



*Topic Expert Group: Infant- and family-centred developmental care*

**Very early and continuous skin-to-skin contact**

Bergman NJ, Westrup B, Kuhn P, Daly M, Bertocelli N, Caballero S, König K

*Target group*

Newborn infants and parents

*User group*

Healthcare professionals, neonatal units, hospitals, and health services

*Statement of standard*

Skin-to-skin contact between mother or father and newborn infant is initiated as early as possible and maintained continuously.

*Rationale*

Skin-to-skin contact (SSC) supports infant physiology and transition to extra-uterine life and clinical stabilisation. (1–3) It acts through multimodal mother-infant sensory interaction and offers an environment that elicits hormonal and epigenetic processes, also supporting the initiation of breastfeeding. On the other hand, separation of the mother and infant after birth may induce harmful stress hormone responses that potentially leads to poorer resilience through the lifespan. (4) To minimise mother-infant separation and safely provide SSC, healthcare professionals have to acquire specific competence and skills to ensure protection of patent airways and provision of medical treatment and technical support as clinically indicated.

Early SSC provides the opportunity for early bonding between the infant and a safe and supportive parent figure. There is biological evidence indicating that the moment of birth is an early critical period. Consequently, early SSC is of particular importance for very preterm infants considering their recognised challenges in establishing future secure attachment. Mother-infant separation disrupts sleep architecture (5), whereas SSC promotes sleep cycling, necessary for the developing brain. (6) Early and continuous SSC is very important for successful breastfeeding and there are indications that continuous SSC has positive effects on long-term outcome. (1)

*Benefits*

*Short-term benefits*

- Improved physiological transition to extra-uterine life (3,7)
- Improved early physiological stability in preterm infants (1,2)
- Increased breastfeeding rates (2)
- Improved growth (1)
- Improved sleep (6,8)
- Facilitated parental sensitisation to their infant's needs and cues (9)
- Improved maternal empowerment and self-efficacy (10)
- Improved paternal empowerment and self-efficacy (consensus)



### *Long-term benefits*

- Increased breastfeeding rates beyond infant period (1,2)
- Improved parent-infant bonding and mental health (11)
- Improved immunity, decreased re-admissions (12)
- Reduced prematurity related morbidity in adulthood (13)
- Improved neurodevelopmental outcome (14)
- Improved social behaviour in early adulthood (15)
- Reduced stress for parents (16)
- Improved maternal outcomes associated with breastfeeding (17)

### *Components of the standard*

<b>Component</b>	<b>Grading of evidence</b>	<b>Indicator of meeting the standard</b>
<b>For parents and family</b>		
1. Parents are informed by healthcare professionals before birth about the importance and provision of postnatal safe skin-to-skin contact (SSC).	A (Low quality) B (High quality)	Patient information sheet
2. Maternal SSC is provided as early and as continuously as possible. (3,7)	A (High quality) B (Moderate quality)	Guideline, parent feedback
3. The father is involved to ensure continuous SSC when the mother is not able to do so. (18)	A (Moderate quality) B (Moderate quality)	Guideline, parent feedback
<b>For healthcare professionals</b>		
4. A unit guideline on SSC and early suckling is adhered to by all healthcare professionals. (2,19) (see TEG Care procedures)	A (High quality) B (High quality)	Guideline
5. Training on safe SSC technique, including the protection of the airway, SSC transport from labour and operating rooms, early suckling and breastfeeding is attended by all responsible healthcare professionals. (18,20)	A (Moderate quality) B (High quality)	Training documentation
<b>For neonatal unit</b>		
6. A unit guideline on SSC and early suckling is available and regularly updated. (2,19)	A (High quality) B (High quality)	Guideline
7. NICU bed space and practical arrangements for SSC throughout the 24 hours by mother and father are	A (Low quality) B (Moderate quality)	Audit report



provided. (21,22) (see TEG NICU Design)

- |   |                      |                                |
|---|----------------------|--------------------------------|
| 8. Starting time of SSC, and daily dose for all newborn infants are documented and monitored. | B (Moderate quality) | Audit report, clinical records |
|---|----------------------|--------------------------------|

