmosphere that they want to stay there” [unit 36].

**TABLE 2** Facilitators and examples to promote parent-infant closeness

Facilitators (themes)	Level	Examples
<i>Culture</i>	Family	The family is willing to go home with extra medical care
	Staff	The staff is open to change
		The staff recognize that parents have knowledge on their child
		The staff endorse that parents have their own distinguished and added role within the NICU/care of their infant
		The staff value that parents are capable of taking care of their infant
		The staff respect and acknowledge parents in their own choices
Unit	The staff feels responsible for other part of the dyad	
Unit	The unit welcomes parents at all times	
Hospital	The hospital (management) is open to change and values their employees and patients	
<i>Collaboration</i>	Family	The family is able to arrange schedules and tasks between them and staff
	Staff	The staff can arrange schedules and tasks between them and the family
		The staff supports the family to achieve closeness according to their personal needs, preferences and pace
		The staff invites parents to family centered rounds
	Unit	The staff from different departments and specialties work together to minimize separation
		Different specialty units are open to each other or merged with each other
Hospital	The hospital (board) works together with unit, staff, and families	
<i>Capacities</i>	Family	The family has resources to come to hospital
	Staff	The staff perceives an acceptable workload
		The unit has resources and equipment present for the dyad
	Unit	The unit has an open access policy
		The unit has enough staff/acceptable patient load
		The unit has a dedicated person to support parents and/or staff
		The unit supports the use of IT/webcam
		The unit is set up with single-family rooms or has rooming-in rooms
		The unit provides facilities for parents to stay 24 h per day
		The unit has a policy of early discharge programs
		The unit promotes skin-to-skin care
		The unit has a policy of rooming-in before discharge
		The unit promotes breastfeeding
The unit has breastpumps available for all mothers		
Hospital	The hospital supplies patients/families with free meals and parking	
	The hospital has a facility close to hospital where parents can stay	
	The hospital arranges the localization of units within hospital conveniently to support parent-infant closeness	
<i>Coaching</i>	Family	The family educates staff
		The family receives education on special care and the needs of the infant
		Veteran parents support parents during the hospital stay
	Staff	The staff is educated on the importance of preventing parent-infant separation, family participation in care, and parental presence in the unit
		The staff is trained to perform care for another part of the dyad
		The staff is comfortable working inter-, cross-, and transdisciplinary
	Unit	The unit is educated on the importance of preventing parent-infant separation, family participation in care, and parental presence in the unit
	Hospital	The hospital has a policy for professionals to be trained and educated regularly

NICU, neonatal intensive care unit.

## Collaboration

*Collaboration* is working together on and between the different levels. The current (historical) division and compartmentalization between the maternity and neonatal departments within the hospital limited parent- and specifically mother-infant closeness in the postpartum period. Poor *Collaboration* and co-organization at the hospital, unit, and staff level impeded parent-infant closeness: “We always fight with them [about gavage feeding in the maternity ward], but we are different organizations so we are not the same” [unit 13].

Staff from different units and disciplines had to collaborate and work together to keep families close: “Sometimes we have an agreement with the maternity ward that they come and supervise us and take care of the mother and they can stay with their child” [unit 35]. In one unit, midwives were on the NICU department’s payroll and always present in the NICU for maternity care, others had full obstetric and neonatal co-organization of the unit, care, and staff.

Parent-staff *Collaboration* was also important. Some professionals referred to a distinct and added role for parents, enhancing *Collaboration* with the healthcare team: “It is kind of promoted that everybody has their own important role to play. Parents carry that sixth sense” [unit 12] and during painful procedures: “A very important role for parents is pain management, non-pharmacological [...] when they have this role to comfort the baby, they hold the baby, and many times we do not need pain medication” [unit 36].

Family-centred rounds (FCRs, 17/45, 38%) were important for parent-staff *Collaboration*. However, organizing schedules between parents and professionals could be challenging. Important were professional beliefs on the added and distinct role of parents: “I think FCRs are very wise. The parents could give us a lot of information about the infant” [unit 4]. Privacy issues limited FCR implementation in NICUs with open bay settings: “Parents cannot be in the unit because of confidentiality questions” [unit 3]. Some NICUs provided solutions in these settings such as headphones for other parents during FCRs and signing confidentiality agreements. Some professionals regarded FCRs as less efficient: “Parents used to be present during daily rounds. But now we changed the way that we are doing rounds. It is in a separate room, so they are not invited anymore. It is more efficient and faster” [unit 41]. Other interviewees described increased efficiency, as parents often do not require extra information after the FCR. In single-family rooms (SFRs), privacy was not an issue, and SFRs contributed to parent-staff *Collaboration*.

## Capacities (resources and policies)

*Capacities* included resources of supply or support which could be physical (e.g., equipment) or human (e.g.,

staffing). Policies included guidelines that determined courses of action (e.g., welcoming policies) as well as logistics.

