

The effect of the NICU environment on parents' participation: A focus on the father's role

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SHINE Conference Orlando
22 January 2026



Father's perspective



A still picture from the YouTube video introducing the NICU in Turku.

Psychological environment can be modified



Ahlqvist-Björkroth S, Axelin A, Lehtonen L.
Close Collaboration with Parents - Implementation
and effectiveness.

Acta Paediatr 2025;114(4):699-709.

Special Issue: Parenting interventions in the neonatal intensive care unit

Editor: Liisa Lehtonen

Guest Editors: Sari Ahlqvist-Björkroth and Rosario Montirosso

Physical space can be modified



You can find more information on family-centered “NICU in Turku” in a YouTube video

Outline of presentation

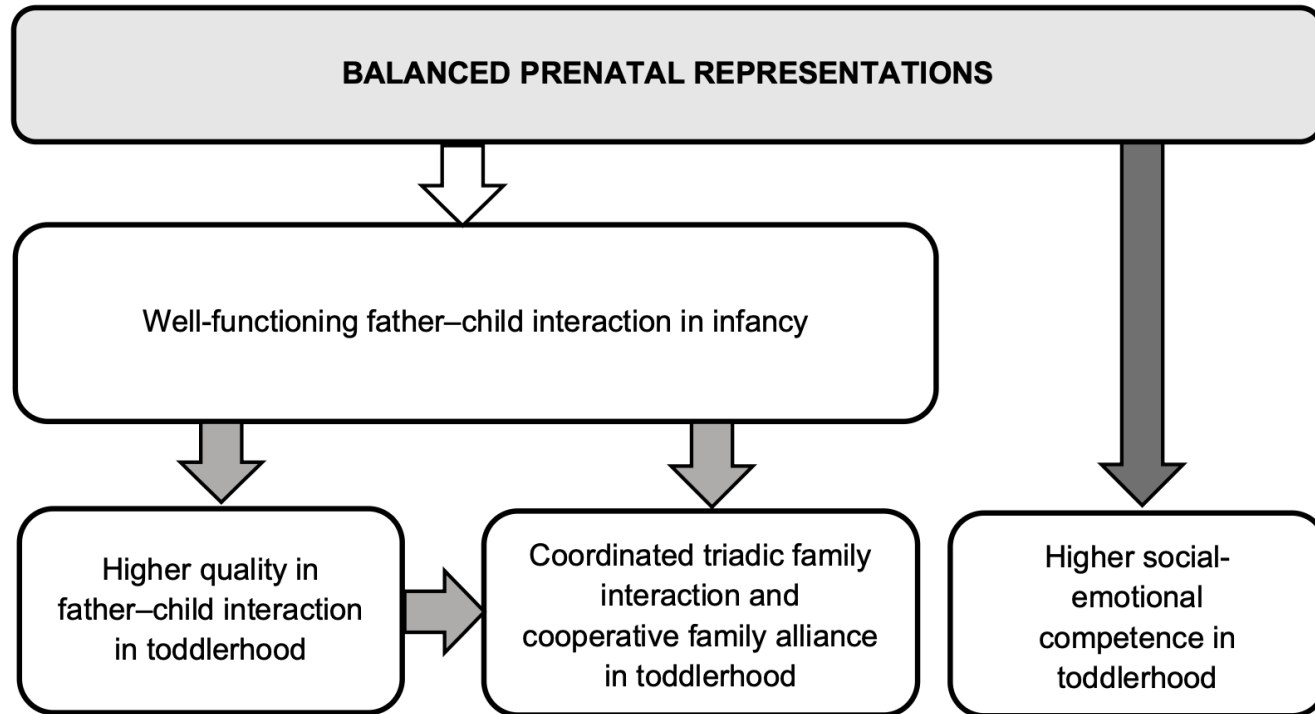
1. Background of the physiology and psychology
2. Effects of modifying the psychological environment
3. Effects of modifying the physical space for parents
4. Experiences of a father staying for 5 months in the NICU
5. Future directions



“I want to enjoy this time which is once in lifetime.”

-Father of a 23 weeker

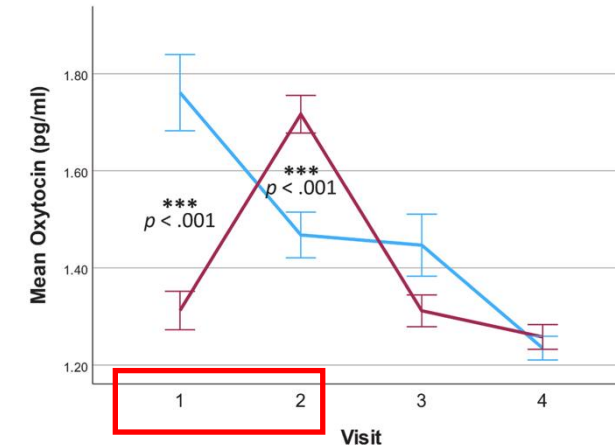
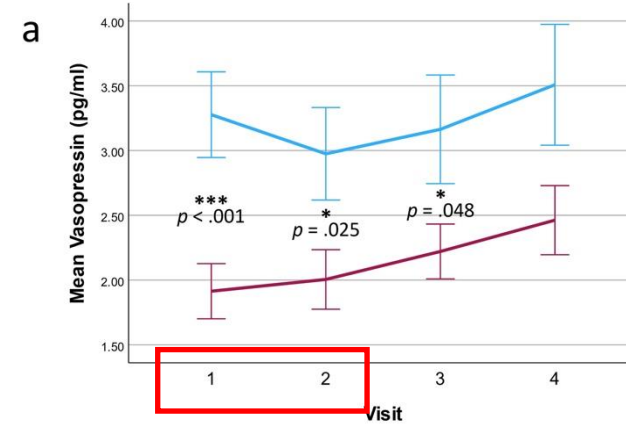
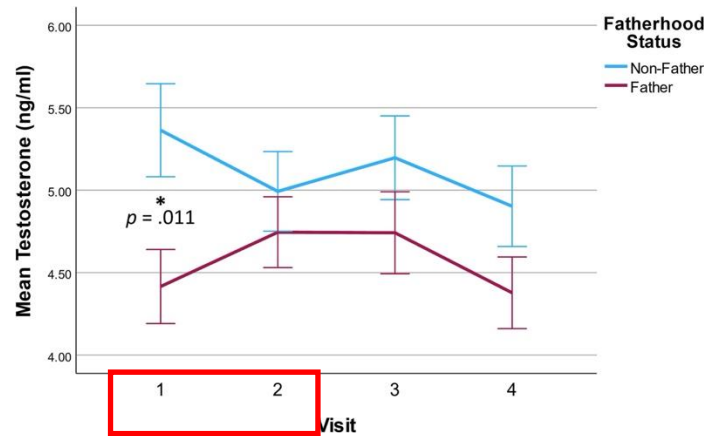
Fathers form an emotional bond with their infant during pregnancy → the basis for early parenting practices



