

REGULAR ARTICLE

Time of initiation of skin-to-skin contact in extremely preterm infants in Sweden

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ABSTRACT

Aim: To describe the time of first skin-to-skin contact in extremely preterm infants in a national perspective and to investigate possible factors affecting the time of first skin-to-skin contact.

Methods: A population-based prospective descriptive study of extremely preterm infants (n = 520) in seven regional hospitals in Sweden.

Results: Extremely preterm infants in Sweden experience first skin-to-skin contact with the parent at a median of six postnatal days (range 0–44). Low gestational age, a high score on the clinical risk index for babies, and the number of days on a ventilator tended to delay first skin-to-skin contact. A statistically significant difference was also found between regional hospitals.

Conclusion: There is a difference in the time of first skin-to-skin contact based on the infant's medical condition and the tradition in the neonatal intensive care unit at the regional hospital where the infant is born.

INTRODUCTION

The main components of kangaroo mother care (KMC) are skin-to-skin contact, where the infant lies between the mother's breasts firmly attached to the chest in an upright position, frequent and exclusive or near-exclusive breast feeding, and early discharge from hospital (1). KMC in low birth weight infants contributes to cardiorespiratory stabilization, improves thermoregulation, encourages the mother to breastfeed, provides analgesia, reduces maternal stress, promotes early discharge and improves bonding between infant and mother (2–6). Studies including extremely preterm infants have shown that it is safe to practise skin-to-skin contact with infants on a ventilator, with an umbilical cord catheter and with a nasogastric tube (7–10). Infants born at a gestational age (GA) of 25–31 weeks can experience skin-to-skin contact without evidence of cold stress, apnoea or low oxygen levels (11–13). One study (GA 25–33 weeks) showed that infants have a lower activity level and lower heart rate and show less signs of discomfort and pain during skin-to-skin contact compared with incubator care (14).

Seventy per cent of infants in Sweden born at <27 weeks' GA survive their first year (15). Extremely preterm infants

require several weeks of significant neonatal intensive care; thus, even though the number of extremely preterm infants is relatively low, the care demands are high (16,17). Factors such as GA and ventilator support may have an impact on the time of first skin-to-skin contact in this group of infants. Other factors that may influence the time of the first skin-to-skin contact are gender, a high clinical risk index for babies (CRIB) score, or if the mother has pre-eclampsia.

Because skin-to-skin contact is practised also in extremely preterm infants although there is little evidence for this particular group, we wanted to learn more about how skin-to-skin contact is clinically used. The first aim of this study was to describe the time of the first skin-to-skin contact (in days) in extremely preterm infants in a national perspective; the second aim was to investigate possible factors affecting this time.

Key notes

- Early (mean 6 days) skin-to-skin contact with the parent among extremely preterm infants is possible and safe, also among infants on ventilator. The time of the first skin-to-skin contact is, however, affected by the infants' medical condition. Also the tradition at the neonatal intensive care unit plays a role; hence, the staffs' attitude towards KMC is probably an important factor.

Abbreviations

CRIB, Clinical risk index for babies; GA, Gestational age; KMC, Kangaroo mother care; NICU, Neonatal intensive care unit.

MATERIALS AND METHODS

Sample

This study is part of a descriptive, prospective observational study including all live-born infants, of GA <27 weeks, delivered at the seven regional level III hospitals in Sweden between 1st April 2004 and 31st March 2007 (15). Sweden has a population of 9 million inhabitants. Each health region is served by one of seven government-funded regional hospitals in this paper called region 1–7. The hospitals differ in number of beds based on births per year (Table S1 in supporting information).

Procedure

Data were collected prospectively during the first 180 days of hospitalization or until discharge or death. Collection of data was by local staff using standard study forms in accordance with a manual defining the variables. After collection, the data from each region were transmitted electronically to a central database, where they were checked for quality and completeness. The database was created in collaboration with the Swedish Perinatal Quality Register (15).

Ethical consideration

The study was approved by the Regional Research Ethics Board of Lund University, Lund, Sweden (Dnr 42/2004). Oral consent for data acquisition was given by parents (15).

