

STATE OF THE ART



KANGAROO MOTHER CARE LEARNING PORTAL

For the implementation, strengthening and updating of KMC programs

The Ministry of Health and Social Protection of Colombia, the World Food Program of the United Nations with the technical support of the Kangaroo Foundation, prepared this training kit for all health professionals in charge of preterm or /and low birth weight infants .

This tool summarizes the knowledge and experience gained by pediatricians, nurses, psychologists, social workers, physiotherapists, ophthalmologists, optometrists in the management of these children.

The goals of this tool are to support the dissemination of the Kangaroo Mother Care Method, to decrease infant morbidity and mortality worldwide and to improve the quality of survival of preterm and Low Birth Weight infants. The original version was released in Spanish and can be found on this website.

Maternal and Child Health Integrated Program (MCHIP), and JSI Research & Training Inst. supported the finalization of the English version. The coordination of this English version was assured by:

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This Learning Portal is developed for professionals who have received a theoretical and a practical training in a KMC implementing site. This training kit is prepared only for educational purposes, and should not be used for profit activities.

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The videos and photographic material used in this Learning Portal received the appropriate authorization from the parents and / or guardians of the preterm infants.


Fundacion kangaro

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The present document contains scientific evidence from around the world on the scope and limitations of the Kangaroo Mother Method. The document is based on “SCIENTIFIC EVIDENCE OF THE BENEFITS OF THE KANGAROO MOTHER CARE METHOD” prepared by the Kangaroo Foundation funded by the Ministry of Social Protection, Social Action, (Convention number 233) and by UNICEF and PMA (contract – NFI Number 18/2009). On the basis of its content, the new evidence and results of the latest research supporting current claims of the Kangaroo Mother Care Method were updated.

Practical recommendations, questions and answers based on evidences were taken “CLINICAL PRACTICALGUIDE BASED ON EVIDENCE FOR THE OPTIMAL USE OF THE KANGAROO MOTHER METHOD IN THE PRETERM AND LOW BIRTH WEIGHT INFANT”, Kangaroo Foundation and Department of Clinical Epidemiology and Statistics, Javeriana University, Bogota, Colombia, 2007.

1.

Evidence Based Medicine

Evidence-Based Medicine came to the fore in the early 1990s and has become a major driving force for many national healthcare organizations. It has been defined as “the integration of best research evidence with clinical expertise and patient values” (Sackett, 2000).

EBM advocates the use of up-to-date “best” scientific evidence from health care research as the basis for making medical decisions.

Evidence-based guidelines (EBG) are the practice of evidence-based medicine at the organizational or institutional level. This includes the production of guidelines, policy, and regulations. This approach has also been called evidence based healthcare.

Evidence-based individual decision making

Evidence-based individual decision (EBID) making is evidence-based medicine as practiced by the individual health care provider. There is concern that current evidence-based medicine focuses excessively on EBID.

For supporters, EBM has three main advantages:

It offers the surest and most objective way to determine and maintain consistently high quality and safety standards in medical practice;

It can help speed up the process of transferring clinical research findings into practice;

It has the potential to reduce health-care costs significantly.

Opponents of EBM consider that it risks downplaying the importance of clinical experience and expert opinion, and that the conditions under which clinical trials used to define best practice take place are hard to replicate in routine practice.

Evidence-based medicine categorizes different types of clinical evidence and rates or grades them according to the strength of their freedom from the various biases that beset medical research. For example, the strongest evidence for therapeutic interventions is provided by systematic review of randomized, triple-blind, placebo-controlled trials with allocation concealment and complete follow-up involving a

homogeneous patient population and medical condition. Use of the word “trial” means a randomized study to determine the difference in effect between subjects who received the treatment and subjects who did not (control) receive the treatment. Many studies use only one group of subjects and measure the outcomes in the subjects before treatment (called pretest), sometimes during the treatment (called test), and usually after the treatment (called posttest). One-group pretest—(test) — posttest studies can be called controlled trials (because the study simply describes what happens before, during, and after a treatment) or sometimes called quasi-experimental, which means “some- what experimental” because a treatment is administered to the subjects but there is no control group. In contrast, patient testimonials, case reports, and even expert opinion (however some critics have argued that expert opinion “does not belong in the rankings of the quality of empirical evidence because it does not represent a form of empirical evidence” and continue that “expert opinion would seem to be a separate, complex type of knowledge that would not fit into hierarchies otherwise limited to empirical evidence alone.” have little value as proof because of the placebo effect, the biases inherent in observation and reporting of cases, difficulties in ascertaining who is an expert, and more.