**For hospital**

- |  |  |                        |
|--|--|------------------------|
| 9. Training on safe SSC technique, including the protection of the airway, SSC transport from labour and operating rooms, early suckling and breastfeeding is ensured. (18,20) | A (Moderate quality)<br>B (High quality)     | Training documentation |
| 10. Labour and operating rooms are adapted for immediate SSC by mother or family member. (23)  | A (Moderate quality)<br>B (Moderate quality) | Audit report           |

**For health service**

- |  |                                      |           |
|--|--------------------------------------|-----------|
| 11. A national guideline on SSC and early suckling is available and regularly updated. | A (High quality)<br>B (High quality) | Guideline |
|--|--------------------------------------|-----------|

*Where to go – further development of care*

Further development	Grading of evidence
For parents and family N/A	
For healthcare professionals N/A	
For neonatal unit Develop strategies for the use of skin-to-skin contact during intra- and inter-hospital transport.	A (Low quality)
For hospital N/A	
For health service N/A	

*Getting started*

Initial steps
For parents and family <ul style="list-style-type: none"> <li>• Parents are verbally informed by healthcare professionals about the importance of early skin-to-skin contact (SSC).</li> </ul>
For healthcare professionals



- Attend training on safe SSC technique, including the protection of the airway, SSC transport from labour and operating rooms, early suckling and breastfeeding.
- Encourage parents to start SSC as soon as possible.
- Take incremental steps to care for smaller and more fragile newborn infants.

#### For neonatal unit and hospital

- Develop and implement a unit guideline on SSC including safe technique to secure the airway during transport from the incubator to the mother.
- Develop information material on early SSC for parents.
- Provide adjustable reclining chairs for parents in NICU.
- Support healthcare professionals to participate in training on early SSC.

#### For health service

- Develop and implement a national guideline on SSC including safe technique to secure the airway during transport from the incubator to the mother.

### *Description*

The benefits of skin-to-skin contact (SSC) derive from a global neurological state, in which intimate maternal-infant physical SSC is the safe and expected environment to foster reproductive fitness. (24) The immediate result is bonding, which is in the short-term expressed physiologically (25), with improved cardiorespiratory and metabolic status. (2) This same bonding is however also the psychobiological root of long-term emotional and social development. (25,26) This is the essence of “buffering protection of adult support”, and absence thereof corresponds to “toxic stress” in the context of early childhood development. (27) The many benefits of SSC are really reflecting the decrease of harms from toxic stress that follows separation.

Recent advances in the understanding of epigenetics and developmental neuroscience (28), along with interpretations from life sciences theory (evolutionary biology) (24,29) and preclinical studies (30), suggest new paradigms for improving neonatal outcomes, and by gentle early newborn care based on parents they suggesting increased attention to the needs of the developing brain, as a basis for better long-term outcomes. (2,31–33) Moreover, a feature of reproduction in primate life sciences theory is SSC, where SSC is the environment or habitat required for epigenetic and neurosensory needs (34), supporting physiological systems for survival. (25) Maternal-neonate separation in primate studies is the most severe form of stress known (35,36), resulting in physiological dysregulation (25), overwhelming autonomic and neuroendocrine stress-responses (37), with the most severe effects on development and health. (38–40) Decreased resilience is proportional to immaturity, therefore the smaller the infant the greater the potential benefit of SSC. Further it is during the period of transition to extra-uterine life immediately after birth that such regulation has the greatest importance (7), and when failure may result in mortality in low resource settings. (1,18,41)

