

# KANGAROO MOTHER CARE BIBLIOGRAPHY

## 2001 – 2005

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*Compiled by Ghislaine Reid*

Anderson, G. C., S. H. Chiu, et al. (2003). "Mother-newborn contact in a randomized trial of kangaroo (skin-to-skin) care." J Obstet Gynecol Neonatal Nurs **32**(5): 604-11.

OBJECTIVE: To describe the type and percent time of contact 0-48 hours postbirth for mother-preterm newborn (infant) dyads given kangaroo care (skin-to-skin) or standard care (controls). DESIGN: Randomized controlled trial with assignment by computerized minimization to kangaroo care (n = 48) or control (n = 43). SETTING: Postpartum units and neonatal intensive-care units (NICU). PARTICIPANTS: Preterm infants 32 to less than 37 weeks gestation and their mothers. INTERVENTION: Kangaroo (skin-to-skin, SS) care (KC). MAIN OUTCOME MEASURES: Type and percent time of mother-infant contact (SS versus holding wrapped in blankets). RESULTS: Analyses were based on four groups: assignment for infants in each group to postpartum or NICU. For KC dyads, SS postpartum was 22.0%; SS NICU was 7.5%. KC wrapped holding postpartum was 11.6%; NICU was 1.8%. For control dyads, wrapped holding postpartum was 13.9%; NICU was 6.1%. CONCLUSION: Amount of SS was much less than expected. Reasons include unavailability of infants or mothers and hospital staff interrupting contact. However, KC postpartum dyads were held wrapped almost as often as control postpartum dyads. Total contact time for KC dyads (SS plus wrapped) was more than double that of controls. These data suggest that hospital and social supports for families are needed to facilitate early initiation of SS, prolonged periods of mother-infant SS contact, and reduction of maternal stress.

Anderson, G. C., M. A. Dombrowski, et al. (2001). "Kangaroo care: not just for stable preemies anymore." Reflect Nurs Leadersh **27**(2): 32-4, 45.

Barnes, N. P. and P. Roberts (2005). "'Extrasystoles" during kangaroo care." Pediatr Crit Care Med **6**(2): 230.

Bergh, A. M., I. Arsalo, et al. (2005). "Measuring implementation progress in kangaroo mother care." Acta Paediatr **94**(8): 1102-8.

AIM: To describe the development and testing of a monitoring model with quantitative indicators or progress markers that could measure the progress of individual hospitals in the implementation of kangaroo mother care (KMC). METHODS: Three qualitative data sets in the larger research programme on the implementation of KMC of the MRC Research Unit for Maternal and Infant Health Care Strategies in South Africa were used to develop a progress-monitoring model and an accompanying instrument. RESULTS: The model was conceptualized around three phases (pre-implementation, implementation and institutionalization) and six constructs depicting progress (awareness, adopting the concept, mobilization of resources, evidence of practice, evidence of routine and integration, sustainable

practice). For each construct, indicators were developed for which data could be collected by means of the monitoring instrument used in a walk-through visit to a hospital. The instrument has been tested in 65 hospitals. **CONCLUSION:** The progress-monitoring model enables the quantification of individual hospitals' progress in the process of implementing KMC and an objective measurement of the effectiveness of different outreach strategies. The model also has potential to be adapted for measuring progress in other innovative healthcare interventions on a large scale.

Bergh, A. M. and R. C. Pattinson (2003). "Development of a conceptual tool for the implementation of kangaroo mother care." *Acta Paediatr* **92**(6): 709-14.

**AIM:** To develop a conceptual tool to assist healthcare workers and management in the implementation of a kangaroo mother care programme. **METHODS:** A qualitative research approach was followed and methods included on-site observations and informal conversational interviews, as well as unstructured, in-depth interviews with senior managers, doctors and nurses at two large training hospitals in the north of South Africa. A consultative process was used to refine the tool. **RESULTS:** The patterns that emerged from the data were captured in a diagram, entitled: "Main issues in the establishment of kangaroo mother care". In addition, a set of core questions was developed to assist in decision-making at institutional level. **CONCLUSION:** The diagram and questions contain concepts that could be adapted and used by a healthcare facility's multidisciplinary team in planning the implementation of kangaroo mother care and in reviewing the progress made in the implementation and the quality of the kangaroo mother care provided.

Bergman, N. J., L. L. Linley, et al. (2004). "Randomized controlled trial of skin-to-skin contact from birth versus conventional incubator for physiological stabilization in 1200- to 2199-gram newborns." *Acta Paediatr* **93**(6): 779-85.

**AIM:** Conventional care of prematurely born infants involves extended maternal-infant separation and incubator care. Recent research has shown that separation causes adverse effects. Maternal-infant skin-to-skin contact (SSC) provides an alternative habitat to the incubator, with proven benefits for stable pretermes; this has not been established for unstable or newborn low-birthweight infants. SSC from birth was therefore compared to incubator care for infants between 1200 and 2199 g at birth. **METHODS:** This was a prospective, unblinded, randomized controlled clinical trial; potential subjects were identified before delivery and randomized by computerized minimization technique at 5 min if eligible. Standardized care and observations were maintained for 6 h. Stability was measured in terms of a set of pre-determined physiological parameters, and a composite cardio-respiratory stabilization score (SCRIP). **RESULTS:** 34 infants were analysed in comparable groups: 3/18 SSC compared to 12/13 incubator babies exceeded the pre-determined parameters ( $p < 0.001$ ). Stabilization scores were 77.11 for SSC versus 74.23 for incubator (maximum 78), mean difference 2.88 (95% CI: 0.3-5.46,  $p = 0.031$ ). All 18 SSC subjects were stable in the sixth hour, compared to 6/13 incubator infants. Eight out of 13 incubator subjects experienced hypothermia. **CONCLUSION:** Newborn care provided by skin-to-skin contact on the mother's chest results in better physiological outcomes and stability than the same care provided in closed servo-controlled incubators. The cardio-respiratory instability seen in separated infants in the first 6 h is consistent with

mammalian "protest-despair" biology, and with "hyper-arousal and dissociation" response patterns described in human infants: newborns should not be separated from their mothers.

Bergman, N., A. Malan, et al. (2003). "Fourth International Workshop on Kangaroo Mother Care." J Trop Pediatr **49**(5): 311-2.

Bohnhorst, B., T. Heyne, et al. (2001). "Skin-to-skin (kangaroo) care, respiratory control, and thermoregulation." J Pediatr **138**(2): 193-7.

AIM: To demonstrate that skin-to-skin care (SSC) has no detrimental effects on the frequency of episodes of bradycardia and/or hypoxemia. METHODS: Twenty-two spontaneously breathing preterm infants (median gestational age at birth, 29 weeks [range, 24-31 weeks]; age at study, 26 days [range, 7-72 days]; weight at study, 1310 g [range, 725-1890 g]) had three 2-hour recordings of breathing movements, nasal airflow, heart rate, and oxygen saturation as measured by pulse oximetry (SpO<sub>2</sub>) before, during, and after SSC. Rectal temperature was obtained every 2 hours. Recordings were analyzed for baseline heart and respiratory rates, bradycardia (heart rate < two thirds of baseline), and hypoxemia (SpO<sub>2</sub> < or =80%), as well as for breathing pattern (regular vs non-regular). RESULTS: Baseline heart rate and respiratory rate increased during SSC (P <.01), as did the combined frequency of bradycardia and hypoxemia (from 1.5/h [0-8] before to 2.8/h [0-15] during SSC; P<.05). Rectal temperature increased from 36.9 degrees C (36.2 degrees -37.4 degrees C) to 37.3 degrees C (36.6 degrees -38.6 degrees C; P <.01). The proportion of regular breathing pattern decreased from 14% (2%-28%) to 7% (3%-26%) with SSC (P<.01). CONCLUSION: SSC was associated with a significant increase in the combined frequency of bradycardia and hypoxemia and with less regular breathing. These changes were unexpected and may have been related to heat stress. Body temperature, heart rate, and oxygenation should be monitored during SSC.

Burkhammer, M. D., G. C. Anderson, et al. (2004). "Grief, anxiety, stillbirth, and perinatal problems: healing with kangaroo care." J Obstet Gynecol Neonatal Nurs **33**(6): 774-82.

A young, anxious mother's first pregnancy was eclamptic, her placenta was underperfused, and her son was stillborn. She carried grief, guilt, anxiety, and hypervigilance into her next preeclamptic pregnancy, birth (of her small-for-dates son), and early postpartum period. When breastfeeding difficulties developed, the authors intervened with three consecutive (skin-to-skin) breastfeedings. During the first skin-to-skin breastfeeding, the mother stopped crying, shared self-disparaging emotions, and then began relaxing and "taking-in" her new baby. Breastfeeding continues at 1 year.

Caetano, L. C., C. G. Scochi, et al. (2005). "[Living the mother-child-family triad in the Kangaroo Method]." Rev Lat Am Enfermagem **13**(4): 562-8.

This study focuses on the experience of families in the Kangaroo Mother Method (KM) and aims to understand the functioning of the family dynamics and to apprehend the family transformations as a result of their experience in the method.

The study used Symbolic Interactionism as a theoretical and Grounded Theory as a methodological reference framework. Data revealed the following phenomena: having an unexpected evolution and outcome of pregnancy, which is a phase in which the parents go through a pregnancy and suffer due to its premature interruption; coping with the prematurity of the child, in which the parents get into the world of prematurity and face the need to act for the child's survival; and living with the decision and the experience together with the child, which reveals the possibility of staying in hospital in the KM or not. These phenomena led to the central category: weighing the risks and benefits between staying with the child in the kangaroo method or with the family.