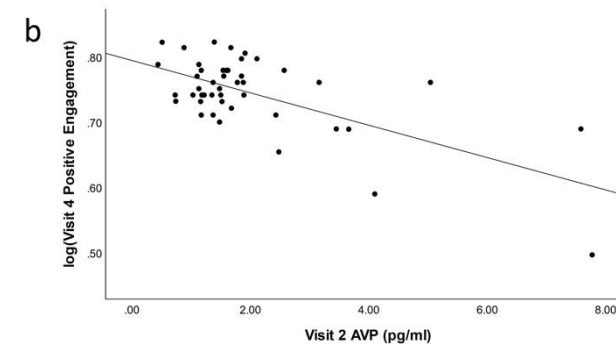
Johanna Lindstedt: Prenatal representations, early family relationships and child social-emotional development: The Father's contribution <https://urn.fi/URN:ISBN:978-951-29-9944-6>

Lindstedt J et al. J Family Psychology, 2021; Family Relations, 2024; Attachment & Human Development, 2024.

Expecting fathers experience hormonal changes which prepare them for fatherhood



Testosterone and vasopressin levels were lower in expecting fathers. Oxytocin levels higher during late pregnancy.



Rilling JK, et al. Horm Behav 2025; 171: 105740

Vasopressin levels showed a negative correlation with positive engagement with the child

Transition to fatherhood after the birth

- Reciprocal father-infant interaction elicits hormonal and neurobiological changes
 - Interaction alters oxytocin, vasopressin and testosterone levels
 - improve synchrony of interaction and alter emotion regulation areas in the brain
 - affect interaction → positive circle → →
 - Oxytocin administration activated brain circuits important in caregiving (reward and motivation; empathy and attention) (Li et al 2017)
- Fathers - more playful and more physical stimulation
 - No different in sensitivity (Volling et al 2002)
- Reciprocal interaction and secure attachment with the father predicted
 - less emotional and behavioral problems in their children, better peer relations and less aggression
 - more optimal involvement in a child's life later

Abraham & Feldman

Clinical Child Family Psychology Review 2022; 25:93–109.

Men have oxytocin too!



Transition to fatherhood in the NICU

- All newborns have the right to be close to their parents
- Fathers - like mothers - should have the right to be parents even (and especially) when their child needs medical care
- A time window for the father to provide closeness experiences to the infant when the mother is recovering physically and mentally
 - Father's interaction can be buffering when the mother is depressed
- Skin-to-skin contact increases oxytocin and decreases cortisol levels and decreases anxiety also in fathers (Vittner et al 2015, 2023) → more synchrony and bonding behaviors
- Both psychological and physical space are needed in the NICUs, also for fathers, to allow parenting



How can the staff learn to support parents to support their children



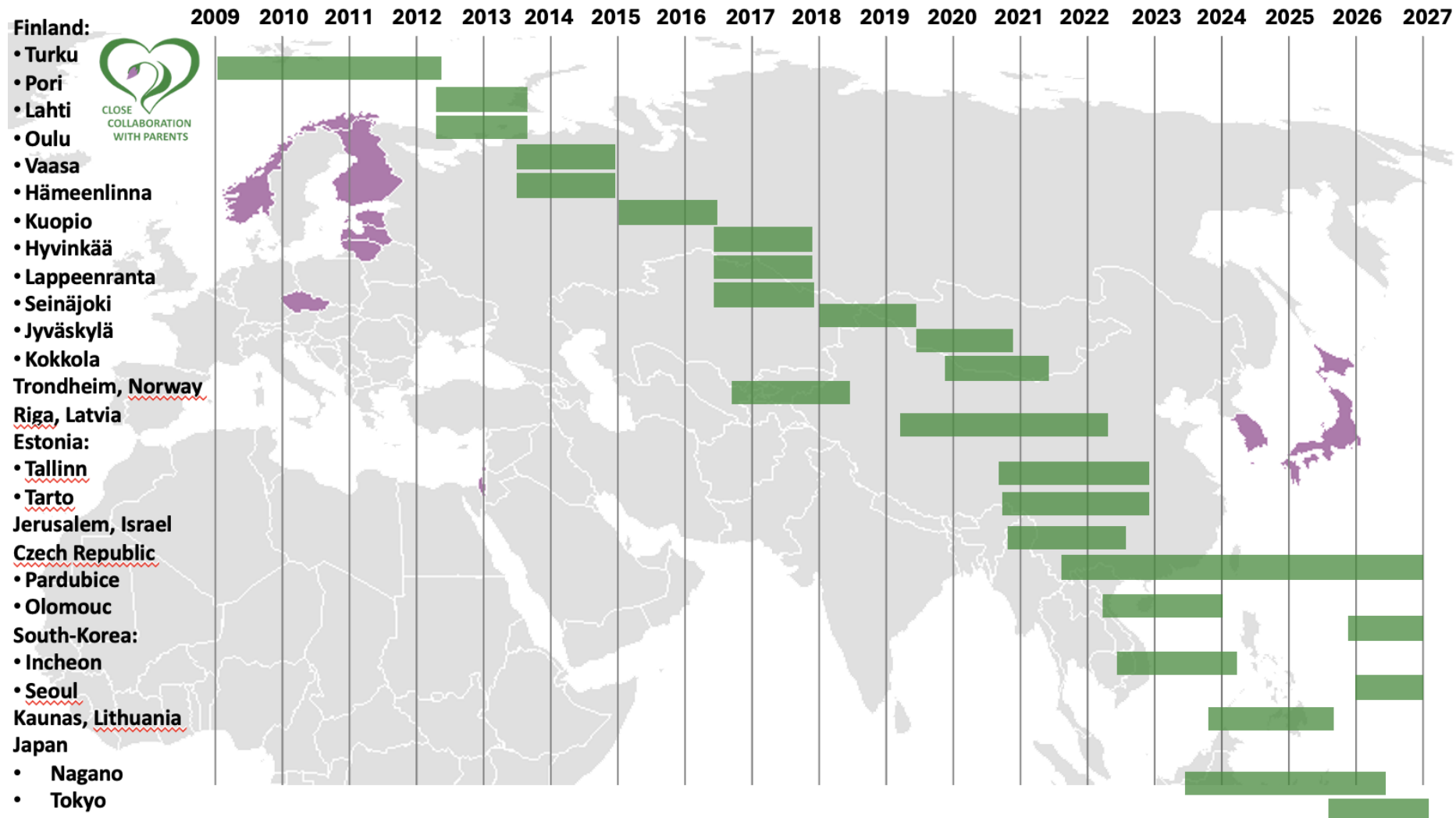
Close Collaboration with Parents training for NICU staff to build their competencies to collaborate with parents and to change attitudes and priorities