Several mechanisms may underlie SSC, at the heart of these is the concept of maternal-neonate co-regulation, meaning that mother and neonate in close contact constitute an evolved self-regulating system which, when functioning properly, promotes mutual health and thriving. (25,42–46) This system requires a sense of safety (47) provided by SSC. This self-regulating system comprises ‘hidden regulators’ – physiological, behavioural and psychological signals passed back and forth between mother and infant – that regulate physiology, mood and behaviour



towards thriving. (25,45) Regulatory effects of maternal odour (45,48), breastmilk (49) and SSC (50) on human neonatal physiology, breastfeeding, sleep and brain development have been demonstrated. Sleep may be the most powerful factor, as brain development takes place primarily during hourly sleep cycles. (6) Separated infants have disturbed sleep cycles (5), while SSC in infants born preterm promotes sleep cycling (51), and consequently accelerates brain maturation. (8) Similarly, these systems regulate feeding behaviour, and offer frequent opportunities to suckle at the breast, with an umbrella of sensory cues from SSC and promote early establishment of exclusive breastfeeding. (2) Improved temperature control from SSC is achieved, fewer calories are required for thermogenesis and more are available for growth. For stable low birth weight infants, there is good evidence that SSC improves both mortality and morbidity. (1)

Animal and human evidence shows that the regulatory status of physiological systems in early life may become epigenetically programmed for life (13,52–54) and increased risk for long term physiological dysregulation and social maladaptation. (38) This permanent anatomical and physiological embedding is called developmental programming. (53,54) A ten-year follow-up study from Israel provides evidence of a long-lasting benefit from early SSC in both physiologic organisation and in cognitive control. (14) The ‘hidden regulators’ may be involved in establishing a number of biological rhythms (brain oscillators), that control the social vagus (parasympathetic), cortisol reactivity (sympathetic) and the sleep-wake cycle (state organisation). (55) The early settings of these may contribute to an ongoing advantage in development, ensuring a more secure maternal-infant attachment, with increasing benefit over time. (14)

Newborn infants, through their behaviour, vocalisations (56), and odours (48) also exert powerful regulatory influences over mothers and fathers. These regulatory mechanisms are reflected in the response patterns of hormones, e.g. oxytocin (57), testosterone, prolactin, and brain activity in mothers (26), and fathers. (57,58) SSC is important for fathers and their involvement enables continuous SSC. (59–61) Other close family members may also contribute. (62)

Attention to SSC technique is important. Key features are ensuring actual skin contact with no other clothing at all between infant and adult skin, and ensuring that the airway is secured and protected. There is no technology that contra-indicates the use of SSC, however a skill set is needed that ensures patient safety is protected at all times.

### Source

1. Conde-Agudelo A, Belizán JM, Diaz-Rossello J. Kangaroo mother care to reduce morbidity and mortality in low birthweight infants. *Cochrane Database Syst Rev*. 2011 Mar 16;(3):CD002771.
2. Moore ER, Anderson GC, Bergman N, Dowswell T. Early skin-to-skin contact for mothers and their healthy newborn infants. *Cochrane Database Syst Rev*. 2012 May 16;(5):CD003519.
3. Bergman NJ, Linley LL, Fawcus SR. Randomized controlled trial of skin-to-skin contact from birth versus conventional incubator for physiological stabilization in 1200- to 2199-gram newborns. *Acta Paediatr Oslo Nor* 1992. 2004 Jun;93(6):779–85.