Charpak, N., J. G. Ruiz, et al. (2005). "Kangaroo Mother Care: 25 years after." Acta Paediatr **94**(5): 514-22.

The components of the Kangaroo Mother Care (KMC) intervention, their rational bases, and their current uses in low-, middle-, and high-income countries are described. KMC was started in 1978 in Bogota (Colombia) in response to overcrowding and insufficient resources in neonatal intensive care units associated with high morbidity and mortality among low-birthweight infants. The intervention consists of continuous skin-to-skin contact between the mother and the infant, exclusive breastfeeding, and early home discharge in the kangaroo position. In studies of the physiological effects of KMC, the results for most variables were within clinically acceptable ranges or the same as those for premature infants under other forms of care. Body temperature and weight gain are significantly increased, and a meta-analysis showed that the kangaroo position increases the uptake and duration of breastfeeding. Investigations of the behavioral effects of KMC show rapid quiescence. The psychosocial effects of KMC include reduced stress, enhancement of mother-infant bonding, and positive effects on the family environment and the infant's cognitive development. Conclusion: Past and current research has clarified some of the rational bases of KMC and has provided evidence for its effectiveness and safety, although more research is needed to clearly define the effectiveness of the various components of the intervention in different settings and for different therapeutic goals.

Charpak, N., J. G. Ruiz-Pelaez, et al. (2001). "A randomized, controlled trial of kangaroo mother care: results of follow-up at 1 year of corrected age." Pediatrics **108**(5): 1072-9.

OBJECTIVE: To assess the effectiveness and safety of Kangaroo Mother Care (KMC) for infants of low birth weight. METHODS: An open, randomized, controlled trial of a Colombian social security referral hospital was conducted. A total of 1084 consecutive infants who were born at  $\leq 2000$  g were followed, and 746 newborns were randomized when eligible for minimal care, with 382 to KMC and 364 to "traditional" care. Information on vital status was available for 693 infants (93%) at 12 months of corrected age. KMC consisted of skin-to-skin contact on the mother's chest 24 hours/day, nearly exclusive breastfeeding, and early discharge, with close ambulatory monitoring. Control infants remained in incubators until the usual discharge criteria were met. Both groups were followed at term and at 3, 6, 9, and 12 months of corrected age. The main outcomes measured were morbidity, mortality, growth, development, breastfeeding, hospital stay, and sequelae. RESULTS: Baseline variables were evenly distributed, except for weight at recruitment (KMC: 1678 g;

control participants: 1713 g). The risk for death was lower among infants who were given KMC, although the difference was not significant (KMC: 11 [3.1%] of 339; control participants: 19 [5.5%] of 324; relative risk: 0.57; 95% confidence interval: 0.17-1.18). The growth index of head circumference was statistically significantly greater in the group given KMC, but the developmental indices of the 2 groups were similar. Infants who weighed  $\leq$ 1500 g at birth and were given KMC spent less time in the hospital than those who were given standard care. The number of infections was similar in the 2 groups, but the severity was less among infants who received KMC. More of these infants were breastfed until 3 months of corrected age. **CONCLUSION:** These results support earlier findings of the beneficial effects of KMC on mortality and growth. Use of this technique would humanize the practice of neonatology, promote breastfeeding, and shorten the neonatal hospital stay without compromising survival, growth, or development.

Charpak, N., J. G. Ruiz-Pelaez, et al. (2001). "A randomized, controlled trial of kangaroo mother care: results of follow-up at 1 year of corrected age." *Pediatrics* **108**(5): 1072-9.

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Charpak, N., J. G. Ruiz-Pelaez, et al. (2005). "Influence of feeding patterns and other factors on early somatic growth of healthy, preterm infants in home-based kangaroo mother care: a cohort study." *J Pediatr Gastroenterol Nutr* **41**(4): 430-7.

**OBJECTIVE:** Breast-milk fortifiers recommended for premature infants are seldom available in developing countries. We describe the characteristics of growth in preterm infants under ambulatory Kangaroo Mother Care (KMC) who eventually required supplemental formula because of failure to thrive with exclusive breast feeding. We evaluated the relationship between growth indices at term, nutritional status of the infant at birth, and feeding pattern. **DESIGN:** Prospective cohort study conducted in the Neonatal Unit at Clinica San Pedro Claver and the KMC program, an ambulatory clinic from the Clinica del Nino tertiary care clinics in Bogota, Colombia. Included were 115 mothers and their 129 healthy, preterm infants. One hundred twenty-six (98.4%) infants were available for evaluation at term. Infant weights were monitored daily until they achieved 15 g/kg per day for 2 days and then weekly until term. Formula was offered only to infants who did not gain 15 g per kg per day for 3 consecutive days. **RESULTS:** Sixty (47.6%) infants gained weight adequately with exclusive breast feeding. In 14 of those who needed supplements, adequate weight gain was achieved before reaching term and supplements could be stopped. The more immature infants required supplementation more frequently. With or without supplementation, infants with lower weight for gestational age at birth were less likely to achieve adequate weight by term. **CONCLUSIONS:** Growth indices at term in premature infants were close to those expected for term infants born in Bogota (between percentile 10 to percentile 25). Decision on formula supplementation of breast milk should be made not only based on birth weight or gestational age but on a careful monitoring of weight gain while the mother is receiving continuous support to enhance and maintain successful breast-feeding. Small-for-date premature infants thrive less well than other infants even with supplementation.

Chwo, M. J., G. C. Anderson, et al. (2002). "A randomized controlled trial of early kangaroo care for preterm infants: effects on temperature, weight, behavior, and acuity." *J Nurs Res* **10**(2): 129-42.

Kangaroo care (KC) has been the intervention for preterm infants in numerous published studies. However, most well designed studies to date have used a one-group repeated measure design. This methodology is not as definitive as an experimental design. Because of the absence of a comparable control group, change between pretest and posttest may be due to any other environmental variables or normal variation of subjects (Kirk, 1995). This randomized controlled trial (RCT) was done to test the hypotheses that KC infants would have higher mean tympanic temperatures, less weight loss, more optimal behavioral states, and lower acuity (length of stay). Thirty-four eligible mother-infant dyads were randomly assigned to the KC or the control group by computerized minimization on the day following birth. Stratification variables included infant gender, birth weight, delivery method, and parity. KC infants compared to control infants had higher mean tympanic temperature (37.3 degrees C vs. 37.0 degrees C), more quiet sleep (62% vs. 22%), and less crying (2% vs. 6%) all at  $p=.000$ . No significant difference was found for weight loss and acuity (length of stay). These findings can be used for evidence-based nursing practice in Taiwan. With the knowledge attained from this RCT, nurses can educate and motivate mothers to keep their stable preterm infants warm by skin-to-skin contact inside their clothing, thereby encouraging self-regulatory feeding.

Conde-Agudelo, A., J. L. Diaz-Rossello, et al. (2003). "Kangaroo mother care to reduce morbidity and mortality in low birthweight infants." Cochrane Database Syst Rev(2): CD002771.

**BACKGROUND:** Kangaroo mother care (KMC), defined as skin-to-skin contact between a mother and her newborn, frequent and exclusive or nearly exclusive breastfeeding, and early discharge from hospital, has been proposed as an alternative to conventional neonatal care for low birthweight (LBW) infants. **OBJECTIVES:** To determine whether there is evidence to support the use of KMC in LBW infants as an alternative to conventional care after the initial period of stabilization with conventional care. **SEARCH STRATEGY:** We used the standard search strategy of the Neonatal Review Group of the Cochrane Collaboration. MEDLINE, EMBASE, LILACS, POPLINE and CINAHL databases (to December 2002), and the Cochrane Controlled Trials Register (The Cochrane Library), were searched using the key words terms "kangaroo mother care" or "kangaroo care" or "kangaroo mother method" or "skin-to-skin contact" and "infants" or "low birthweight infants". **SELECTION CRITERIA:** Randomized trials comparing KMC and conventional neonatal care in LBW infants. **DATA COLLECTION AND ANALYSIS:** Trial quality was assessed and data were extracted independently by two reviewers. Statistical analysis was conducted using the standard Cochrane Collaboration methods. **MAIN RESULTS:** Three studies, involving 1362 infants, were included. All the trials were conducted in developing countries. The studies were of moderate to poor methodological quality. The most common shortcomings were in the areas of blinding procedures for those who collected the outcomes measures, handling of drop outs, and completeness of follow-up. The great majority of results consist of results of a single trial. KMC was associated with the following reduced risks: nosocomial infection at 41 weeks' corrected gestational age (relative risk 0.49, 95% confidence interval 0.25 to 0.93), severe illness (relative risk 0.30, 95% confidence interval 0.14 to 0.67), lower respiratory tract disease at 6 months follow-up (relative risk 0.37, 95% confidence interval 0.15 to 0.89), not exclusively breastfeeding at discharge (relative risk 0.41, 95% confidence interval 0.25 to 0.68), and maternal dissatisfaction with method of care (relative risk 0.41, 95% confidence interval 0.22 to 0.75). KMC infants had gained more weight per day by discharge (weighted mean difference 3.6 g/day, 95% confidence interval 0.8 to 6.4). Scores on mother's sense of competence according to infant stay in hospital and admission to NICU were better in KMC than in control group (weighted mean differences 0.31 [95% confidence interval 0.13 to 0.50] and 0.28 [95% confidence interval 0.11 to 0.46], respectively). Scores on mother's perception of social support according to infant stay in NICU were worse in KMC group than in control group (weighted mean difference -0.18 (95% confidence interval -0.35 to -0.01)). Psychomotor development at 12 months' corrected age was similar in the two groups. There was no evidence of a difference in infant mortality. However, serious concerns about the methodological quality of the included trials weaken credibility in these findings. **REVIEWER'S CONCLUSIONS:** Although KMC appears to reduce severe infant morbidity without any serious deleterious effect reported, there is still insufficient evidence to recommend its routine use in LBW infants. Well designed randomized controlled trials of this intervention are needed.