- A 18-month-long systematic training at bedside to the whole NICU staff
- The goal is to change in the care culture
 - by learning to observe infants together with the parents, to listen parents' observations and validate them
 - by learning to listen to parents' preferences
 - by learning an empathetic, non-judgemental attitude
 - by learning to negotiate the care decisions with parents

→ a supportive partnership in care → nurturing parent-child relationship

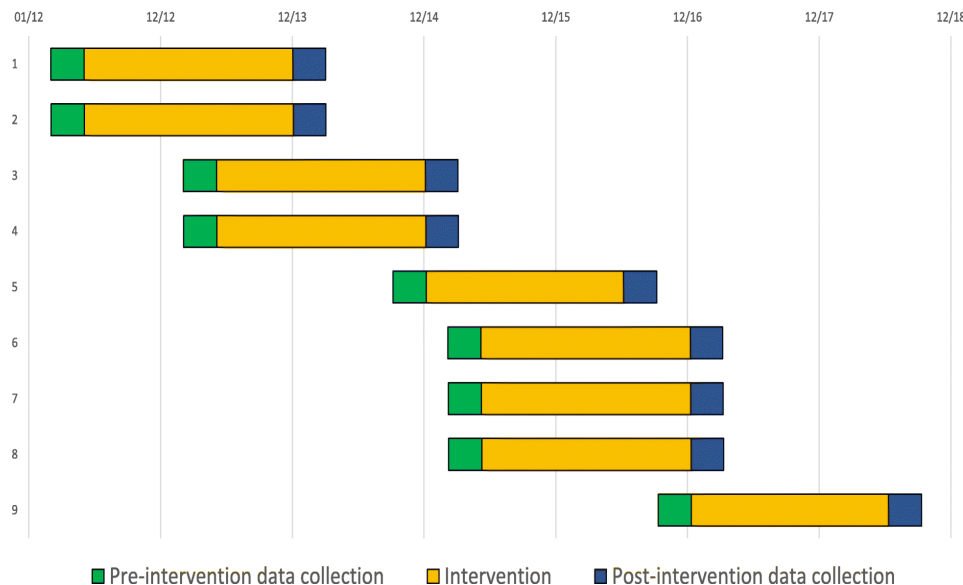


Close Collaboration with Parents training has been carried out in >30 NICUs in 9 countries over 14 years



Close Collaboration with Parents training increased parents' presence and parent-infant skin-to-skin contact (SSC) in 9 NICUs in Finland

Closeness Diary before and after the training



Parent's **presence** increased from mean 453 min (SD 331) to 620 min/day (SD 371)

- **intervention effect 99 min per day,**
 $p = 0.0007$ (adjusted statistical model)

SSC increased from mean of 76 min (SD 84) to 114 min/day (SD 83)

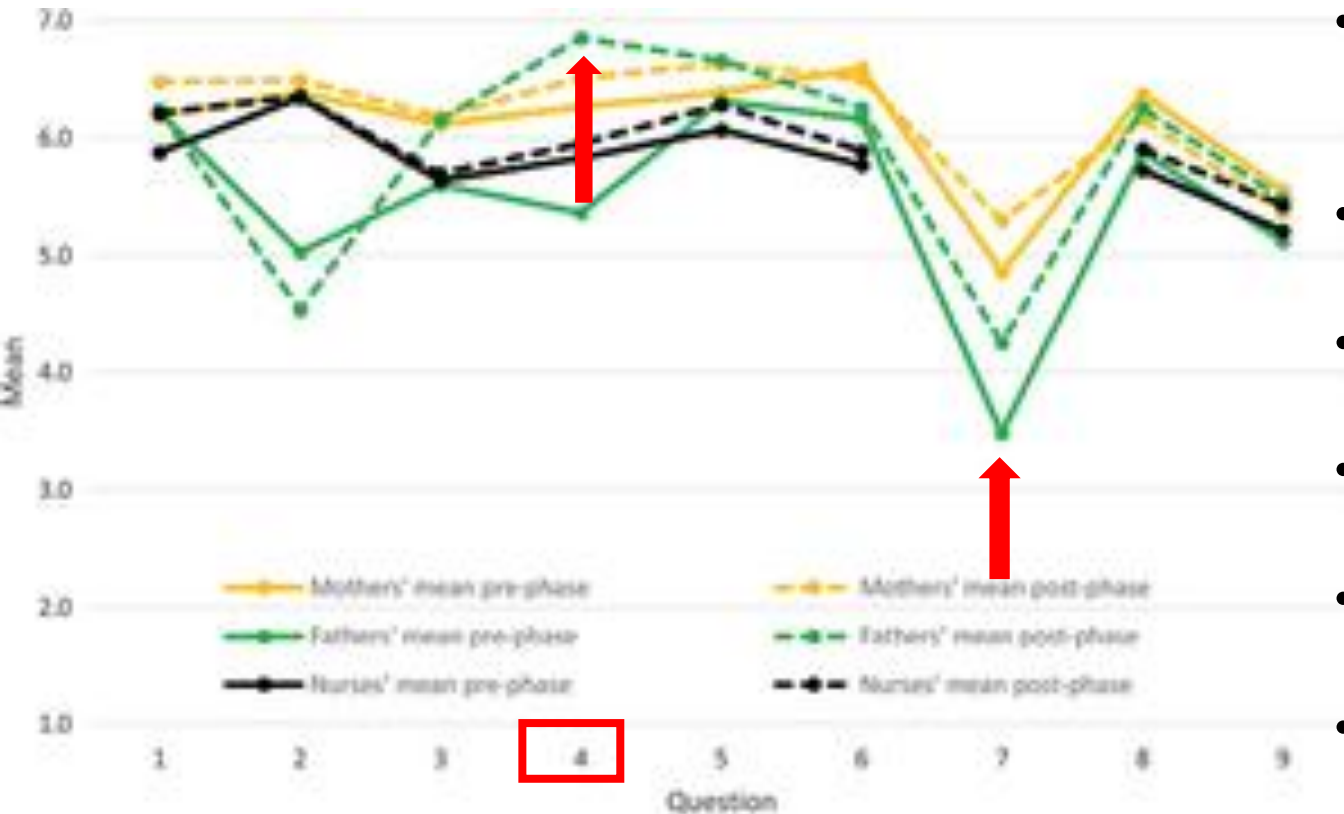
- **intervention effect 24min/day,**
 $p = 0.0405$ (adjusted statistical model)