Statistics

The statistical program SPSS (version 17.0, SPSS Inc., Chicago, IL, USA) was used to analyse the collected data. The One-Sample Kolmogorov–Smirnov Test was used to determine whether the items skin-to-skin contact, GA at birth, gender, CRIB score, days on a ventilator and pre-eclampsia were normally distributed. Even though the data were not normally distributed, a simple regression (ANOVA) was found to be the best alternative to analyse items that were considered main factors for the time infants first experienced skin-to-skin contact. A multiple regression was conducted to investigate whether other factors could have an impact on the result of the ANOVA. The Kruskal–Wallis Test, Mann Whitney *U*-test and chi-square were used to test differences between the seven different regions. The Mann Whitney *p*-values were corrected to avoid mass significance when items were compared repeatedly. Results were

considered significant if *p*-values were <0.05. In some cases, data were missing, meaning that the numbers of subjects for each analysis differ slightly.

RESULTS

Participants

Seven hundred and seven infants were born alive before GA 27 between 1st April 2004 and 31st March 2007. Six hundred and one infants were alive at 24 h and are included in this analysis. Eighty-one infants died within 28 days and are excluded from the main analyses and presented separately (Fig. S1 in supporting information). This study included 520 infants with a GA <27 weeks, 285 boys and 235 girls. The mean (SD) birth weight was 772 (170) g (range 348–1315 g). The median GA was 25³ weeks (range 22¹–26⁶). Fifty-nine (11.9%) mothers had pre-eclampsia (Table 1); presence of pre-eclampsia was not reported in 26 cases.

Reporting rates

Skin-to-skin contact was reported for 330 of the 520 infants (63.5%). The frequency of reported skin-to-skin contact differed between the regions, from 16% to 98% (Fig. S2 in supporting information). Reporting rates for other variables (pre-eclampsia, GA at birth, birth weight, CRIB score, gender and days on a ventilator) varied between 90% and 100%.

Skin-to-skin contact

The results show that extremely preterm infants are taken out of the incubator to experience first skin-to-skin contact at a median of six postnatal days (range 0–44 days). GA, CRIB score, days on a ventilator, gender and pre-eclampsia were analysed as independent variables for skin-to-skin contact. Statistical significances (*p* < 0.001) were found between first skin-to-skin contact and low GA [*F* = 42.99 (*df* = 1.3) adj *R*² = 0.11], first skin-to-skin contact and a high CRIB score [*F* = 52.03 (*df* = 1.3) adj *R*² = 0.14], and first skin-to-skin contact and days on a ventilator [*F* = 40.93 (*df* = 1.3) adj *R*² = 0.11]. Low GA, a high CRIB score, and more days on a ventilator tended to delay first skin-to-skin contact for the extremely preterm infants. A multiple regression adding gender and pre-eclampsia to the

Table 1 Descriptive data of included infants

	All infants <i>n</i> = 520	Skin-to-skin contact <i>n</i> = 330	No information of skin-to-skin contact <i>n</i> = 190
Clinical risk index for babies score	6.3 (3.6)	6.0 (3.6)	6.6 (3.5)
GA, median (range)	25 ³ (22 ¹ –26 ⁶)	25 ³ (22 ¹ –26 ⁶)	25 ⁴ (22 ⁴ –26 ⁶)
Birth weight, g	772 (170)	777 (173)	765 (166)
Days on ventilator	15.0 (17.8)	16.5 (19.1)	12.5 (15.1)
Girls, %	45.2	45.8	44.2
Mother with pre-eclampsia, %	11.9	11.4	12.8

GA, gestational age.

Values are mean (SD) unless otherwise is stated.