Dodd, V. L. (2005). "Implications of kangaroo care for growth and development in preterm infants." J Obstet Gynecol Neonatal Nurs **34**(2): 218-32.

**OBJECTIVE:** To review research on kangaroo care with implications for growth and development in preterm infants. **DATA SOURCES:** Nursing, medical, and child development research literature was searched through PubMed through 2003 using the search terms kangaroo Care, skin-to-skin, growth/development, and premature infants. **STUDY SELECTION:** Randomized controlled trials, pretest-posttest designs, and other comparative studies of kangaroo care were reviewed. Reports exploring parent perspectives were examined for attachment and parent-infant interaction findings. Theory and research regarding growth in preterm infants were explored. **DATA EXTRACTION:** Research on topics of kangaroo care, skin-to-skin contact, preterm infant growth, preterm infant weight gain, and failure to thrive was evaluated. **DATA SYNTHESIS:** Research on kangaroo care reports physiologic safety for preterm infants and increased attachment for parents. Attachment promotes nurturing behaviors that support growth and development. Weight gain as a benefit of kangaroo care remains in question. **CONCLUSIONS:** Kangaroo care is safe for preterm infants and may have important benefits for growth and development. Suggestions are made for future research on effects of KC on preterm infants.

Dombrowski, M. A., G. C. Anderson, et al. (2001). "Kangaroo (skin-to-skin) care with a postpartum woman who felt depressed." MCN Am J Matern Child Nurs **26**(4): 214-6.

The mother in this case study had numerous known risk factors for postpartum depression and was in rehabilitation for drug abuse. She was crying at 2 hours postbirth and expressing feelings of sadness as her baby was being unwrapped for her first kangaroo care (KC) experience. Thereafter, during our research protocol, her self-reported depression scores decreased rapidly and had disappeared by 32 hours postbirth. A benefit of KC requiring systematic study is that KC may lessen maternal depression. There is new knowledge that some functions of the maternal HPA axis become dampened during the last trimester of pregnancy as the placenta increases its secretion of corticotrophin-releasing hormone. The sudden loss of the placenta following delivery, accompanied by a suppressed HPA axis, may have an effect on mood during the immediate postpartum period. Perhaps appropriate reactivation of the maternal HPA axis can be triggered following birth by the stimulation inherent in KC, thereby minimizing risk for postpartum depression.

Dombrowski, M. A., G. C. Anderson, et al. (2000). "Kangaroo skin-to-skin care for premature twins and their adolescent parents." MCN Am J Matern Child Nurs **25**(2): 92-4.

Risk factors associated with prematurity and adolescent parenting greatly increase when combined with multiple birth. Kangaroo care (KC) for preterm infants is well documented, although KC with twins or with adolescent parents is mentioned only briefly. In this case study, adolescent parents experience KC with their 32-week twin sons beginning 19 hours postbirth. These young parents interacted with, responded to, and took responsibility for their newborn sons, behaviors that are sometimes difficult for adolescent parents. Thus, KC appeared to be an effective intervention for these adolescent parents. Additionally, three kinds of KC with twins were identified: separate, sequential, and shared.

Dzukou, T., A. de la Pintiere, et al. (2004). "[Kangaroo mother care: bibliographical review on the current attitudes, their interests and their limits]." Arch Pediatr **11**(9): 1095-100.

Initiated in 1978 by a Colombian team, then largely adapted in industrialized countries as well as in poor developed countries, the kangaroo mother care (KMC) are known to ensure for low birth weight newborn, a thermoregulation, a good physiological stability and a better relational comfort with their parents. The goal of this work is to make a bibliographical review on current concepts, interests and limits of this method. We re-examined impact of the KMC on the basal metabolism, thermoregulation, growth and evolution of these children. They are helpful in the developing countries but medical safety should not be forgotten. In these countries where there's high frequentation of the services, they are able to regulate body temperature and metabolic adaptation of the newborn. In developed countries, KMC contribute to decrease anxiety of parents and improve the relations with their child. However, it is difficult to recommend their use in current practice. Rigorous randomised studies are necessary to argue their establishment in full safety, to know the neuropsychological development and the real somatic growth on the long term of the children and to know their true economic cost.

Ellett, M. L., D. A. Bleah, et al. (2004). "Feasibility of using kangaroo (skin-to-skin) care with colicky infants." Gastroenterol Nurs **27**(1): 9-15.

Infant colic affects about 20% of all infants and the cause remains elusive. Healthcare providers typically view infant colic as a minor inconvenience that is harmless to the thriving infant and will go away with time; however, parents view caring for a colicky infant as a crisis situation. The purpose of this feasibility study conducted via the internet was to examine the feasibility of implementing kangaroo care at the beginning of colicky episodes. Mothers of colicky infants began the study by completing the on-line Infant Colic Scale and recording in a baseline state-of-arousal diary for 3 days. Next, they implemented kangaroo care at the beginning of as many episodes of colic as possible for 2 weeks while recording in a second state-of-arousal diary. Then, they stopped kangaroo care for 2 days while continuing to record in the second state-of-arousal diary, and lastly they were asked how kangaroo care worked for them. Seventy-five parents of colicky infants consented to participate in this study; however, only five of them actually did. Three of these completed only the baseline state-of-arousal diary, and two completed all parts of the study. This dropout rate showed that conducting such an intervention via the internet is not a feasible approach. Because kangaroo care for infants with colic is a promising intervention and because there are no other effective treatments for most of these infants, another feasibility study is warranted using different methods. Then if results are promising, a larger clinical trial should be conducted.

Elliott, D. (2002). "Kangaroo care." MCN Am J Matern Child Nurs **27**(6): 357.

Engler, A. J., S. M. Ludington-Hoe, et al. (2002). "Kangaroo care: national survey of practice, knowledge, barriers, and perceptions." MCN Am J Matern Child Nurs **27**(3): 146-53.

**PURPOSE:** A national survey was conducted to assess practice, knowledge, barriers, and perceptions regarding Kangaroo Care (KC)--the holding of diaper-clad preterm infants skin-to-skin, chest-to-chest by parents. **DESIGN:** A descriptive survey was conducted. **METHODS:** Kangaroo Care Questionnaires (KCQs), developed for the study, were sent to nurse managers in all hospitals in the United States that were identified as providing neonatal intensive care services (N = 1,133), and were to be completed by the nurse most familiar with the practice of KC in that unit. A second KCQ was sent to non-respondents. Descriptive statistics were used to summarize the data. **RESULTS:** A response rate of 59% (N = 537) was achieved. Over 82% of the respondents reported practicing KC in their neonatal intensive care units (NICUs). Nurses were knowledgeable about KC. Major barriers to practicing KC for certain types of infants were infant safety concerns, as well as reluctance by nurses, physicians, and families to initiate or participate in KC. Many NICUs do not permit KC for certain types of infants (e.g., those on vasopressors or high-frequency ventilation). Over 60% of respondents agreed that low gestational age or weight were not contraindications. Respondents from NICUs in which KC is practiced were more positive in their perceptions than respondents from NICUs that do not practice KC. **CLINICAL IMPLICATIONS:** The findings suggest that in order to overcome barriers to the practice of KC, nurses need educational offerings highlighting the knowledge and skills needed to provide KC safely and effectively. These educational offerings should also emphasize the value of KC to infants and parents. In addition, knowledgeable practitioners need to develop evidence-based policies and procedures that will lead to successful KC.

Feldman, R. and A. I. Eidelman (2003). "Skin-to-skin contact (Kangaroo Care) accelerates autonomic and neurobehavioural maturation in preterm infants." Dev Med Child Neurol **45**(4): 274-81.

The effects of mother-infant skin-to-skin contact (Kangaroo Care; KC) on autonomic functioning, state regulation, and neurobehavioural status was examined in 70 preterm infants, half of whom received KC over 24.31 days (SD 7.24) for a total of 29.76 hours (SD 12.86). Infants were matched for sex (19 males and 16 females in each group); birthweight (KC, 1229.95 g [SD 320.21]; controls, 1232.17 g [SD 322.15]); gestational age (GA) (KC, 30.28 weeks [SD 2.54]; controls, 30.19 weeks [SD 2.65]); medical risk; and family demographics. Vagal tone was calculated from 10 minutes of heart rate before KC and again at 37 weeks' GA. Infant state was observed in 10-second epochs during four consecutive hours before KC and again at 37 weeks' GA. Neurobehavioural status was assessed at 37 weeks' GA with the Neonatal Behavioral Assessment Scale (NBAS). Infants receiving KC showed a more rapid maturation of vagal tone between 32 and 37 weeks' GA ( $p=0.029$ ). More rapid improvement in state organization was observed in KC infants, in terms of longer periods of quiet sleep ( $p=0.016$ ) and alert wakefulness ( $p=0.013$ ) and shorter periods of active sleep ( $p=0.023$ ). Neurodevelopmental profile was more mature for KC infants, particularly habituation ( $p=0.032$ ) and orientation ( $p=0.007$ ). Results underscore the role of early skin-to-skin contact in the maturation of the autonomic and circadian systems in preterm infants.