4. Charney DS. Psychobiological mechanisms of resilience and vulnerability: implications for successful adaptation to extreme stress. *Am J Psychiatry*. 2004 Feb;161(2):195–216.
5. Morgan BE, Horn AR, Bergman NJ. Should neonates sleep alone? *Biol Psychiatry*. 2011 Nov 1;70(9):817–25.
6. Peirano PD, Algarín CR. Sleep in brain development. *Biol Res*. 2007;40(4):471–8.
7. Chi Luong K, Long Nguyen T, Huynh Thi DH, Carrara HPO, Bergman NJ. Newly born low birthweight infants stabilise better in skin-to-skin contact than when separated from their mothers: a randomised controlled trial. *Acta Paediatr Oslo Nor 1992*. 2016 Apr;105(4):381–90.
8. Scher MS, Ludington-Hoe S, Kaffashi F, Johnson MW, Holditch-Davis D, Loparo KA. Neurophysiologic assessment of brain maturation after an 8-week trial of skin-to-skin contact on preterm infants. *Clin Neurophysiol Off J Int Fed Clin Neurophysiol*. 2009 Oct;120(10):1812–8.
9. Bigelow AE, Littlejohn M, Bergman N, McDonald C. The relation between early mother-infant skin-to-skin contact and later maternal sensitivity in South African mothers of low birth weight infants. *Infant Ment Health J*. 2010 May;31(3):358–77.
10. Aghdas K, Talat K, Sepideh B. Effect of immediate and continuous mother-infant skin-to-skin contact on breastfeeding self-efficacy of primiparous women: a randomised control trial. *Women Birth J Aust Coll Midwives*. 2014 Mar;27(1):37–40.
11. Tessier R, Cristo MB, Velez S, Giron M, Nadeau L, Figueroa de Calume Z, et al. Kangaroo Mother Care: A method for protecting high-risk low-birth-weight and premature infants against developmental delay. *Infant Behav Dev*. 2003 Aug;26(3):384–97.
12. Lawn JE, Mwansa-Kambafwile J, Horta BL, Barros FC, Cousens S. “Kangaroo mother care” to prevent neonatal deaths due to preterm birth complications. *Int J Epidemiol*. 2010 Apr;39 Suppl 1:i144-154.
13. Hochberg Z, Feil R, Constancia M, Fraga M, Junien C, Carel J-C, et al. Child health, developmental plasticity, and epigenetic programming. *Endocr Rev*. 2011 Apr;32(2):159–224.
14. Feldman R, Rosenthal Z, Eidelman AI. Maternal-preterm skin-to-skin contact enhances child physiologic organization and cognitive control across the first 10 years of life. *Biol Psychiatry*. 2014 Jan 1;75(1):56–64.
15. Charpak N, Tessier R, Ruiz JG, Hernandez JT, Uriza F, Villegas J, et al. Twenty-year Follow-up of Kangaroo Mother Care Versus Traditional Care. *Pediatrics*. 2017 Jan;139(1).
16. Atzil S, Hendler T, Feldman R. Specifying the neurobiological basis of human attachment: brain, hormones, and behavior in synchronous and intrusive mothers. *Neuropsychopharmacol Off Publ Am Coll Neuropsychopharmacol*. 2011 Dec;36(13):2603–15.
17. Labbok MH. Health sequelae of breastfeeding for the mother. *Clin Perinatol*. 1999 Jun;26(2):491–503, viii–ix.
18. Bergman NJ, Jürisoo LA. The “kangaroo-method” for treating low birth weight babies in a developing country. *Trop Doct*. 1994 Apr;24(2):57–60.
19. Gartner LM, Morton J, Lawrence RA, Naylor AJ, O’Hare D, Schanler RJ, et al. Breastfeeding and the use of human milk. *Pediatrics*. 2005 Feb;115(2):496–506.
20. Sontheimer D, Fischer CB, Buch KE. Kangaroo Transport Instead of Incubator Transport. *PEDIATRICS*. 2004 Apr 1;113(4):920–3.