Table 2 Median and quartiles (q1–q3) for first skin-to-skin contact, gestational age (GA) at birth, clinical risk index for babies (CRIB) score and days on a ventilator

	Total	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	
	Md	Md	Md	Md	Md	Md	Md	Md	
	(q1–q3)	(q1–q3)	(q1–q3)	(q1–q3)	(q1–q3)	(q1–q3)	(q1–q3)	(q1–q3)	p-value
Time for 1st skin-to-skin contact (days)	6.00 (3–13) n = 330	6.00 (5–11) n = 63	3.00 (1–4) n = 62	7.00 (3–13) n = 35	17.00 (9–23) n = 85	7.00 (4–9) n = 15	5.00 (2–10) n = 8	4.00 (2–6) n = 62	0.000
GA (days)	178 (172–184) n = 520	180 (171–186) n = 120	178 (170–184) n = 106	180 (175–184) n = 37	178 (172–181) n = 89	179 (174–184) n = 93	181 (171–186) n = 12	178 (171–182) n = 63	0.257
CRIB score	6.00 (4–9) n = 510	6.50 (4–9) n = 114	7.00 (4–8) n = 104	5.00 (2–9) n = 37	7.00 (5–9) n = 89	6.00 (4–9) n = 93	5.00 (1–8) n = 10	6.00 (3–8) n = 63	0.436
Days on a ventilator	9.00 (3–21) n = 520	11.00 (3–22) n = 120	7.00 (2–21) n = 106	11.00 (5–34) n = 37	15.00 (6–22) n = 89	6.00 (2–14) n = 93	4.50 (0–15) n = 12	14.00 (4–27) n = 63	0.001

p-value analysed with Kruskal–Wallis test.

significant items did not show any significant difference to the previous results.

Because there was a difference between regions in reporting rates, the analysis was recalculated using only regions 3, 4 and 7. The results show that extremely preterm infants in region 3, 4 and 7 ($n = 188$) are taken out of the incubator to experience first skin-to-skin contact at a median of eight and a half postnatal days (range 0–44 days). The regression analysis yielded the same significances as reported earlier.

Hospital regions and skin-to-skin contact

There was a significant difference between hospital regions in the time of first skin-to-skin contact ($p < 0.001$) (Table 2). Regions 2 and 4 differed most: in region 2, extremely preterm infants experienced their first skin-to-skin contact at a median of three postnatal days (range 0–12); in region 4, first skin-to-skin contact was at a median of 17 postnatal days (range 2–44). Further analysis of the time of first skin-to-skin contact by hospital region 3, 4 and 7 revealed significant differences between regions 3 and 4 ($p < 0.001$) and regions 4 and 7 ($p < 0.001$) (Table 2).

In addition, there were significant regional differences in days on a ventilator ($p < 0.001$) (Table 2). The highest number of days on a ventilator was reported from region 4, with a median of 15 days (range 0–49). Region 4 was compared pairwise with the other regions, analysing days on a ventilator. There was a significant difference between region 4 and region 5 ($p < 0.001$) (Table 2). Region 2, which practises early skin-to-skin contact, had a median of 7 days on a ventilator (range 0–134). No significant difference in days on a ventilator was found between region 2 and the other regions or between region 3, 4 and 7. Further, there were no significant regional differences in CRIB scores or GA (Table 2).

Infants for whom skin-to-skin contact was not reported

Skin-to-skin contact was not reported for 190 (36.5%) infants alive after day 28. The mean (SD) birth weight was

765 (166) g (range 375–1315 g). CRIB scores, GA, birth weight, days on a ventilator, gender and mothers with pre-eclampsia are presented in Table 1. There were no significant differences in the above-mentioned variables between infants who experienced skin-to-skin contact and those for whom skin-to-skin contact was not reported.

Infants deceased before day 28

Eighty-one infants died before day 28 (46 boys and 35 girls). The mean (SD) birth weight was 698 (169) g (range 434–1161 g), the median GA was 24⁶ weeks (range 22⁵–26⁶) and the mean (SD) CRIB score was 8.9 (3.6). Birth weight, GA and CRIB scores all differed significantly from the group of infants included in this study ($p < 0.001$ for each variable). The median day of death was 4 (range 1–26 days).

Skin-to-skin contact was reported for 17 (21%) infants. The median day for first skin-to-skin contact was 3 (range 0–22). The median day of death for infants who experienced skin-to-skin contact and for infants who did not experience skin-to-skin contact was 12 (range 3–24) and 3 (range 1–26), respectively ($p < 0.0001$).