Feldman, R., A. I. Eidelman, et al. (2002). "Comparison of skin-to-skin (kangaroo) and traditional care: parenting outcomes and preterm infant development." *Pediatrics* **110**(1 Pt 1): 16-26.

**OBJECTIVE:** To examine whether the kangaroo care (KC) intervention in premature infants affects parent-child interactions and infant development. **METHODS:** Seventy-three preterm infants who received KC in the neonatal intensive care unit were matched with 73 control infants who received standard incubator care for birth weight, gestational age (GA), medical severity, and demographics. At 37 weeks' GA, mother-infant interaction, maternal depression, and mother perceptions were examined. At 3 months' corrected age, infant temperament, maternal and paternal sensitivity, and the home environment (with the Home Observation for Measurement of the Environment [HOME]) were observed. At 6 months' corrected age, cognitive development was measured with the Bayley-II and mother-infant interaction was filmed. Seven clusters of outcomes were examined at 3 time periods: at 37 weeks' GA, mother-infant interaction and maternal perceptions; at 3-month, HOME mothers, HOME fathers, and infant temperament; at 6 months, cognitive development and mother-infant interaction. **RESULTS:** After KC, interactions were more positive at 37 weeks' GA: mothers showed more positive affect, touch, and adaptation to infant cues, and infants showed more alertness and less gaze aversion. Mothers reported less depression and perceived infants as less abnormal. At 3 months, mothers and fathers of KC infants were more sensitive and provided a better home environment. At 6 months, KC mothers were more sensitive and infants scored higher on the Bayley Mental Developmental Index (KC: mean: 96.39; controls: mean: 91.81) and the Psychomotor Developmental Index (KC: mean: 85.47; controls: mean: 80.53). **CONCLUSIONS:** KC had a significant positive impact on the infant's perceptual-cognitive and motor development and on the parenting process. We speculate that KC has both a direct impact on infant development by contributing to neurophysiological organization and an indirect effect by improving parental mood, perceptions, and interactive behavior.

Feldman, R., A. Weller, et al. (2002). "Skin-to-Skin contact (Kangaroo care) promotes self-regulation in premature infants: sleep-wake cyclicality, arousal modulation, and sustained exploration." *Dev Psychol* **38**(2): 194-207.

The effect of mother-infant skin-to-skin contact (kangaroo care, or KC) on self-regulatory processes of premature infants was studied. Seventy-three infants who received KC were compared with 73 infants matched for birth weight, gestational age, medical risk, and family demographics. State organization was measured in 10-s epochs over 4 hr before KC and again at term. No differences between KC infants and controls were found before KC. At term, KC infants showed more mature state distribution and more organized sleep-wake cyclicality. At 3 months, KC infants had higher thresholds to negative emotionality and more efficient arousal modulation while attending to increasingly complex stimuli. At 6 months, longer duration of and shorter latencies to mother-infant shared attention and infant sustained exploration in a toy session were found for KC infants. The results underscore the importance of maternal body contact for infants' physiological, emotional, and cognitive regulatory capacities.

Feldman, R., A. Weller, et al. (2003). "Testing a family intervention hypothesis: the contribution of mother-infant skin-to-skin contact (kangaroo care) to family interaction, proximity, and touch." *J Fam Psychol* **17**(1): 94-107.

The provision of maternal-infant body contact during a period of maternal separation was examined for its effects on parent-infant and triadic interactions. Participants were 146 three-month-old preterm infants and their parents, half of whom received skin-to-skin contact, or kangaroo care (KC), in the neonatal nursery. Global relational style and micro-patterns of proximity and touch were coded. Following KC, mothers and fathers were more sensitive and less intrusive, infants showed less negative affect, and family style was more cohesive. Among KC families, maternal and paternal affectionate touch of infant and spouse was more frequent, spouses remained in closer proximity, and infant proximity position was conducive to mutual gaze and touch during triadic play. The role of touch as a constituent of the co-regulatory parent-infant and triadic systems and the effects of maternal contact on mothering, co-parenting, and family processes are discussed.

Ferber, S. G. and I. R. Makhoul (2004). "The effect of skin-to-skin contact (kangaroo care) shortly after birth on the neurobehavioral responses of the term newborn: a randomized, controlled trial." *Pediatrics* **113**(4): 858-65.

**BACKGROUND:** The method of skin-to-skin contact (kangaroo care [KC]) has shown physiologic, cognitive, and emotional gains for preterm infants; however, KC has not been studied adequately in term newborns. **AIMS:** To evaluate the effect of KC, used shortly after delivery, on the neurobehavioral responses of the healthy newborn. **STUDY DESIGN:** A randomized, controlled trial using a table of random numbers. After consent, the mothers were assigned to 1 of 2 groups: KC shortly after delivery or a no-treatment standard care (control group). **SUBJECTS:** Included were 47 healthy mother-infant pairs. KC began at 15 to 20 minutes after delivery and lasted for 1 hour. Control infants and KC infants were brought to the nursery 15 to 20 and 75 to 80 minutes after birth, respectively. **RESULTS:** During a 1-hour-long observation, starting at 4 hours postnatally, the KC infants slept longer, were mostly in a quiet sleep state, exhibited more flexor movements and postures, and showed less extensor movements. **CONCLUSIONS:** KC seems to influence state organization and motor system modulation of the newborn infant shortly after delivery. The significance of our findings for supportive transition from the womb to the extrauterine environment is discussed. Medical and nursing staff may be well advised to provide this kind of care shortly after birth.

Fohe, K., S. Kropf, et al. (2000). "Skin-to-skin contact improves gas exchange in premature infants." *J Perinatol* **20**(5): 311-5.

**OBJECTIVE:** Skin-to-skin contact (kangarooing) is regarded as an important method to improve intensive care in premature infants. There is still demand for investigations of its impact on physiological parameters. **STUDY DESIGN:** We examined 53 preterm infants of < 1800 gm in a prospective, pretest-test-posttest design study during incubator care (60 minutes), skin-to-skin contact (90 minutes), and incubator care again (90 minutes). Heart rate, respiratory rate, oxygen saturation (SaO<sub>2</sub>), transcutaneous pO<sub>2</sub> (tcpO<sub>2</sub>), transcutaneous pCO<sub>2</sub>, rectal temperature, and fraction of inspired oxygen were measured. **RESULTS:** The heart rate increased during skin-to-skin contact by 5 beats per minute (p < 0.001), the respiratory rate

dropped by 5/minute ( $p < 0.01$ ), the SaO<sub>2</sub> improved by 0.4% ( $p < 0.05$ ) accompanied by an increase of tcpO<sub>2</sub> of 4.8 mm Hg ( $p < 0.001$ ), the tcpCO<sub>2</sub> dropped by 1.2 mm Hg ( $p < 0.001$ ), and the rectal temperature increased by 0.3 degree C ( $p < 0.001$ ). Analyzing three groups separately by postnatal weight, we observed the smallest increase in heart rate and the highest decrease in respiratory rate in infants of < 1000 gm ( $p < 0.001$ ). The increase in SaO<sub>2</sub> and in the tcpO<sub>2</sub> doubles in infants of < 1000 gm compared with infants of > 1000 gm ( $p < 0.001$ ). All changes were independent of postnatal age. CONCLUSION: During skin-to-skin contact, preterm infants not only remain clinically stable but also show a more efficient gas exchange. Although the patient is removed (transferred) from the incubator, there is no risk of hypothermia even in infants of < 1000 gm.

Furlan, C. E., C. G. Scochi, et al. (2003). "[Perception of parents in experiencing the kangaroo mother method]." Rev Lat Am Enfermagem **11**(4): 444-52.

This study aimed at analyzing the perception of pre-term babies' parents in experiencing the Kangaroo Mother Method. It is a descriptive study with a qualitative approach. Data were collected from semi-structured interviews with 10 parents, held in the first 60 days after the discharge of the pre-term baby from the Kangaroo method, in a philanthropic hospital in the interior of Sao Paulo State. The parents' perception concerning the experience was grouped in four thematic units: making maternal stay in the Kangaroo Method flexible; favoring the mother-child and family relationship; completing the pre-term newborn's growth and development and developing skills in caring for the child. The obtained data provided information for the organization of care in the Kangaroo Mother Method, from the institutional perspective of the health care team as well as the relationship with clients, which enabled understanding about the difficulties and meanings attributed to the experience and optimization of nursing care.

Furman, L. and J. Kennell (2000). "Breastmilk and skin-to-skin kangaroo care for premature infants. Avoiding bonding failure." Acta Paediatr **89**(11): 1280-3.

Gharavi, B., C. Schott, et al. (2004). "[Value of kangaroo care, basal stimulation, kinesthesia awareness and baby massage in development promoting nursing of premature infants]." Kinderkrankenschwester **23**(9): 368-72.

Ibe, O. E., T. Austin, et al. (2004). "A comparison of kangaroo mother care and conventional incubator care for thermal regulation of infants < 2000 g in Nigeria using continuous ambulatory temperature monitoring." Ann Trop Paediatr **24**(3): 245-51.