Effect sizes were similar regardless of the baseline level of the unit)

Mother's and father's presence and skin-to-skin contact after Close Collaboration with Parents

- Mother's presence increased from 517 min to 624 min, by **107 min per day**,
 $p = 0.0004$
- Father's presence increased from 305 to 374, by **68 min per day**,
 $p = 0.01$
- Mother-infant SSC increased from 69 min to 91 min, **by 22 min per day**,
 $p = 0.03$
- Father-infant SSC increased from 38 min to 46 min, by 8 min per day,
 $p = 0.3$

The quality of FCC measured by 9 questions before and after Close Collaboration with Parents training in 5 NICUs in Finland

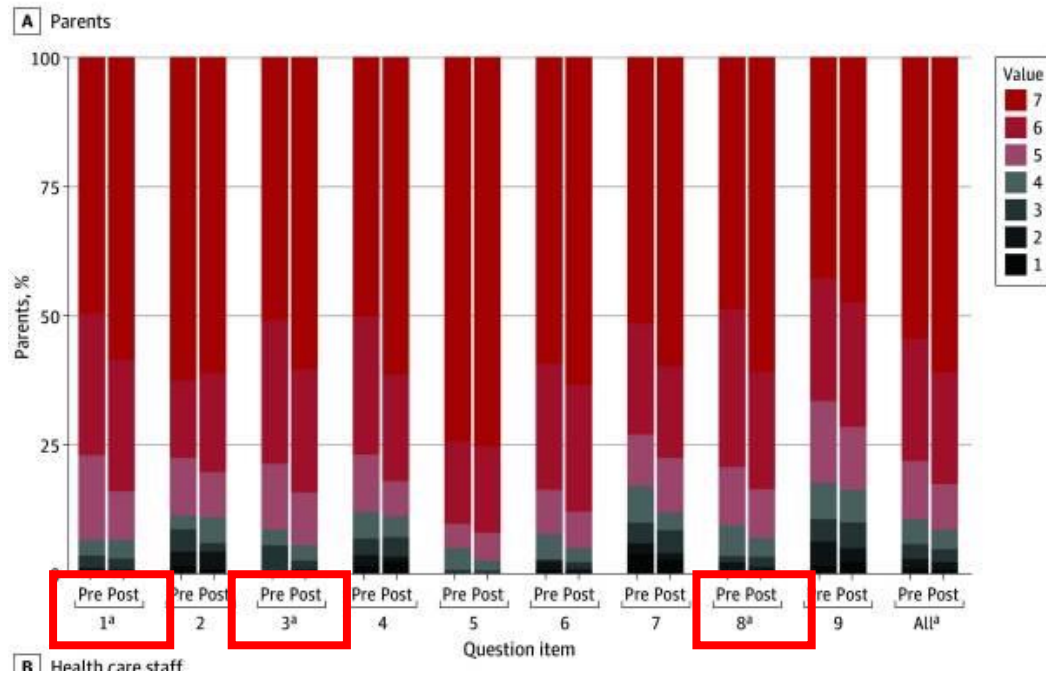


- 31 and 21 fathers (green) and 53 and 61 mothers (yellow) of preterm infants before and after (dashed line) the intervention
- Fathers' total score improved after the intervention from 5.61 to 6.07, $p = 0.02$
- Most improvement in “Shared decision making”: from 5.36 (SD 1.72) to 6.85 (SD 0.32) $p = 0.002$
- Mothers’ scores close to the maximum before the intervention, little room for improvement
- Fathers’ support and participation lower at the baseline, more room for improvement
- The intervention was able to change the care culture so that it met better fathers’ needs

- | | |
|----------------------------------|---|
| 1. Active listening | 6. Mutual trust (staff → parent) |
| 2. Participation in care | 7. Participation in medical round (not asked from nurses) |
| 3. Individualized guidance | 8. Individualized information |
| 4. Shared decision making | 9. Emotional support |
| 5. Mutual trust (parent → staff) | |



The quality of FCC measured by 9 questions before and after Close Collaboration with Parents training in 6 NICUs in Estonia



- Intervention improved parents' total score and specifically the following items
 - To which extent you were listened to today?
 - To which extent did you receive individualized guidance?
 - To which extent did you receive emotional support?
- 186 and 208 mothers and 22 and 55 fathers
 - Covid restrictions affected the data collection as it occurred in March-Aug 2021 for the preintervention and Dec 2022-June 2023 for the postintervention period



Mothers had less depressive symptoms after Close Collaboration with Parents training in Turku University Hospital



In the cohort after the training, the mothers of VLBW infants had lower EPDS scores compared to a historical cohort from 2001-2006

at **6 months**
by median 2.69
(95% CI 1.58-4.22),
 $p < 0.001$

at **24 months**
by median 2.56
(95% CI 1.64-3.48),
 $p < 0.001$

at **24 months**
fewer mothers
exceeded the threshold
of 12, $p = 0.009$

The benefits of improved NICU care culture are long-lasting

2nd International Closeness Survey

- Parents of 739 preterm infants from 23 NICUs; 15 countries in 2018–2020
- Parents reported by daily text messages the quality of FCC, 9 questions
- Parents filled in Closeness Diary for 14 days (presence, holding and skin-to-skin contact)
- The Edinburgh Postnatal Depression Scale (EPDS) was collected at discharge and at 4 months after the due date.