## Resources

At the hospital level, obstetric and maternity departments were sometimes distant from the NICU, preventing mothers from being with their babies continuously: “Our maternity ward is in another building” [unit 16].

At the unit level, SFRs (available in 20/45, 44%) were facilitators for parent physical presence at the bedside of the infant, but also other amenities (independent of SFRs) were important for 24-h presence such as a bed, a kitchen, a bathroom, and comfortable chairs. Lack of space limited closeness between parents and their infant: “The big difficulty for us is space, you know, we’ve got several babies in a room with lots of equipment, and it is very difficult” [unit 3].

For staff, available time, (under)staffing issues, and high patient loads hindered parent-infant closeness: “We don’t like to give an intravenous catheter on the maternity ward, as it is a very busy ward and if these nurses need to take care of these babies then they do not take care of other babies—they do not have time to do everything” [unit 24].

Resources (such as maternity beds and midwives in the NICU and gavage feeding or phototherapy in maternity wards) impacted parent-infant closeness. More than half of the hospitals had patient hotels or Ronald McDonald Houses (31/45, 69%), where parents could stay after the mother was discharged (usually 5–7 days after birth). However, sometimes these were earmarked for parents living far away and were not always available to all parents. Many NICUs indicated rooming-in before discharge to home to be important and to be common practice (41/45, 91%).

Several family resources were important for family presence, including financial resources, distance to the hospital, and family composition. Professionals were ambivalent about the implementation of IT applications and specifically a webcam to achieve closeness between parents and their infants during hospital stay (available in 3/45, 7%): “No, we want them [the parents] to be present in the unit” [unit 35].

## Policies

On the hospital level, free meals and free parking for parents were deemed essential and on the unit level, policies for parent-infant closeness included promotion of (early) SSC, promotion of breastfeeding, and availability of breast pumps (44/45, 98%), parent participation in care and decision-making, and open access policies (32/45, 71%). Mother and infant health determined logistics: “Babies can go there [mother-baby-unit] as long as they are showing

signs that they can feed on their own” [unit 3]. Often logistics limited parent-infant closeness, because mothers would usually be transferred consecutively from antenatal wards to delivery rooms, to maternity wards, and then to home, which was different from the infant hospital stay in the NICU.

Early discharge and homecare programs (9/45, 20%) facilitating gavage-feeding and cardio-respiratory monitoring for families at home were important, but lack of structured education for parents and sometimes far distances inhibited successful implementation.

### Coaching

Finally, *Coaching*, often referred to as “education”, acquiring and transferring knowledge and skills, was important. Currently, a discrepancy between professionals’ training and specifically what the reality of keeping mothers and infants together postnatally requires them to do, is present. If the staff was not educated and did not feel comfortable in taking care of either mother (NICU-professionals) or infants (obstetric or maternity care professionals), parent-infant closeness was limited: “Maternity nurses and midwives are not comfortable with providing that sort of care” [unit 39]. Some units exchanged or collaborated between staff: “We have had this rotation; our NICU nurses went to the prenatal and postnatal ward and midwives were in our unit for periods” [unit 36]. *Coaching* staff was either implemented regularly by structured training programs in the unit (22/45, 49%), at the start of working in the unit by senior staff, or by parents. *Coaching* was enhanced by *Culture* and *Collaboration*: “You need to provide education for staff because they support families involved. That is a big part of what happens. When a new nurse starts in the unit they are orientated in integrated care and coached by a parent” [unit 40].

*Coaching* at the family level was important, for families to acquire knowledge on the special care and needs of their infant and to promote parent-infant interaction. Education sessions were implemented structurally in 16/45 (36%) units.

### Relationships between themes

*Culture* was the overarching theme in our analyses, encompassing the other themes, centered around closeness (Figure 2). A *Culture* can be nurturing for closeness through *Coaching*, *Collaboration*, and *Capacities*. *Collaboration* and a *Culture* of *Collaboration* to achieve closeness was characterized by co-working and coordination of care between the same levels (e.g. the neonatal and obstetric units working with each other) and between different levels within the hospital (e.g. *Collaboration* between staff and the unit management, and *Collaboration* between parents and staff). *Collaboration* could be limited

by *Capacities* (e.g. staffing issues) but facilitated by *Coaching* (e.g. Coaching neonatal nurses on maternity care). *Coaching* is related to *Culture* (some hospitals find teaching very important with many professionals in training), but also to *Capacities* (e.g. dedicated professionals organizing educational sessions) and *Collaboration* (educated on the importance of *Collaboration* and *Collaboration* between professionals facilitated *Coaching*).