Although skin-to-skin contact (or kangaroo mother care, KMC) for preterm infants is a practical alternative to incubator care, no studies have compared these methods using continuous ambulatory temperature monitoring. To compare thermal regulation in low birthweight infants (< 2000 g) managed by KMC alternating with conventional care (CC) and to determine the acceptability to mothers of KMC, an experimental study with a crossover design with observational and qualitative data collected on temperature patterns and mothers attitudes to skin-to-skin care was

conducted in the neonatal wards of three hospitals in Lagos, Nigeria. Thirteen eligible infants were nursed by their mothers or surrogates in 38 4-hour sessions of KMC and the results compared with 38 sessions of incubator care. The risk of hypothermia was reduced by > 90% when nursed by KMC rather than conventional care, relative risk (RR) 0.09 (0.03-0.25). More cases of hyperthermia (> 37.5 degrees C) occurred with KMC, and core-periphery temperature differences were widened, but the risk of hyperthermia > 37.9 degrees C (RR 1.3, 0.9-1.7) was not significant. Micro-ambient temperatures were higher during KMC, although the average room temperatures during both procedures did not differ significantly. Mothers felt that KMC was safe, and preferred the method to CC because it did not separate them from their infants, although some had problems adjusting to this method of care. Where equipment for thermal regulation is lacking or unreliable, KMC is a preferable method for managing stable low birthweight infants.

Javorski, M., L. C. Caetano, et al. (2004). "[Social representations on breastfeeding according to preterm infants' mothers in Kangaroo Care]." Rev Lat Am Enfermagem **12**(6): 890-8.

This study aimed to identify the social representations on premature infants' breastfeeding at a Kangaroo Care Unit, from the perspective of mothers who are breastfeeding and describe the conflicts and contradictions they experience in this context. A qualitative approach was adopted, using the first stage of enunciation analysis in the light of social representations theory to identify the meanings assigned to breastfeeding. We found the following representations: healthy babies are breastfed, mother's milk provides protection and preserves the premature child's life, breastfeeding is the complement of motherhood and breastfeeding a premature infant is a hard and exhausting experience. The conflicts resulted from the assimilation of technical contents and discourse, late sucking and representations on breastfeeding.

Johnson, A. N. (2005). "Kangaroo holding beyond the NICU." Pediatr Nurs **31**(1): 53-6.

The primary goal for maternal-child nurses in caring for parents and their infants is to support parental confidence and competence through education and services to assure optimal parental-infant attachment. Kangaroo holding in the hospital and home environment is one intervention that encourages parental-infant interaction as well as provides the benefits of closeness, proximity, and touch. Nurses in hospitals, private practice, the community, and beyond must work together to change practice by adding the intervention of kangaroo care for the benefit of infants and their families.

Johnston, C. C., B. Stevens, et al. (2003). "Kangaroo care is effective in diminishing pain response in preterm neonates." Arch Pediatr Adolesc Med **157**(11): 1084-8.

**OBJECTIVE:** To test the efficacy of maternal skin-to-skin contact, or kangaroo care (KC), on diminishing the pain response of preterm neonates to heel lancing. **DESIGN:** A crossover design was used, in which the neonates served as their own controls. **Subjects** Preterm neonates (n = 74), between 32 and 36 weeks' postmenstrual age and within 10 days of birth, who were breathing without assistance and who were not receiving sedatives or analgesics in 3 level II to III neonatal

intensive care units in Canada. INTERVENTIONS: In the experimental condition, the neonate was held in KC for 30 minutes before the heel-lancing procedure and remained in KC for the duration of the procedure. In the control condition, the neonate was in the prone position in the isolette. The ordering of conditions was random. MAIN OUTCOME MEASURES: The primary outcome was the Premature Infant Pain Profile, which is composed of 3 facial actions, maximum heart rate, and minimum oxygen saturation changes from baseline in 30-second blocks. Videotapes, taken with the camera positioned on the neonate's face so that an observer could not tell whether the neonate was being held or was in the isolette, were coded by research assistants who were naive to the purpose of the study. Heart rate and oxygen levels were continuously monitored into a computer for later analysis. A repeated-measures analysis of covariance was used, with order of condition and site as factors and severity of illness as a covariate. RESULTS: Premature Infant Pain Profile scores across the first 90 seconds from the heel-lancing procedure were significantly ( $.002 < P < .04$ ) lower by 2 points in the KC condition. CONCLUSIONS: For preterm neonates who are 32 weeks' postmenstrual age or older, KC seems to effectively decrease pain from heel lancing. Further study is needed to determine if younger neonates or those requiring assistance in breathing, or older infants or toddlers, would benefit from KC, or if it would remain effective over several procedures. Given its effectiveness, and that parents of neonates in critical care units want to participate more in comforting their children, KC is a potentially beneficial strategy for promoting family health.

Kadam, S., S. Binoy, et al. (2005). "Feasibility of kangaroo mother care in Mumbai." Indian J Pediatr 72(1): 35-8.

OBJECTIVE: The purpose of this study was to determine the feasibility and acceptability of kangaroo care in a tertiary care hospital in India. METHODS: A randomized controlled trial was performed over one year period in which 89 neonates were randomized into two groups kangaroo mother care (KMC) and conventional method of care (CMC). RESULTS: Forty-four babies were randomized into KMC group and 45 to CMC. There was significant reduction in KMC vs CMC group of hypothermia (10/44 vs 21/45, p-value < 0.01), higher oxygen saturations (95.7 vs 94.8%, p-value < 0.01) and decrease in respiratory rates (36.2 vs 40.7, p-value < 0.01). There were no statistically significant differences in the incidence of hyperthermia, sepsis, apnea, onset of breastfeeding and hospital stay in two groups. 79% of mothers felt comfortable during the KMC and 73% felt they would be able to give KMC at home. KMC is feasible, as mothers are already admitted in hospitals and are involved in the care of newborn. CONCLUSION: KMC is a simple and feasible intervention; acceptable to most mothers admitted in hospitals. There may be benefits in terms of reducing the incidence of hypothermia with no adverse effects of KMC demonstrated in the study. The present study has important implications in the care of LBW infants in the developing countries, where expensive facilities for conventional care may not be available at all place.

Kambarami, R. (2002). "Kangaroo care and multiple births." Ann Trop Paediatr 22(1): 107-8.

Kambarami, R. A., O. Chidede, et al. (2003). "Long-term outcome of preterm infants discharged home on kangaroo care in a developing country." Ann Trop Paediatr **23**(1): 55-9.

Several hospital-based studies have shown the beneficial effect of kangaroo care on preterm infants. Long-term outcome was studied in 297 preterm infants born at Harare Hospital weighing 500-1800 g, discharged home on kangaroo care and followed up for 12 months. Of these, 79 (26.6%) died, 141 (47.5%) survived to complete follow-up and 77 (25.9%) were lost to follow-up. Of those who died, median birthweight was 1460 g, median age at hospital discharge 7 days, median weight at discharge 1400 g and median age at death 66 days. Of those who completed follow-up, median birthweight was 1575 g, median age at hospital discharge was 6 days and median weight at hospital discharge was 1500 g. Of those who were lost to follow-up, median age at loss to follow-up was 70 days, median birthweight was 1540 g, median age at hospital discharge was 5 days and median weight at hospital discharge was 1500 g. The hospital re-admission rate was 22.9% with 8.8% mortality. Maternal mortality and chronic morbidity rates were 4.7% and 7.4%, respectively. On comparing those who died with those who completed follow-up, mother's age <20 years, birthweight <1500 g and maternal mortality and chronic morbidity were significant risk factors for infant mortality. Age at discharge and weight at birth and on discharge were not significantly associated with infant mortality.

Kambarami, R. A., J. Mutambirwa, et al. (2002). "Caregivers' perceptions and experiences of 'kangaroo care' in a developing country." Trop Doct **32**(3): 131-3.

The widespread use of 'kangaroo care' is yet to be realized despite strong evidence to suggest that this method of preterm care is safe, effective and affordable. We need to understand users' perception of this method of care. We studied, through focus group discussions, caregivers' experiences and perceptions of this method in a tertiary level hospital of a developing country. We conclude that, in this hospital, caregivers preferred kangaroo care to conventional methods. Communities' awareness of this method of care and its advantages must be improved.

Kirsten, G., J. van Zyl, et al. (2004). "Impact of unfortified human milk feeding on weight gain and mineral status of very-low-birth-weight infants after discharge from a Kangaroo mother care unit." Adv Exp Med Biol **554**: 379-81.

Kirsten, G. F., N. J. Bergman, et al. (2001). "Kangaroo mother care in the nursery." Pediatr Clin North Am **48**(2): 443-52.

Kangaroo mother care is becoming an integral part of the care of low birth weight infants worldwide. It provides economic savings to families and health care facilities and many physiologic and psychobehavioral benefits to mothers and infants, the most important of which is the promotion of successful breastfeeding. The benefits of breastfeeding, of human milk over formula, and of feeding from the breast per se, are beyond dispute, and so KMC should be actively promoted. The full impact of KMC on breastfeeding low birth weight infants is yet to be realized.

Kluthe, C., R. R. Wauer, et al. (2004). "Extrasystoles: side effect of kangaroo care?" Pediatr Crit Care Med **5**(5): 455-6.

**OBJECTIVE:** To present an unpublished reason for an arrhythmic electrocardiogram (ECG) recording during kangaroo care in a preterm infant. **DESIGN:** Case report. **PATIENT:** Preterm infant. **MEASUREMENTS AND MAIN RESULTS:** A preterm infant exhibited cardiac arrhythmia on the ECG monitor during kangaroo care, leading to interruption of kangarooing. Arrhythmia disappeared after placing the baby back into the incubator. The most likely reasons for arrhythmia were excluded. However, arrhythmia reappeared upon continuation of kangaroo care. ECG monitoring revealed the reason for the monitoring error. **CONCLUSIONS:** ECG monitoring during kangaroo care should cause error because of superimposed electric activity from the parent. Oxygen saturation represents a more reliable method of monitoring during kangaroo care.