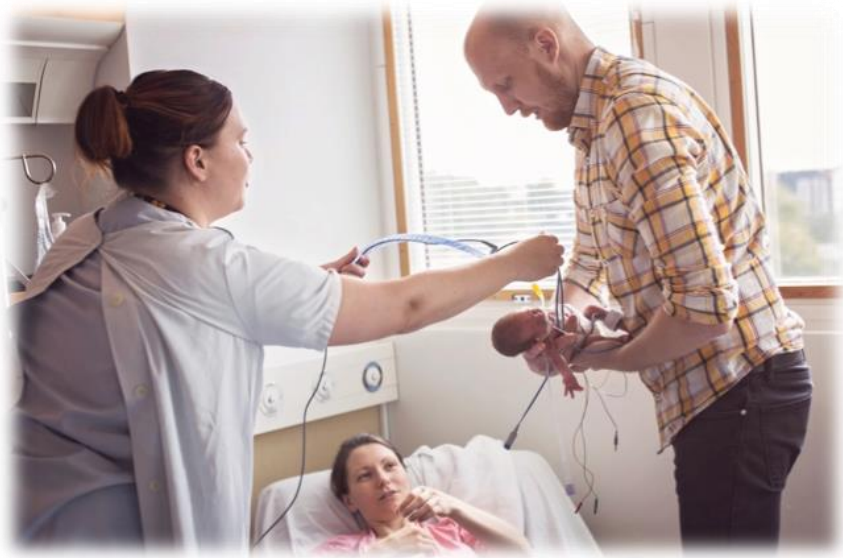
- Mothers' mean EPDS score
 - 9.19 (SD 5.0) at discharge
 - 6.66 (SD 4.73) at 4 months
- Mothers' EPDS scores ≥ 13
 - 25.3% at discharge
 - 12.3% at 4 months
- Fathers' mean EPDS score
 - 6.34 (SD 4.41) at discharge
 - 4.45 (SD 4.21) at 4 months
- Fathers' EPDS scores ≥ 13
 - 8.3% at discharge
 - 5.8% at 4 months

Axelin A, Feeley N, Cambell-Yeo M, ..., Lehtonen L; SCENE research group. Symptoms of depression in parents after discharge from NICU associated with family-centred care. *J Adv Nurs*. 2022;78(6):1676-1687.

Lehtonen L, Lilliesköld S, De Coen K, ... , Axelin A; Separation, Closeness Experiences in Neonatal Environment (SCENE) research group. Parent-infant closeness after preterm birth and depressive symptoms: A longitudinal study. *Front Psychol* 2022;13:906531.

Results of the 2nd International Closeness Survey

Parents in 23 NICUs in 15 countries (13 in Europe, 1 in Australia, 2 in Canada) in 2018-2020



- Higher quality of family-centered care associated with fewer depressive symptoms in both parents of preterm infants; key aspects staff–parent partnership and emotional support
- The duration of physical closeness did not associate with parents' depressive symptoms
- focus on the quality of the interaction

Axelin A, Feeley N, Cambell-Yeo M, ..., Lehtonen L; SCENE research group. Symptoms of depression in parents after discharge from NICU associated with family-centred care. *J Adv Nurs*. 2022;78(6):1676-1687.

Lehtonen L, Lilliesköld S, De Coen K, ... , Axelin A; Separation, Closeness Experiences in Neonatal Environment (SCENE) research group. Parent-infant closeness after preterm birth and depressive symptoms: A longitudinal study. *Front Psychol* 2022;13:906531.



Conclusion: Psychological environment matters

- Educational intervention to the neonatal staff changed care culture and
 - increased parental presence by 37%
 - increased skin-to-skin contact by 51%
 - decreased high scores of depressive symptoms in the mothers by 67%
- Family-centered care associated with fewer depressive symptoms in both parents up to 4 months after discharge

Outline of presentation

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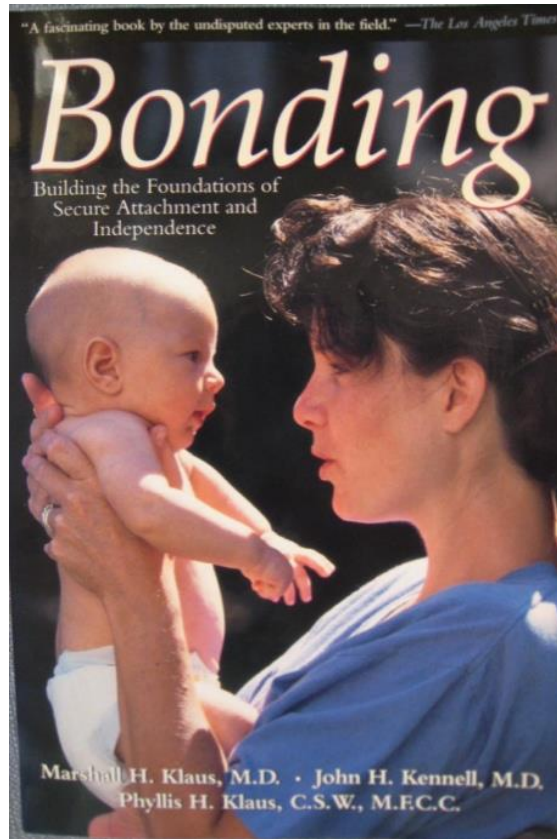
To involve fathers, provide beds for both parents

- 22 NICU rooms, including 8 twin rooms
- All are family rooms with two hospital beds for parents and a bathroom with a shower
- Mother's postpartum care is provided in the same room with the infant care (=couplet care)
- A midwife call system for the mother
- Silent monitors, nurses have mobile devices for alarms



Klemming S, Lilliesköld S, Arwehed S, Jonas W, Lehtonen L, Westrup B. Mother-newborn couplet care: Nordic country experiences of organization, models and practice. *J Perinatol.* 2023;43(Suppl 1):17-25.

Single-family room intervention in Cleveland in early 1990s



Researchers made the following observations:

- Most of the mothers closed the door "*shutting out any chance of observation*"
- Mothers were not satisfied until **unlimited visiting for fathers and comfortable chairs**
- The babies seemed to be quieter, mothers had more breastmilk and several mothers insisted taking their baby home earlier than planned.

Klaus MH, Kennell JH, Klaus PH:

Bonding. Building the foundations of secure attachment and independence. 1995

Historical pictures from Turku NICU until 2014



Flacking R, Dykes F. 'Being in a womb' or 'playing musical chairs': the impact of place and space on infant feeding in NICUs. BMC Pregnancy Childbirth 2013;13:179.

An attitude change is the starting point



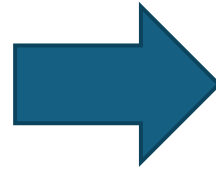
- To learn to appreciate the meaning of this moment for the baby and the parents
- Understanding is followed by action: the bed for the parents was brought in a 4-patient NICU room in 2010

Architectural change in Turku in 2014

from 4-patient rooms to 1-2 patients per room



Effects of the architectural change in Turku in 2014



The duration of time (q1-q3) when at least one parent was present

Median from 5.9 (4.9-7.6) → 10.2 (7.6-13.2) hours per day

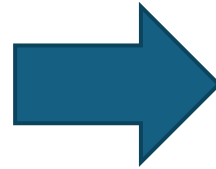
Minimum from 2.3 → 4.0 hours per day

Maximum from 10.5 → 21.0 hours per day

Kainiemi E, Hongisto P, Lehtonen L, Bape P, Axelin A. J Perinatol 2021;41(9):2244-2251.