DISCUSSION

In this article, we have shown that extremely preterm infants are experiencing skin-to-skin contact at an average of six postnatal days and that infants in a poor medical condition were experiencing skin-to-skin contact later than healthier. GA, days on ventilator and CRIB score had an impact for the time the infant was taken out of the incubator to experience first skin-to-skin contact with the parent.

The reporting frequency was relatively low in four of the regions. A low reporting frequency could indicate either a lack of interest in the KMC method or a reluctance to report statistics. However, because there is a high reporting rate for medical variables, a plausible assumption is that KMC as a method of care is overlooked in some hospitals. The

results of this study show that there is a marked difference in the time of first skin-to-skin contact between hospitals. This difference may suggest that infants <27 weeks' GA are treated differently depending on where they are born in Sweden. Possible explanations for practising earlier skin-to-skin contact could be attitudes and knowledge among staff, routines at different wards and hospital tradition (18,19). Studies among nurses and nurse manager providing neonatal intensive care showed different barriers to initiate KMC. Nurses identified practical concerns such as organizational support and training and nurse manager safety concerns and reluctant by nurses, physicians and families (18,20). Skin-to-skin contact has been used in Swedish neonatal intensive care units (NICUs) since 1985, which implies that there has been a lot of training (21). Workload or organizational support was not evaluated in this study. There was general acceptance among Australian nurses that KMC could be practised with intubated low birth weight infants, but the nurses wanted assurance that KMC was safe and effective (20). Even though KMC is a well-studied intervention, relatively few studies on KMC have included extremely preterm infants, and there is no study exclusively examining infants born at <27 weeks. Therefore, at present, it is not possible to conclude from research whether skin-to-skin contact is superior to incubator care for extremely preterm infants. As yet, there is insufficient evidence to determine whether those hospital wards that practise early skin-to-skin contact or late skin-to-skin contact for extremely preterm infants are implementing the best care for the infant. Further research on KMC for extremely preterm infants is therefore necessary.

Underuse of KMC may also be explained by medically and technologically driven care (22). It is understandable that frail infants with a higher risk of mortality and morbidity receive skin-to-skin contact later than healthier infants with lower CRIB scores. Because ventilation support is often necessary in those infants, it is possible that staff are more afraid of accidental extubation when the infant is transferred from the incubator to the parent (18). However, in this study, there was no significant difference in days on a ventilator between the hospital that practised early skin-to-skin contact and the other hospitals. Moreover, there was no significant difference in days on a ventilator between infants experiencing skin-to-skin contact and infants for whom skin-to-skin contact was not reported. Studies including infants on a ventilator support the use of skin-to-skin contact and a useful protocol for practising skin-to-skin contact in intubated preterm infants have been published (8). Previously, NICU staff have reported that fear of arterial or venous line dislodgement may be a barrier to practising skin-to-skin contact in preterm infants (18). The use of an umbilical cord catheter was not included in this study. To our knowledge, there are no published studies describing accidents with umbilical cord catheters during skin-to-skin contact.

Parents of preterm infants experience a great deal of stress related to the separation that occurs when the newborn is admitted to a neonatal care unit (23–25). KMC is an

easy method of increasing the closeness to the infant, of strengthening bonding and improving the parent-infant relationship (2,26,27). Parents practising skin-to-skin contact have reported less stress, improved mood and increased sense of competence in their care of their infant (14,28). Finally, of the infants who died before day 28, skin-to-skin contact was reported for only 21%. This implies that almost 80% of the parents who lost a newborn preterm infant never experienced skin-to-skin contact with their baby before its death.

CONCLUSION

Extremely preterm infants in Sweden experience skin-to-skin contact at a median of six postnatal days. However, the time of the first skin-to-skin contact differs between hospitals.

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SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article:

Figure S1 Flow diagram of participants.

Figure S2 Reporting rates of skin-to-skin contact by hospital region.

Table S1 Number of births per year and NICU beds for the seven regional hospitals in Sweden.

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