A **Meta-analysis** will thoroughly examine a number of valid studies on a topic and combine the results using accepted statistical methodology as if they were from one large study¹. Some clinicians put Meta-analysis at the top of the pyramid because part of the methodology includes critical appraisal of the selected RCTs for analysis.

Systematic Reviews usually focus on a clinical topic and answer a specific question. An extensive literature search is conducted to identify all studies with sound methodology. The studies are reviewed, assessed, and the results summarized according to the predetermined criteria of the review question. The Cochrane Collaboration has done a lot of work in the area of systematic reviews.

Randomized controlled clinical trials are carefully planned projects that study the effect of a therapy on real patients. They include methodologies that reduce the potential for bias (randomization and blinding) and that allow for comparison between intervention groups and control groups (no intervention).

Studies that show the efficacy of a diagnostic test are called **prospective, blind comparison to a gold standard study**. This is a controlled trial that looks at patients with varying degrees of an illness and administers both diagnostic tests -- the test under investigation and the “gold standard” test -- to all of the patients in the study group.

¹ Once 3 or more randomized clinical trials have been conducted by different investigators examining the same effects, the data from all these studies are put together and analyzed to determine what the effect on the population (not just the subjects in one research investigation) would be. Population analysis studies are called meta-analyses, meaning overall analysis of effects

Cohort Studies take a large population and follow patients who have a specific condition or receive a particular treatment over time and compare them with another group that has not been affected by the condition or treatment being studied. Cohort studies are observational and not as reliable as randomized controlled studies, since the two groups may differ in ways other than in the variable under study.

Case Control Studies are studies in which patients who already have a specific condition are compared with people who do not. They often rely on medical records and patient recall for data collection. These types of studies are often less reliable than randomized controlled trials and cohort studies because showing a statistical relationship does not mean that one factor necessarily caused the other.

Case series and **Case reports** consist of collections of reports on the treatment of individual patients or a report on a single patient. Because they are reports of cases and use no control groups with which to compare outcomes, they have no statistical validity.

The pyramid serves as a guideline to the hierarchy of evidence available. It is not always possible to find the best level of evidence to answer a specific question. In the absence of the best evidence, consider moving down the pyramid to other types of studies.

Effectiveness is established to a degree that:

A= merits application

B=suggest application

C= warrant consideration of applying findings

D= is limited, and

E= effectiveness is not established

2.

Conceptualization Of The Kangaroo Mother Care Method

The Kangaroo Mother Care Method (KMC) was elaborated and implemented by the end of the 1970's in the " **Instituto Materno Infantil (IMI)**" in Bogotá, by Doctor Edgar Rey Sanabria. Since then, the method has evolved from its initial concept, incorporating modifications originated in practice and scientific researches.

The kangaroo mother care method is currently being used as the basis to care for preterm or low birth weight infant (<2500 g)

The Kangaroo Mother Care Method has been standardized, following a protocol based on skin-to-skin contact between the preterm infant and his mother. It aims to empower the mother-child dyad and gradually transfer to the mother the ability and responsibility of being the primary caregiver for her baby, satisfying his physical and emotional needs.

The Kangaroo Mother Method has three fundamental components:

- 1) The Kangaroo position (KP)
- 2) The Kangaroo feeding and nutrition strategy based on breastfeeding (KN)
- 3) The kangaroo discharge policy. Timely (early) discharge in kangaroo position supported by close and strict ambulatory follows up.

The KMC method should be offered to physiologically stable preterm and or LBW infants. The fact that Kangaroo Position allows infants who are not able to regulate and maintain an adequate temperature does not imply that the KMC method can replace specialized care provided in neonatal care units. Rather, it complements them and helps to humanize the practice of neonatology.

Kangaroo Position: is defined by the position of the infant on the mother's chest, in strict upright position, between her breasts. The Kangaroo position allows skin to skin contact between the mother's chest skin and the baby's frontal side. The position must be provided as soon as possible, progressively then in a continuous and prolonged manner, ideally up to 24 hours a day, for as long as the infant requires and tolerates it.

In this position the infant finds a permanent source of warmth as well as kinesthetic

and tactile stimulation, which stimulates and fosters breastfeeding. The upright position with the head turned on the side maintains air way open. Furthermore, an intimate and prolonged contact between mother and infant aims to establish or reinforce the biological and emotional bond that must form between every newborn and his mother. Establishing this bond is hampered by early and prolonged separation resulting frequently of the prematurity or illness of the child.