Lai, H. L., C. J. Chen, et al. (2005). "Randomized controlled trial of music during kangaroo care on maternal state anxiety and preterm infants' responses." Int J Nurs Stud.

The purpose of this randomized controlled trial was to investigate the influences of music during kangaroo care (KC) on maternal anxiety and preterm infants' responses. There are no experimental studies that explore the influences of combination of music and KC on psychophysiological responses in mother-infant dyads. Purposive sampling was used to recruit 30 hospitalized preterm infants body weight 1500gm and over, gestational age 37 weeks and lower from two NICUs. Mother-infant dyads were randomly assigned to the treatment and the control group using permuted block randomization stratified on gender. There were 15 mother-infant dyads in each group. Subjects in the treatment dyads listened to their choice of a lullaby music during KC for 60min/section/day for three consecutive days. Control dyads received routine incubator care. Using a repeated measures design with a pretest and three posttests, the responses of treatment dyads including maternal anxiety and infants' physiologic responses (heart rate, respiratory rate, and O<sub>2</sub> saturation) as well as behavioural state were measured. The results revealed that there were no significant differences between the two groups on infants' physiologic responses and the values were all in the normal range. However, infants in the treatment group had more occurrence of quiet sleep states and less crying ( $p < 0.05-0.01$ ). Music during KC also resulted in significantly lower maternal anxiety in the treatment group ( $p < 0.01$ ). Maternal state anxiety improved daily, indicating a cumulative dose effect. The findings provide evidence for the use of music during KC as an empirically-based intervention for behavioural state stability and maternal anxiety in mother-infant dyads.

Ludington-Hoe, S. M., G. C. Anderson, et al. (2004). "Randomized controlled trial of kangaroo care: cardiorespiratory and thermal effects on healthy preterm infants." Neonatal Netw **23**(3): 39-48.

**PURPOSE:** To determine the safety and effects on healthy preterm infants of three continuous hours of kangaroo care (KC) compared to standard NICU care by measuring cardiorespiratory and thermal responses. **DESIGN:** Randomized controlled trial-pretest-test-posttest control group design. **SAMPLE:** Twenty-four healthy preterm infants (33-35 weeks gestation at birth) nearing discharge. Eleven of the

infants received KC; 13 received standard NICU care. MAIN OUTCOME VARIABLES: Heart rate, respiratory rate, oxygen saturation, and abdominal skin temperature were manually recorded every minute. Apnea, bradycardia, periodic breathing, and regular breathing were captured continuously on a pneumocardiogram printout. Three consecutive interfeeding intervals (three hours each) on one day constituted the pretest, test, and posttest periods. RESULTS: Mean cardiorespiratory and temperature outcomes remained within clinically acceptable ranges during KC. Apnea, bradycardia, and periodic breathing were absent during KC. Regular breathing increased for infants receiving KC compared to infants receiving standard NICU care.

Ludington-Hoe, S. M., C. Ferreira, et al. (2003). "Safe criteria and procedure for kangaroo care with intubated preterm infants." J Obstet Gynecol Neonatal Nurs **32**(5): 579-88.

Kangaroo care (KC) was safely conducted with mechanically ventilated infants who weighed less than 600 grams and were less than 26 weeks gestation at birth. These infants, ventilated for at least 24 hours at the time of the first KC session, were considered stable on the ventilator at low settings (intermittent mandatory ventilation < 35 breaths per minute and FiO<sub>2</sub> < 50%), had stable vital signs, and were not on vasopressors. A protocol for implementation of KC with ventilated infants that uses a standing transfer, with two staff members assisting to minimize the possibility of extubation, is presented. Also discussed is the positioning of the ventilator tubing during KC. This protocol was implemented without any accidental extubation throughout an experimental research study. The criteria and protocol were compared to those available in published reports and revealed many similar elements, providing additional support for the recommended protocol. No adverse events occurred with the criteria and protocol reported here, suggesting that they can be adopted for broader use.

Ludington-Hoe, S. M., R. Hosseini, et al. (2005). "Skin-to-skin contact (Kangaroo Care) analgesia for preterm infant heel stick." AACN Clin Issues **16**(3): 373-87.

The purpose of the study was to compare a heel stick conducted during Kangaroo Care (skin-to-skin contact) with the mother to a heel stick in a warmer in reducing premature infant physiologic and behavioral pain responses. Twenty-four premature infants in a university-based neonatal intensive care unit were recruited and randomized to 2 sequences: sequence A group received 3 hours of Kangaroo Care (with a heel stick in Kangaroo Care) followed by 3 hours in a warmer (with a heel stick in the warmer). Sequence B group had warmer care and a heel stick (in the warmer) before Kangaroo Care and a heel stick (in Kangaroo Care). Heart rate, respiratory rate, oxygen saturation, crying time, and behavioral state were measured before, during, and after heel stick. Repeated measures ANOVA and Mann Whitney U statistics were performed. Heart rate and length of crying in response to pain were significantly reduced during Kangaroo Care and the Kangaroo Care heel stick as compared to when infants were in the warmer and had a heel stick in the warmer. Three infants did not cry at all during the Kangaroo Care heel stick; infants slept more during Kangaroo Care than in the warmer. Kangaroo Care positioning before and during heel stick is a simple and inexpensive analgesic intervention to ameliorate pain in stable premature infants.

Ludington-Hoe, S. M. and J. Y. Swinth (2001). "Kangaroo mother care during phototherapy: effect on bilirubin profile." Neonatal Netw **20**(5): 41-8.

**PURPOSE:** To determine the safety and efficacy of allowing kangaroo mother care (KMC) one hour per day during the course of phototherapy using a fiberoptic phototherapy panel. **SAMPLE:** Thirty premature infants, 30-35 weeks gestation, <2,500 gm, who required phototherapy. Infants were randomized into three groups: (1) infants who received traditional bank or spotlight phototherapy 24 hours per day, (2) infants who received traditional phototherapy 23 hours per day and for the 24th hour lay prone on a fiberoptic phototherapy panel, and (3) infants who received traditional phototherapy 23 hours per day and for the 24th hour were given KMC with a fiberoptic phototherapy panel held against their back. **OUTCOME VARIABLES:** Nonparametric statistics were used for between-group comparisons on number of days of phototherapy, daily bilirubin decrement, and bilirubin profiles over the course of phototherapy. **RESULTS:** Groups did not differ in the number of days of phototherapy or in daily mean bilirubin decrement. The bilirubin profile for the KMC group showed a more shallow descent than did the profiles for the other groups, but a significant difference in decline was present only on day 4 of treatment ( $p = .05$ ). **CONCLUSION:** This pilot work suggests that KMC using a fiberoptic panel during phototherapy may be safe, but further study is needed.

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Ludington-Hoe, S. M., C. Thompson, et al. (1994). "Kangaroo care: research results, and practice implications and guidelines." Neonatal Netw **13**(1): 19-27.

Results of two studies of the effects of 2 to 3 hours of kangaroo care (KC), one a randomized trial of 25 premature infants in open-air cribs and the other a pilot of 6 premature infants who were at least 24 hours postextubation, who were cared for in incubators are reviewed. Both studies incorporated a pretest/posttest control group design. Heart rate and abdominal skin temperature rose for KC infants during KC.

Heat loss did not occur during KC, and infants slept more during KC. Kangaroo care had a comforting effect on infants and their mothers. Apnea and periodic breathing episodes dropped during KC for incubator infants. Suggestions and guidelines for selection of infants and practice based on these studies are presented.

Marchi, L. (2004). "[Kangaroo habitat, a home care experience]." Soins Gerontol(46): 27-8.

Mazurier, E. and J. C. Picaud (2005). "[Kangaroo mother care vs nidcap: a problem of semantics]." Arch Pediatr **12**(4): 471-2; author reply 473.

McCain, G. C., S. M. Ludington-Hoe, et al. (2005). "Heart rate variability responses of a preterm infant to kangaroo care." J Obstet Gynecol Neonatal Nurs **34**(6): 689-94.

OBJECTIVE: To examine the effect of kangaroo care on heart rate variability in a healthy preterm infant. DESIGN: Case study. SETTING: Private room on a postpartum unit. PARTICIPANT: A mother-preterm infant dyad. INTERVENTION: Kangaroo (skin-to-skin) care. MAIN OUTCOME MEASURE: Heart rate variability, a noninvasive measurement of the sympathetic and parasympathetic components of the autonomic nervous system's influence on heart rate. RESULTS: Heart rate variability, especially the parasympathetic component, was high when the infant was fussy in the open crib, indicating increased autonomic nervous system activity. With kangaroo care, the infant fell asleep, and both sympathetic and parasympathetic components of heart rate variability decreased. CONCLUSIONS: The wide fluctuations in the parasympathetic component of heart rate variability suggest immaturity of the sympathovagal response. Overall, kangaroo care produced changes in heart rate variability that illustrate decreasing stress.

Neu, M. (2004). "Kangaroo care: is it for everyone?" Neonatal Netw **23**(5): 47-54.

PURPOSE: In spite of the benefits reported for kangaroo holding, many mothers of preterm infants requiring intensive care do not choose to hold kangaroo style. The purpose of this study is to describe factors that influence mothers healthy preterm infants to choose kangaroo holding compared to the standard care method of blanket holding. SAMPLE: Twenty-four primiparous mother of healthy infants born at 30-34 weeks gestational age. DESIGN: In this naturalistic inquiry, mothers were interviewed twice: once while the infant was hospitalized and again after the infant was discharged home. RESULTS: Mothers' holding practices divided them into three groups: (1) kangaroo holding in hospital and home, (2) blanket holding in hospital and home, and (3) holding practice switched from hospital to home. Three themes emerged from the interview data: (1) emotional state, (2) holding environment, and (3) benefits of close contact with the infant.