## DISCUSSION

In this study, we describe current practices in neonatal care with facilitators and barriers to parent-infant closeness in 19 countries. Despite the willingness to facilitate parent-infant closeness, many barriers exist that prevent zero-separation in a vast majority of the units examined.

NICU professionals encountered challenges for parent-infant closeness within four main themes of facilitators and barriers on and between the hospital, unit, staff, and family level: *Culture* (jointly held characteristics, values, thinking, and behaviors), *Collaboration* (the act of working together between and within different levels), *Capacities* (resources and policies), and *Coaching* (education to acquire and transfer knowledge and skills).

This study provides tangible and comprehensive data to support the call-to-action to achieve zero-separation during neonatal care,<sup>7,21</sup> and shows where priorities should be given. Enabling parents’ participation in care and presence can give them a sense of closeness.<sup>4</sup> However, implementing the four pillars of FICare alone might not be enough to facilitate parent-infant closeness and zero-separation.<sup>11</sup> We show that despite the implementation of FICare components and knowledge of the negative health effects of parent-infant separation,<sup>1,40</sup> healthcare professionals still encounter challenges to keep families close. Especially, keeping mothers and infants together during specialized neonatal or maternity care is not common practice yet, and attention should be given to this topic in future innovations.<sup>1,7,25,41</sup>

Change within hospitals and units can be very challenging, specifically when it concerns hospital(care) culture,<sup>42</sup> which we found was the overarching theme within our analyses in concordance with previous research.<sup>20,34,43</sup> The SFR design (as part of *Capacities*) has long been promoted to be the solution, but this might solely increase parental presence and not necessarily parental feelings of closeness or participation in care.<sup>9,44</sup> Above, without *Coaching* or *Collaboration* the SFR design alone may not be the solution. And therefore, endorsing facilitators within the other themes could also have a potentially great impact on parent-infant closeness if budgets are under constraint.

We included the Canadian site because of its unique pioneering role concerning FICare worldwide. This might have

introduced bias in sites, but due to the qualitative nature of our study and as we believe saturation was met because no new items arose during our interviews, we think these results give a fair example of the facilitators and barriers healthcare professionals encounter within the NICU context of included countries. Future research could purposefully search for units in other and more countries or for instance in developing countries and compare their results with ours, as FICare practices are on the rise in other parts of the world too.<sup>45</sup>

Interviews were held just before the emergence of the COVID-19 pandemic, which imposed even stricter policies on parental presence and participation in neonatal units, increasing parent-infant separation.<sup>21,46,47</sup> We show, that also before the pandemic, issues regarding parent-infant closeness were already present. The themes we encountered could therefore possibly be even more urgent and relevant as family supportive post-pandemic neonatal care practices are (re)established.

The results represent NICU professional views and we did not include obstetricians, midwives, and parents that experienced the healthcare in the included hospitals. Keeping families close could be different from their point of view in that same setting, and should be explored in depth in future research. Especially, we were unable to explore the perception of emotional closeness and the pathways towards emotional closeness that might be facilitated in the included units from parents' perspectives.<sup>32</sup> Also, the exact roles parents play in the infant's care team and their potential added role within multidisciplinary teams remains to be elucidated.

One of the strengths of our study is that we included parents during all phases of conduct and analysis, making the results and challenges that are met meaningful for all stakeholders. Moreover, we have interviewed a large sample throughout Europe, whereas previous studies have focused either on healthcare professionals with high incentives for PPNC models,<sup>33,34</sup> or on quantitative outcomes<sup>26,28,29,33</sup> without addressing an in-depth understanding of the matter of parent-infant separation specifically.

Future research should focus on the different (aspects of) care concepts, themes, and workplace cultures we encountered in our study, the fidelity of care models, and the potential pathways towards outcomes of parents and their infants with for instance network meta-analyses<sup>48,49</sup> or mediation analyses.<sup>14,50</sup> As much data is arising on the benefits of parent participation in care and zero-separation,<sup>10,11,14,15,50</sup> next studies should work with methods from an implementation science point of view to promote the systematic uptake of these clinical research findings into routine neonatal care.<sup>51</sup> Additionally, research should focus on an exact definition and measurement of "zero-separation" in

this context, as one can still feel emotionally connected without being physically present. Lastly, core outcome sets for family care are needed to be able to perform these and future robust studies.<sup>52</sup>

In conclusion, here we describe current practices in neonatal care with facilitators and barriers to parent-infant closeness in 19 countries. Parent-infant separation during infant and/or maternity care is still very common in participating units. Further optimization in neonatal care towards zero-separation and parent-infant closeness can be achieved by enforcing on the family-, staff-, unit- and hospital-level the 'four Cs for Closeness': *Culture, Collaboration, Capacities, and Coaching*.

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## CONFLICT OF INTEREST

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## SUPPORTING INFORMATION

Additional Supporting Information may be found online in the supporting information tab for this article.

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