21. Dumas L, Lepage M, Bystrova K, Matthiesen A-S, Welles-Nyström B, Widström A-M. Influence of skin-to-skin contact and rooming-in on early mother-infant interaction: a randomized controlled trial. *Clin Nurs Res*. 2013 Aug;22(3):310–36.
22. O'Brien K, Bracht M, Macdonell K, McBride T, Robson K, O'Leary L, et al. A pilot cohort analytic study of Family Integrated Care in a Canadian neonatal intensive care unit. *BMC Pregnancy Childbirth*. 2013;13(Suppl 1):S12.
23. Nolan A, Lawrence C. A pilot study of a nursing intervention protocol to minimize maternal-infant separation after Cesarean birth. *J Obstet Gynecol Neonatal Nurs JOGNN*. 2009 Aug;38(4):430–42.
24. Narvaez D, Wang L, Cheng Y. The evolved developmental niche in childhood: Relation to adult psychopathology and morality. *Appl Dev Sci*. 2016 Oct;20(4):294–309.
25. Hofer MA. Psychobiological Roots of Early Attachment. *Curr Dir Psychol Sci*. 2006 Apr;15(2):84–8.
26. Nelson EE, Panksepp J. Brain substrates of infant-mother attachment: contributions of opioids, oxytocin, and norepinephrine. *Neurosci Biobehav Rev*. 1998 May;22(3):437–52.
27. Shonkoff JP, Garner AS, Committee on Psychosocial Aspects of Child and Family Health; Committee on Early Childhood, Adoption, and Dependent Care; Section on Developmental and Behavioral Pediatrics, Siegel BS, Dobbins MI, Earls MF, et al. The Lifelong Effects of Early Childhood Adversity and Toxic Stress. *PEDIATRICS*. 2012 Jan 1;129(1):e232–46.
28. Ganzel BL, Morris PA, Wethington E. Allostasis and the human brain: Integrating models of stress from the social and life sciences. *Psychol Rev*. 2010 Jan;117(1):134–74.
29. Kuzawa CW, Thayer ZM. Timescales of human adaptation: the role of epigenetic processes. *Epigenomics*. 2011 Apr;3(2):221–34.
30. Panksepp J, Nelson E, Bekkedal M. Brain systems for the mediation of social separation-distress and social-reward. Evolutionary antecedents and neuropeptide intermediaries. *Ann N Y Acad Sci*. 1997 Jan 15;807:78–100.
31. Westrup B. Newborn Individualized Developmental Care and Assessment Program (NIDCAP) - family-centered developmentally supportive care. *Early Hum Dev*. 2007 Jul;83(7):443–9.
32. Westrup B, Kleberg A, Stjernqvist K. The Humane Neonatal Care Initiative and family-centred developmentally supportive care. *Acta Paediatr Oslo Nor* 1992. 1999 Oct;88(10):1051–2.
33. Kennell J, De Chateau P, Wasz-Höckert O. John Lind memorial symposium. *Infant Ment Health J*. 1987;8(3):190–209.
34. Panksepp J. *Affective neuroscience: the foundations of human and animal emotions*. Oxford: Oxford Univ. Press; 2005. 466 p. (Series in affective science).
35. Dettling AC, Feldon J, Pryce CR. Repeated parental deprivation in the infant common marmoset (*Callithrix jacchus*, primates) and analysis of its effects on early development. *Biol Psychiatry*. 2002 Dec 1;52(11):1037–46.
36. Kalin NH, Shelton SE, Barksdale CM. Opiate modulation of separation-induced distress in non-human primates. *Brain Res*. 1988 Feb 9;440(2):285–92.
37. McEwen BS, Gianaros PJ. Stress- and allostasis-induced brain plasticity. *Annu Rev Med*. 2011;62:431–45.