Nyqvist, K. H. (2004). "How can kangaroo mother care and high technology care be compatible?" J Hum Lact **20**(1): 72-4.

Ohgi, S., M. Fukuda, et al. (2002). "Comparison of kangaroo care and standard care: behavioral organization, development, and temperament in healthy, low-birth-weight infants through 1 year." *J Perinatol* **22**(5): 374-9.

**OBJECTIVE:** To determine whether Kangaroo Care (KC) for healthy, low-birth-weight (LBW) infants can promote better behavioral and developmental outcomes. **STUDY DESIGN:** In this historical control study, 26 infants in the KC group (GA: 34.3+/-2.5 weeks, BW: 1833.9+/-167.6 g) and 27 infants in the comparison group who received the standard medical-nursing care (34.6+/-2.3 weeks, 1850.9+/-156.7 g) were analyzed by the Neonatal Behavioral Assessment Scale (NBAS) at 40 weeks of postmenstrual age, the Bayley Scales of Infant Development and the Carey's Infant Temperament Questionnaire (ITQ) at 6 and 12 months corrected ages. **RESULTS:** KC infants had significantly higher NBAS scores in Orientation, State Regulation, and Supplementary items; lower Intensity scores and higher Mood scores at 6 months on the ITQ; and higher Bayley Scales score at 12 months. **CONCLUSION:** KC effectively promoted neonatal behavioral organization and enhanced developmental outcome over the first year of life for LBW infants.

Parker, L. and G. C. Anderson (2002). "Kangaroo care for adoptive parents and their critically ill preterm infant." *MCN Am J Matern Child Nurs* **27**(4): 230-2.

In this case study kangaroo care (KC) was facilitated for an adoptive mother and father who were planning to attend the birth of the infant they had arranged to adopt. Unexpectedly, the birth mother delivered at 27 weeks gestation. The infant was critically ill and required mechanical ventilation. However, in this neonatal intensive care unit where all adoptive parents and parents of mechanically ventilated infants are offered KC, these adoptive parents began KC on Day 3 while their infant daughter was still mechanically ventilated. She thrived thereafter and the entire experience was profoundly beneficial for this beginning family both at the hospital and after discharge home.

Pattinson, R. C., I. Arsalo, et al. (2005). "Implementation of kangaroo mother care: a randomized trial of two outreach strategies." *Acta Paediatr* **94**(7): 924-7.

**AIM:** To test whether a well-designed educational package on the implementation of kangaroo mother care (KMC) used on its own can be as effective in implementing KMC in a healthcare facility as the combination of a visiting facilitator used in conjunction with the package. **SETTING:** Thirty-four hospitals in KwaZulu-Natal Province, South Africa. **METHOD:** The hospitals were paired with respect to their geographical location and annual number of births at the facility. One hospital in each pair was randomly allocated to receive either the implementation package alone (group A) or the implementation package and visits from a facilitator (group B). Hospitals in group B received three facilitation visits. All hospitals were evaluated by a site visit 8 mo after launching the process and were scored by means of a progress-monitoring tool. **OUTCOMES:** Successful implementation was regarded as demonstrating evidence of practice (score > 10) during the site visit. **RESULTS:** Group B scored significantly better than group A ( $p < 0.05$ ). All 17 hospitals in group B demonstrated evidence of practice, with the median score of the group being 15.44 (range 10.29-22.94). Twelve of the hospitals in group A demonstrated evidence of practice and the median score was 11.33 (range 1.08-21.13). **CONCLUSION:** Successful implementation was achieved in most of the hospitals irrespective of the

strategy used. However, facilitation with an implementation package was clearly superior to using a package alone. Some sites do not need facilitation for successful implementation.

Priya, J. J. (2004). "Kangaroo care for low birth weight babies." Nurs J India **95**(9): 209-12.

Quasem, I., N. L. Sloan, et al. (2003). "Adaptation of kangaroo mother care for community-based application." J Perinatol **23**(8): 646-51.

**OBJECTIVE:** Working with a multidisciplinary team of Ecuadorians, Bangladeshis and Americans, we developed a simple protocol for community-based implementation of kangaroo mother care (CKMC) that does not require birth weight or clinical judgment to identify which newborns should receive CKMC. CKMC could stabilize newborns and possibly reduce neonatal mortality where there is little medical care for newborns and low birth weight (LBW) is common. **STUDY DESIGN:** During their CKMC training, community-based workers identified 35 expectant or recently delivered women in the pilot study area and taught them about CKMC. Women were interviewed at 1 month postpartum to evaluate their experience with CKMC. **RESULTS:** In all, 77% of mothers initiated skin-to-skin care and 85% with LBW babies did so (37% were LBW). CKMC mothers delayed newborn bathing. Few slept upright with their newborns. **CONCLUSIONS:** CKMC was quickly and popularly adopted. A randomized controlled cluster trial is planned to determine whether CKMC reduces neonatal mortality.

Ramanathan, K., V. K. Paul, et al. (2001). "Kangaroo Mother Care in very low birth weight infants." Indian J Pediatr **68**(11): 1019-23.

**OBJECTIVE:** This study was conducted (i) to study through a randomized control trial the effect of Kangaroo Mother Care (KMC) on breast feeding rates, weight gain and length of hospitalization of very low birth neonates and (ii) to assess the acceptability of Kangaroo Mother Care by nurses and mothers. **METHODS:** Babies whose birth weight was less than 1500 Grams were included in the study once they were stable. The effect of Kangaroo Mother Care on breast feeding rates, weight gain and length of hospitalization of very low birth weight neonates was studied through a randomized control trial in 28 neonates. The Kangaroo group (n = 14) was subjected to Kangaroo Mother Care of at least 4 hours per day in not more than 3 sittings. The babies received Kangaroo Care after shifting out from NICU and at home. The control group (n = 14) received only standard care (incubator or open care system). Attitude of mothers and nurses towards KMC was assessed on Day 3 +/- 1 and on day 7 +/- 1 after starting Kangaroo Care in a questionnaire using Likert's scale. **RESULTS:** The results of the clinical trial reveal that the neonates in the KMC group demonstrated better weight gain after the first week of life (15.9 +/- 4.5 gm/day vs. 10.6 +/- 4.5 gm/day in the KMC group and control group respectively p < 0.05) and earlier hospital discharge (27.2 +/- 7 vs. 34.6 +/- 7 days in KMC and control group respectively, p < 0.05). The number of mothers exclusively breastfeeding their babies at 6 week follow-up was double in the KMC group than in the control group (12/14 vs. 6/14) (p < 0.05). **CONCLUSION:** KMC managed babies had better weight gain,

earlier hospital discharge and, more impressively, higher exclusive breast-feeding rates. KMC is an excellent adjunct to the routine preterm care in a nursery.

Reid, C. (2004). "Kangaroo care." Neonatal Netw **23**(2): 53; author reply 53.

Roller, C. G. (2005). "Getting to know you: mothers' experiences of kangaroo care." J Obstet Gynecol Neonatal Nurs **34**(2): 210-7.

**OBJECTIVE:** To reveal mothers' experiences of providing kangaroo care for their preterm newborns while still in the hospital. **DESIGN:** Transcendental phenomenology was used to analyze the experiences of mothers providing kangaroo care for their preterm newborns. Tape recorded, semistructured interviews were conducted 1 to 4 weeks postpartum. Mothers were asked one grand tour question, "What was it like for you to provide kangaroo care for your preterm infant while in the hospital?" This study was the qualitative component of a randomized clinical trial. **PARTICIPANTS:** Ten women who provided kangaroo care for their preterm newborns, 32-36 completed weeks, weighing 1500-3000 grams, with APGAR scores 6 or greater at 1 minute, 7 or greater at 5 minutes. **RESULTS:** Four dominant themes emerged. The themes were reduced to one essential structure of knowing. The two essential elements of the structure of knowing were mothers kept from knowing their preterm newborn and mothers getting to know their preterm newborn. **CONCLUSIONS:** Kangaroo care facilitates bonding and enhances maternal-infant acquaintance, even in the neonatal intensive care unit (NICU) environment. Mothers found that kangaroo care calmed them and their newborns.

Ruiz, J. G., N. Charpak, et al. (2002). "Predictional need for supplementing breastfeeding in preterm infants under Kangaroo Mother Care." Acta Paediatr **91**(10): 1130-4.

It has been estimated that 95% of low-birthweight infants are born in developing countries. Nevertheless, most of the globally available resources are invested in developed countries, both for sophisticated, expensive technological care and for research focused on solving problems in scenarios in which access to expensive resources is available. Very little research on scientifically sound, economically accessible interventions reaches internationally recognized scientific journals. For instance, one accepted scientific dogma is that all premature infants must receive breast-milk fortifiers. Thus, healthcare workers consider that not offering fortification or supplementation to all preterm infants under 2000 g is unethical, as it denies them the proven benefits of this intervention. This approach oversimplifies the problem by assuming that infants under 2000 g are a homogeneous population, with similar needs and risks. The largest proportion of preterm survivors in developing countries comprises infants weighing > 1200 g, and their nutritional needs differ from those weighing < 1200 g, who represent a significantly smaller proportion. In developing countries, fortification of breast milk is seldom a feasible option. Even supplementing breast milk with formula implies an expense that cannot always be covered. In addition, many preterm infants (particularly those weighing > 1200 g) can grow properly on exclusive breastfeeding. In our experience, about 45% of infants under ambulatory Kangaroo Mother Care (KMC) thrive properly. The choice between giving and withholding supplementation for all preterm infants is not an ethical issue,

because there is no choice. This was the justification for conducting the study reported here, which attempts to answer the question of how to identify, as early as possible, those premature infants who survive the early neonatal period and have no obvious risk factors for inadequate growth other than prematurity, but who are less likely to thrive with exclusive breastfeeding. Conclusion: The answer to this question will allow us to use our meagre resources in the most reasonable way, as supplementing breast milk involves not only the direct cost of the formula but also that of training the mothers in techniques for feeding their infants without compromising breastfeeding or increasing the risk of infectious diseases.