Toivonen M, Lehtonen L, Löyttyniemi E, Axelin A. Early Human Dev 2017;106-107:59-62.

Effects on mothers' and fathers' presence



The duration of time (q1-q3) when **father** was present

Median from 3.2 (2.6-5.0) → 5.9 (3.4-8.1) hours per day

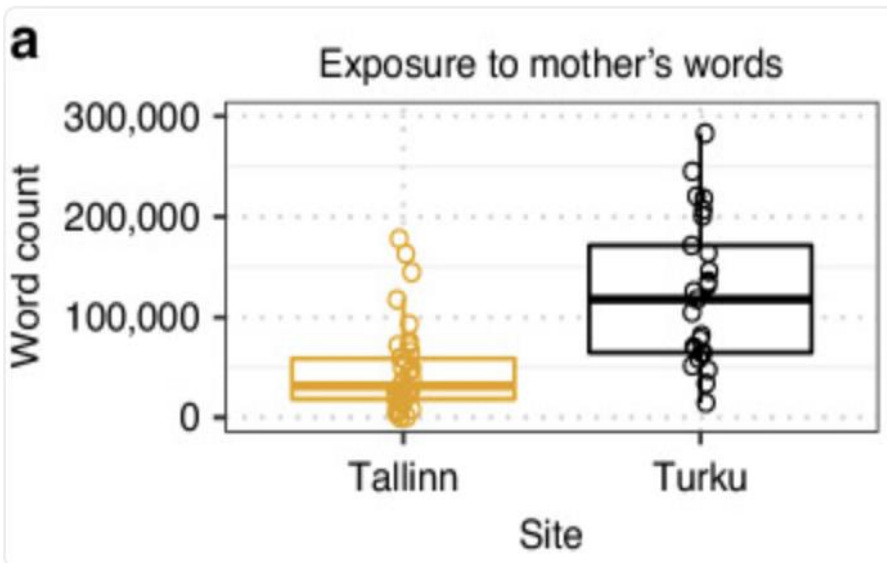
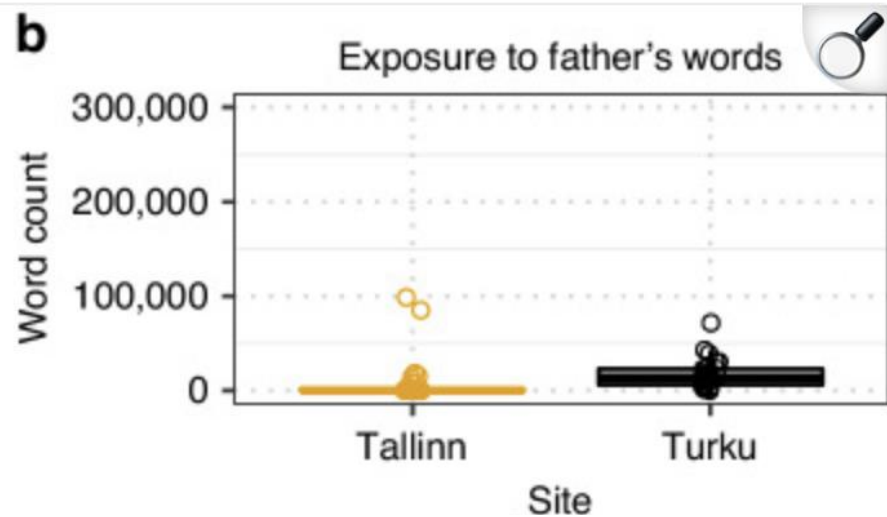
The duration of time (q1-q3) when mother was present

Median from 5.2 (4.6-7.2) → 9.1 (7.2-11.3) hours per day

Kainiemi E, Hongisto P, Lehtonen L, Bape P, Axelin A. J Perinatol 2021;41(9):2244-2251.

Toivonen M, Lehtonen L, Löyttyniemi E, Axelin A. Early Human Dev 2017;106-107:59-62.

Exposure to parent's words in a single-family room NICU (Turku) vs shared rooms NICU (Tallinn)



LENA recording of auditory environment for one day
Father's words

- 14 words/hour in Tallinn
- 329 words/hour in Turku

Father's words in two weeks (diary for the presence)

- 151 words in Tallinn
- 3440 words in Turku

Aija A, Leppänen J, Aarnos L, Hyvönen M, Ståhlberg-Forsén E, Ahlqvist-Björkroth S, Stolt S, Toome L, Lehtonen L.

Pediatr Res 2024;96(7):1803-1811.

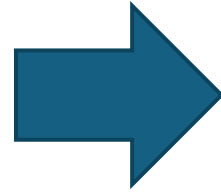
The 12-year journey from the first adult bed in a shared NICU room to single-family rooms with two adult beds

The picture from the NICU at Turku University Hospital in 2010: Parents' bed in a shared intensive care room for 4-6 patients



Picture from the NICU at Turku University Hospital in 2022: A standard single-family room with two adult beds for the parents.

Effects of single family rooms and couplet care in Turku in 2022



The duration of time when at least one parent was present, mean (SD)

10.8 (SD 4.4) hours per day



21.2 (SD 2.8) hours per day, $p < 0.001$

The nights per week when at least one parent stayed overnight, mean (SD)

1.7 (SD 2.3) nights per week

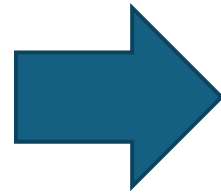


6.4 (SD 1.1) nights per week, $p < 0.001$

Itoshima R, Korhonen K, Axelin A, Ahlqvist-Björkroth S, Hovi A, Lehtonen L.

Effect of couplet care on early parent-infant closeness among preterm infants. *Acta Paediatr.* 2025;114(5):903-912.

Effects on the fathers' presence



The duration of time when father was present, mean (SD)

5.7 (SD 3.6) hours per day



11.5 (6.9) hours per day, $p < 0.001$

The nights per week when father stayed overnight, mean (SD)

0.4 (0.8) nights per week

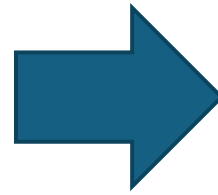


3.3 (2.8) nights per week, $p < 0.001$

Itoshima R, Korhonen K, Axelin A, Ahlqvist-Björkroth S, Hovi A, Lehtonen L.