38. Arabadzisz D, Diaz-Heijtz R, Knuesel I, Weber E, Pilloud S, Dettling AC, et al. Primate early life stress leads to long-term mild hippocampal decreases in corticosteroid receptor expression. *Biol Psychiatry*. 2010 Jun 1;67(11):1106–9.
39. Sabatini MJ, Ebert P, Lewis DA, Levitt P, Cameron JL, Mirnics K. Amygdala gene expression correlates of social behavior in monkeys experiencing maternal separation. *J Neurosci Off J Soc Neurosci*. 2007 Mar 21;27(12):3295–304.
40. Morgan B. Biological embedding of early childhood adversity: Toxic stress and the vicious cycle of poverty in South Africa. *Res Policy Brief Ser*. 2013;2:11.
41. Worku B, Kassie A. Kangaroo mother care: a randomized controlled trial on effectiveness of early kangaroo mother care for the low birthweight infants in Addis Ababa, Ethiopia. *J Trop Pediatr*. 2005 Apr;51(2):93–7.
42. Barrett J, Fleming AS. Annual Research Review: All mothers are not created equal: neural and psychobiological perspectives on mothering and the importance of individual differences. *J Child Psychol Psychiatry*. 2011 Apr;52(4):368–97.
43. Feldman R. Infant-mother and infant-father synchrony: The coregulation of positive arousal. *Infant Ment Health J*. 2003 Jan;24(1):1–23.
44. Kaffman A, Meaney MJ. Neurodevelopmental sequelae of postnatal maternal care in rodents: clinical and research implications of molecular insights. *J Child Psychol Psychiatry*. 2007 Apr;48(3–4):224–44.
45. Dulac C, O'Connell LA, Wu Z. Neural control of maternal and paternal behaviors. *Science*. 2014 Aug 15;345(6198):765–70.
46. Zhang T-Y, Bagot R, Parent C, Nesbitt C, Bredy TW, Caldji C, et al. Maternal programming of defensive responses through sustained effects on gene expression. *Biol Psychol*. 2006 Jul;73(1):72–89.
47. Porges S. *Neuroception: A Subconscious System for Detecting Threats and Safety*. Vol. 24. 2004.
48. Welch MG, Myers MM, Grieve PG, Isler JR, Fifer WP, Sahni R, et al. Electroencephalographic activity of preterm infants is increased by Family Nurture Intervention: a randomized controlled trial in the NICU. *Clin Neurophysiol Off J Int Fed Clin Neurophysiol*. 2014 Apr;125(4):675–84.
49. Verduci E, Banderali G, Barberi S, Radaelli G, Lops A, Betti F, et al. Epigenetic effects of human breast milk. *Nutrients*. 2014 Apr 24;6(4):1711–24.
50. Feldman R, Eidelman AI. Skin-to-skin contact (Kangaroo Care) accelerates autonomic and neurobehavioural maturation in preterm infants. *Dev Med Child Neurol*. 2003 Apr;45(4):274–81.
51. Ludington-Hoe SM, Johnson MW, Morgan K, Lewis T, Gutman J, Wilson PD, et al. Neurophysiologic assessment of neonatal sleep organization: preliminary results of a randomized, controlled trial of skin contact with preterm infants. *Pediatrics*. 2006 May;117(5):e909–923.
52. McEwen BS, Gianaros PJ. Central role of the brain in stress and adaptation: links to socioeconomic status, health, and disease. *Ann N Y Acad Sci*. 2010 Feb;1186:190–222.
53. Gluckman PD, Hanson MA. The plastic human. *Infant Child Dev*. 2010 Jan;19(1):21–6.
54. Leckman JF, Feldman R, Swain JE, Eicher V, Thompson N, Mayes LC. Primary parental preoccupation: circuits, genes, and the crucial role of the environment. *J Neural Transm Vienna Austria* 1996. 2004 Jul;111(7):753–71.



55. Spangler G. The emergence of adrenocortical circadian function in newborns and infants and its relationship to sleep, feeding and maternal adrenocortical activity. *Early Hum Dev.* 1991 Jun;25(3):197–208.
56. Leerkes EM, Weaver JM, O'Brien M. Differentiating Maternal Sensitivity to Infant Distress and Non-Distress. *Parent Sci Pract.* 2012 Jan 1;12(2–3):175–84.
57. Abraham E, Hendler T, Shapira-Lichter I, Kanat-Maymon Y, Zagoory-Sharon O, Feldman R. Father's brain is sensitive to childcare experiences. *Proc Natl Acad Sci.* 2014 Jul 8;111(27):9792–7.
58. Wynne-Edwards KE. Hormonal changes in mammalian fathers. *Horm Behav.* 2001 Sep;40(2):139–45.
59. Christensson K. Fathers can effectively achieve heat conservation in healthy newborn infants. *Acta Paediatr Oslo Nor* 1992. 1996 Nov;85(11):1354–60.
60. Erlandsson K, Dsilna A, Fagerberg I, Christensson K. Skin-to-skin care with the father after cesarean birth and its effect on newborn crying and prefeeding behavior. *Birth Berkeley Calif.* 2007 Jun;34(2):105–14.
61. Velandia M, Uvnäs-Moberg K, Nissen E. Sex differences in newborn interaction with mother or father during skin-to-skin contact after Caesarean section. *Acta Paediatr Oslo Nor* 1992. 2012 Apr;101(4):360–7.
62. Ludington-Hoe SM. Thirty years of Kangaroo Care science and practice. *Neonatal Netw NN.* 2011 Oct;30(5):357–62.

First edition, November 2018

*Lifecycle*

5 years/next revision 2023

*Recommended citation*

EFCNI, Bergman NJ, Westrup B et al., European Standards of Care for Newborn Health: Very early and continuous skin-to-skin contact. 2018.