Ruiz-Pelaez, J. G., N. Charpak, et al. (2004). "Kangaroo Mother Care, an example to follow from developing countries." Bmj **329**(7475): 1179-81.

Sontheimer, D., C. B. Fischer, et al. (2004). "Kangaroo transport instead of incubator transport." Pediatrics **113**(4): 920-3.

**OBJECTIVE:** Compared with in utero transport, incubator transport for preterm infants has several disadvantages including instability during transport with increased mortality and morbidity, lack of adequate systems for securing the infant in the event of an accident, and separation of mother and infant. As a new kind of postnatal transportation that bears some analogy to in utero transport and may be safer than incubator transport, we investigated kangaroo transport, transporting the infant on the mother's or other caregiver's chest. This article presents a description and preliminary data for kangaroo transport. **DESIGN:** We conducted kangaroo transports of 31 stable preterm and term infants in different settings and recorded data regarding transport conditions and cardiorespiratory stability. Eighteen transports were back transfers, and 13 were transfers in. Twenty-seven transports were conducted by the mother, 1 by the father, 2 by nurses, and 1 by a doctor. Transport distance was 2 to 400 km. **RESULTS:** Heart rate, respiratory rate, oxygen saturation, and rectal temperature remained stable during all kangaroo transports lasting 10 to 300 minutes. Weight at transport was 1220 to 3720 g. Parents felt very comfortable and safe and appreciated this method of transport. **CONCLUSIONS:** Kangaroo transport promotes mother-infant closeness and might ameliorate several of the risks associated with incubator transport.

Swinth, J. Y., G. C. Anderson, et al. (2003). "Kangaroo (skin-to-skin) care with a preterm infant before, during, and after mechanical ventilation." Neonatal Netw **22**(6): 33-8.

Using kangaroo care (KC) with unstable and/or ventilated infants remains controversial. In this article, potential advantages for ventilated infants and their mothers are discussed. The 33-week-gestation infant in this case study presented with mild respiratory distress at birth, requiring supplemental oxygen at hour 2. With no improvement by hour 18, KC was also begun, first for 1.25 hours and then, 2 hours later, for 3.5 hours. The infant was intubated at hour 45 for increasing respiratory distress, and KC resumed 24 hours later for 1 hour and 3 hours after that for an additional 3 hours. Extubation occurred at hour 90. Kangaroo care resumed 2 hours later for periods of 1.5, 1.5, and 1 hour over the next 8 hours, 2.5 hours more later that day (day 5, the last day of data collection). Thereafter, KC was done intermittently

until discharge on day 9. Total KC times for pre-vent, vent, and immediate post-vent periods were 4.75, 4, and 6.5 hours, respectively. The data from this study suggest that KC may assist in, rather than retard, recovery from respiratory distress. KC may also foster maternal relaxation and minimize maternal stress.

Theilig, P. (2003). "[The kangaroo method]." *Kinderkrankenschwester* **22**(8): 331-4.

Toma, T. S. (2003). "[Kangaroo Mother Care: the role of health care services and family networks in a successful program]." *Cad Saude Publica* **19 Suppl 2**: S233-42.

Kangaroo Mother Care (KMC) provides many benefits to low birth-weight babies. The family's early and active participation in the care of these infants helps create and strengthen bonding. This study was intended to increase the knowledge on the effect of hospital and family conditions on the method's implementation. Fourteen women and seven men taking part in KMC in the Itapeceira da Serra General Hospital (Sao Paulo State) answered in-depth interviews. The respondents' statements are focused on the decision-making process in the method's implementation, which depends not only on the mother's desire and willingness, but also on the support provided by the family network and empathetic health care teams. Although mothers realize the importance of KMC for their infants' recovery, personal and family problems may prevent them from taking active part in the program. Interaction of such factors as history of perinatal death, presence of other children in the household, involvement of the father and other family members, and household management can establish patterns that may or may not be favorable when choosing and implementing KMC.

Venancio, S. I. and H. de Almeida (2004). "[Kangaroo-Mother Care: scientific evidence and impact on breastfeeding]." *J Pediatr (Rio J)* **80**(5 Suppl): S173-80.

**OBJECTIVE:** To describe the history of the Kangaroo Mother Care and present scientific evidence about benefits of this practice on morbidity and mortality, psychological and neurological development and breastfeeding of low birth weight infants. **SOURCES OF DATA:** Papers about Kangaroo Mother Care published from 1983 to 2004 were consulted, selected in Medline and Lilacs, as well as books, thesis and technical publications from the Brazilian Health Department. **SUMMARY OF THE FINDINGS:** Since its first description, Kangaroo Mother Care has been extensively studied. The analysis of randomized trials showed that it consists in a protection factor to breastfeeding at discharge (relative risk 0.41, 95% confidence interval 0.25 to 0.68). The method was always associated with the following reduced risks: nosocomial infection at 41 weeks' corrected gestational age (relative risk 0.49, 95% confidence interval 0.25 to 0.93), severe illness (relative risk 0.30, 95% confidence interval 0.14 to 0.67), lower respiratory tract disease at 6 months (relative risk 0.37, 95% confidence interval 0.15 to 0.89) and better gain of weight per day (weighted mean difference 3.6 g/day, 95% confidence interval 0.8 to 6.4). Psychomotor development at 12 months' corrected age was similar in the two groups. There was no evidence of a difference in infant's mortality. **CONCLUSIONS:** A positive impact of Kangaroo Mother Care on breastfeeding was found. Although the method appears to reduce severe infant morbidity without any serious deleterious effect reported, there is still insufficient evidence to recommend its routine use. It is

necessary to develop studies about effectiveness, acceptability and applicability of the method in the Brazilian context.

Wallin, L., A. Rudberg, et al. (2005). "Staff experiences in implementing guidelines for Kangaroo Mother Care--a qualitative study." *Int J Nurs Stud* **42**(1): 61-73.

The aim of this study was to investigate staff experiences in implementing guidelines for Kangaroo Mother Care in neonatal care. The study was part of a randomized controlled trial, the overall goal of which was to assess the impact of external facilitation. A total of eight focus group interviews were held at two intervention and two control units. The establishment of a change team to implement the guideline resulted in activities that impacted staff behaviour, which in turn was perceived to influence patients' well-being. The guideline and contextual factors, such as leadership and staff colleagues' attitudes, were of significant importance in that process. The study intervention--facilitation--promoted implementation activities and was highly appreciated by the change teams. However, reviewing the development of events at one of the control units, the provided facilitation appeared to be no more effective than an improvement-focused organizational culture in which the nurse manager was actively involved in the change process. Overall, learning and behaviour change seemed to be a social phenomenon, something that greatly benefited from people's interaction with one another.

Whitelaw, A. (1990). "Kangaroo baby care: just a nice experience or an important advance for preterm infants?" *Pediatrics* **85**(4): 604-5.

Worku, B. and A. Kassie (2005). "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* **51**(2): 93-7.

A randomized controlled trial was conducted over a 1-year period (November 2001-November 2002) in Addis Ababa to study the effectiveness of early Kangaroo mother care before stabilization of low birthweight infants as compared with the conventional method of care. There were 259 babies weighing less than 2000 g during the study period and a total of 123 (47.5 per cent) low birthweight infants were included in to the study. Sixty-two infants were enrolled as Kangaroo Mother Care (KMC) and the remaining 61 were Conventional Method of Care (CMC) cases. The demographic and socioeconomic characteristics for both groups were comparable. The mean age at the time of enrollment was 10 and 9.8 h for KMC and CMC, respectively ( $p > 0.05$  with 95 per cent confidence interval). The mean birthweight was 1514.8 g (range 1000-1900 g) for KMC and 1471.8 g (range 930-1900 g) for CMC ( $p > 0.05$  with 95 per cent CI) and the mean gestational age was 32.42 and 31.59 weeks for KMC and CMC cases, respectively. Fifty-eight per cent of KMC and 52 per cent of CMC cases were on i.v. fluid. Twenty-one of 62 (34 per cent) of KMC and 23/61 (37 per cent) of CMC babies were on oxygen through nasopharyngeal catheter. The mean age at exit from the study was 4.6 days for KMC and 5.4 days for CMC. Ninety-one per cent and 88 per cent of babies in KMC and CMC were discharged from the study in the first 7 days of life, respectively. The study showed that 14/62 (22.5 per cent) of KMC vs. 24/63 (38 per cent) CMC babies died during the study ( $p < 0.05$  and CI of 95 per cent.) The majority of deaths occurred during the first 12 h

of life. Survival for the preterm low birthweight infants was remarkably better for the early kangaroo mother care group than the babies in the conventional method of care in the first 12 h and there after. More than 95 per cent of mothers reported that they were happy to care for their low birthweight babies using the early Kangaroo mother method. It was recommended to study the feasibility and effectiveness of Kangaroo mother care at the community level.