Effect of couplet care on early parent-infant closeness among preterm infants. *Acta Paediatr.* 2025;114(5):903-912.

Effects on the mothers' presence



The duration of time when mother was present, mean (SD)

9.8 (3.9) hours per day



20.5 (2.9) hours per day, $p < 0.001$

The nights per week when mother stayed overnight, mean (SD)

1.3 (2.0) nights per week



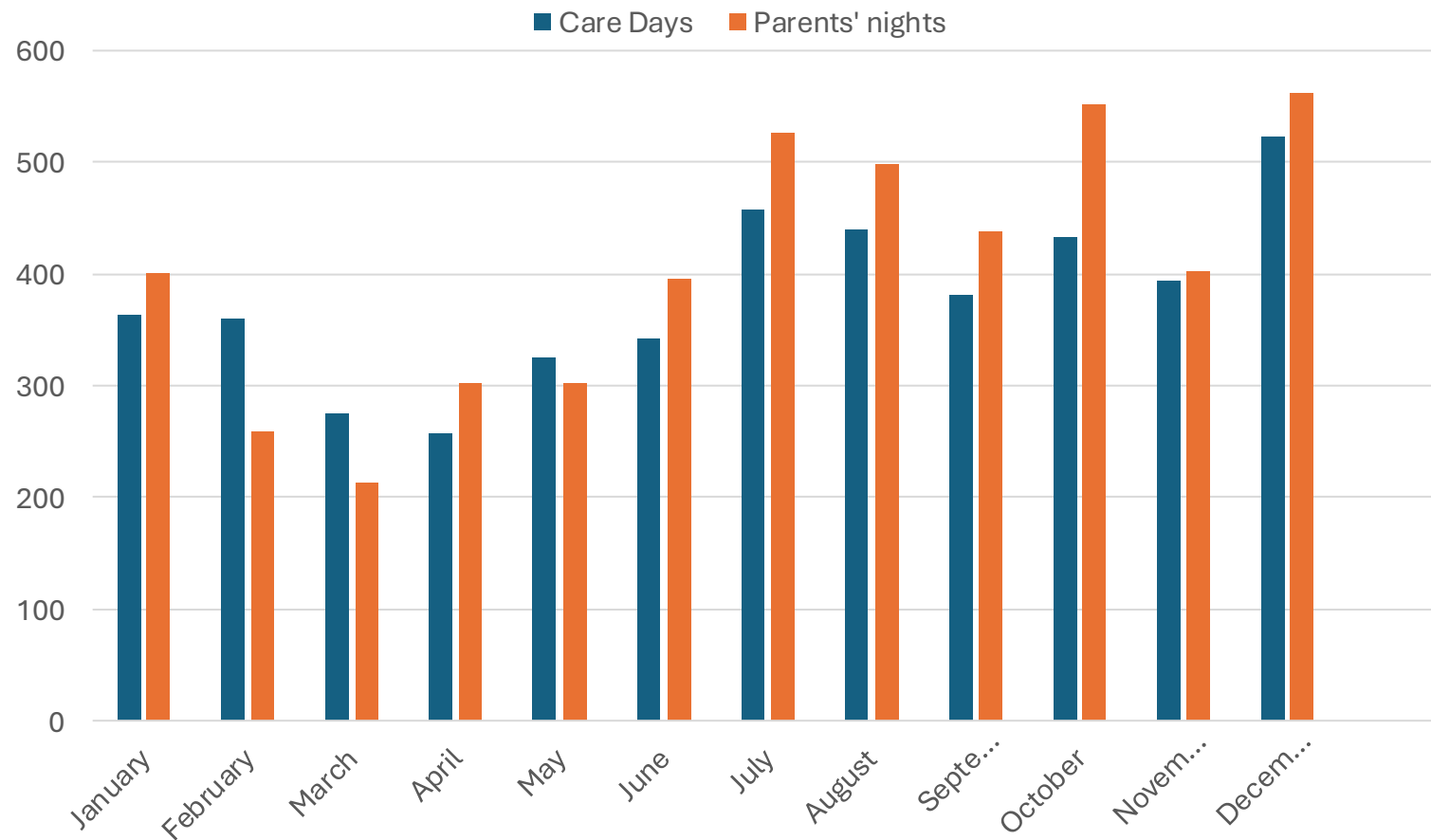
6.3 (1.1) nights per week, $p < 0.001$

Itoshima R, Korhonen K, Axelin A, Ahlqvist-Björkroth S, Hovi A, Lehtonen L.

Effect of couplet care on early parent-infant closeness among preterm infants. *Acta Paediatr.* 2025;114(5):903-912.

More than one parent per baby each night

All NICU patients in Turku in 2025: 4550 infant care days, 4849 parents' overnight stays



Promoting parent-infant closeness in the delivery room



Architecture affected the first skin-to-skin contact after birth in preterm NICU infants

	Before Couplet Care Model	Couplet Care Model	Z ^a or OR (95% CI)	p-value	MD or OR (95% CI)	p-value
Infant (with either parent)						
First SSC after birth, median (IQR), hours	24.0 (17.5, 52.0)	4.0 (0.4, 24.0)	0.33	<0.001	-18.5 (-34.8, -2.1)^b	0.03
First SSC initiated ≤2 h after birth, n(%)	3 (8.6)	30 (45.5)	8.7 (2.4, 48.9)	<0.001	13.8 (3.6, 62.8)^c	<0.001
Mother						
First SSC after birth, median (IQR), hours	24.0 (16.3, 72.0)	13.5 (0.1, 24.0)	0.29	0.04	-16.7 (-35.9, 2.4) ^b	0.09
First SSC initiated ≤2 h after birth, n(%)	3 (11.5)	19 (32.8)	3.7 (0.9, 21.5)	0.06	5.5 (1.4, 29.9)^c	0.03
Father						
First SSC after birth, median (IQR), hours	48.0 (24.0, 63.0)	7.0 (1.0, 48.0)	0.29	0.01	-25.9 (-51.2, -0.6)^b	0.04
First SSC initiated ≤2 h after birth, n(%)	1 (4.8)	19 (35.2)	10.6(1.5, 472.2)	0.007	19.3 (2.9, 413.7)^c	0.01

Immediate SSC had effects on interaction at 4 months

IPISTOSS Study: Infants between 28+0 to 32+6 weeks of gestation; SSC from the first postnatal hour throughout the first 6 hours vs routine care (RCT). With the father if Caesarean section - most SSC with the father (median 3.4 h father vs 0.6 h mother). More SSC during the first 8 days in the intervention group.



- SSC improved physiological stability, incl. respiratory rate (Linnér A, et al. Acta Paediatr 2022)
- SSC reduced depressive and anxiety symptoms in mothers and fathers (Lilliesköld S, et al. J Affect Disord. 2025)
- **Higher-quality mother-infant interaction in the SSC group at 4 months; infant positive affect, communicative and social skills** (Lilliesköld S, et al. JAMA Netw Open. 2023)
- No differences in motor development, cognition, or autism spectrum disorders but language scores better in SSC group (Lode-Kolz K, et al. Children (Basel). 2025)

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"I want to enjoy this time which is once in lifetime."

-Father of a 23 weeker

Father of a 23-weeker after 5 months in the NICU

“Preterm infants do not only need medical care but involvement of the family, love and presence”

“We all know the role of the mother, but the father is the stabilizing pillar during the shock phase supporting the baby and mother “

Father has three main roles

- 1) father-infant involvement
- 2) emotional support for the mother, sharing the worries (especially the first weeks) and tasks (like feeding the baby)
- 3) very good partner for the medical team, informing about the condition of the baby → better decisions

How to support father’s participation

- Consider father as a part of the medical team
- Educate fathers → they can help nurses better
- Provide a family room → allows parenting routines

“We live here and have an early-shaped, strong bond with our baby”

- Parental leave



Differences in parental leaves

	Mother	Fathers
Finland	7.0	7.0
Sweden	6.5	6.5
Estonia	8.5	8.5
France	5.5	5.5
Belgium	3.0 + 8*	0.5 + 8*
Canada	5.0	5.0

Parental leaves in months in different countries

*parental leave until 12 years

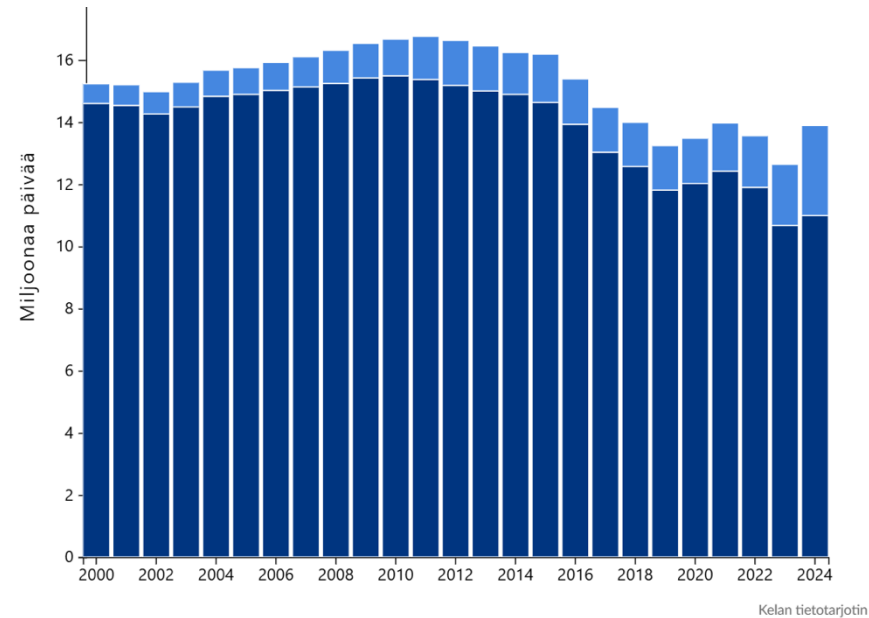
Finland

- Paid by the government, about 70% of the salary
- 2.5 months can be given to the other parent which leaves 4 months which are allocated to the father only
- Extensions if
 - multiples (3.5 months for an additional child divided equally between the parents)
 - preterm (each day >30 days prior to the due date is added to the parental leave)

France

- fathers of infants hospitalised at birth are entitled to 30 extra days of paternity leave

Days of parental leaves paid by the government by the gender:
21% of the days were paid for the fathers in 2024



Feelings of a father of a 23-weeker

“I cannot describe how this time has been for us as it has been so complicated and confusing time and it has been difficult to manage our feelings, especially before the surgeries, but

...we know our baby better than anybody

...we are more close to our baby than anybody

...we bring safety to the care by doing double-checking to avoid mistakes.”



Family together

Mother: “I was weak with dizziness and vomiting for a week after delivery. Then the father could be close to the baby and he could help me (mother) as well.”

Peer support: “We prefer recovering in privacy but we meet other parents in the lunch room, sharing the same pain and getting empathy without judging. It is important to laugh together - it is difficult to find reasons to laugh.”



“Usually the father is the hero for his son – now he is my hero and my role model. I get energy from him as he has been so brave and gone through so much.”



Summary

- Psychological environment matters
 - Educational intervention to the neonatal staff, Close Collaboration with Parents, increased parental presence by 37% and SSC by 51%
- Single-family room architecture with couplet care, after educational intervention, resulted in continuous parents' presence and early SSC
- Fathers have a unique role, especially during the first week after birth, when the infant is in the NICU
- Parents' participation is translated into quicker recovery of the infant (better growth and shorter length of stay*) and better mental wellbeing of the parents

*Itoshima R, Helenius K, Ahlqvist-Björkroth S, Vahlberg T, Lehtonen L. Neonatology 2024;121(3):351-358.

Relational health care



A secure, nurturing relationship between the parent and the child is
“the most fundamental adaptational mechanism for any child; builds resilience in children and promotes healthy brain growth and development”

Forkey H, Szilagyi M, Kelly ET, Duffee J; THE AMERICAN ACADEMY OF PEDIATRICS.
Pediatrics 2021;148(2):e2021052580.



Future directions

NICU care culture should be (become) collaborative, relational health care vs. task-oriented and professional-centered care

Architecture should address parents' needs

Societal support should be improved to allow parents time with their infants

...you can take small steps every day to increase parents' presence and participation – it all matters

...you can focus on the quality of the time if the duration is limited

...you can advocate for equal partnership with parents, better space for them and longer parental leaves



Thank you for your commitment
hard work

- NICU team in Turku
- Close Collaboration with Parents
 - mentors in 9 countries
 - researchers
- SCENE research group



Parents
for sharing your stories &
for your permissions to
show the photos !