Kangaroo Nutrition and Feeding Strategy: the mother's milk is the fundamental source of the child's nutrition and it is used every time it is possible. Maternal milk is supplemented with vitamins. The mother's milk can be fortified or supplemented when necessary. The use of human milk other from a donor can be considered, if it is collected and administered in a safe way and if its nutritional value and benefits are preserved. Feeding with the mother's milk may be done by direct suckling (breastfeeding) or by administering expressed milk, either orally or through intermittent gavages.

Kangaroo Discharge Policy: kangaroo infants are eligible for kangaroo care at home as soon as the following conditions are achieved: (1) successful kangaroo adaptation (both to kangaroo position and kangaroo feeding for mother and child (2) the family is willing and able to strictly follow the program protocols, recommendations and follow up policies; (3) it is an access to a systematic, rigorous and well established ambulatory kangaroo follow up program.

After discharge, children are assessed daily, to monitor their weight until they gain 15 g/kg/day. Follow up visits are then conducted weekly until infants reach 40 weeks of gestational age and 2500 g. Follow up visit includes regular anthropometric measurements, (monitored on growth charts), immunization, routine preventive drugs (anti-reflux, presentation of apnea and vitamins) and a complete clinical assessment to timely recognize any abnormal conditions. Follow up visits include ophthalmologic, audiological, neurological and, at least one brain sonography.

After 40 weeks of GA, a rigorous clinical follow up program is maintain for at least one year (corrected age). This includes clinical and anthropometric assessments, optometry, monitoring of the neurological and psychomotor development, timely immunization and preventive drugs (vitamins and iron).

3.

Evidence Of The Impact Of The Kangaroo Mother Care Method On Mortality And Morbidity In Preterm And Low Birth Weight Infants

In 2003, the Cochrane neonatal group conducted a systematic review. For this review three trials of KMC on LBW infants were assessed (1,362 infants). Results found that “KMC reduces severe illness, infection, breastfeeding problems and maternal dissatisfaction with method of care, and improves some outcomes of mother-baby bonding (Conde- Agudelo, Diaz-Rossello, Belizan 2003) “Infants cared for with KMC also demonstrated better weight gain after the first week of life, compared with babies cared in incubator.

In 2011, an updated Cochrane assessed 35 studies.²

- In 16 studies, 2,518 infants were analyzed, with all inclusion criteria.
- In 14 studies, KMC was evaluated in low birth weight infants, after stabilization.
- One study compares a group that initiated KMC early with another group that initiated it late. Both groups were relatively stable.
- 11 studies evaluated KMCM as applied intermittently. 5 studies evaluated KMC as applied continuously.

A standard research strategy was used, including databases from MEDLINE, EMBAS, LILACS, POPLINE, CINAHL, and from the center for the registration of controlled trials of Cochrane evaluated the benefits and adverse effects of KMCM. The Kangaroo Foundation also conducted a research in conferences, symposiums and Google scholar.

The second review demonstrated even more positive results of KMC compared to conventional neonatal care: mortality at discharge and at the lasted follow-up , severe infection/sepsis, nosocomial infections, hypothermia, severe illness, lower respiratory tract disease and length of hospital stay. The 2011 review also revealed that KMC resulted in improved weight and length, head circumference, breastfeeding, mother-infant bonding and maternal satisfaction with the KMC method of care, as compared with conventional methods (Conde- Agudelo, Diaz-Rossello, Belizan 2011).

Lawn 2010 performed a systematic review and meta-analysis to establish the effect of KMC on neonatal mortality due to direct complications of preterm birth

² Cochrane Library, issue 1, 2011.

The results of the present review also suggest that KMC reduces the risk of mortality at discharge or 40-41 weeks corrected gestational age and at latest follow-up.

Question 1: Is there any evidence that Kangaroo Position reduce neonatal mortality and morbidity?

Answer: The 2011 Cochrane review included seven trials that assessed mortality at discharge or 40-41 weeks. These trials reported a statistically significant 3.4% reduction in the risk of mortality among KMC infants, compared with 5, 7% for babies receiving traditional care. The review ultimately concluded that there is sufficient evidence to recommend the use of KMC in stabilized infants

Question 2: Is there any evidence that Kangaroo Position impact the level of nosocomial infection and severe infection/sepsis?

Answer: In stabilized LBW infants, KMC was associated with statistically significant reduction in severe infection/sepsis latest follow up, severe illness at 6 months follow up, nosocomial infection at discharge at 40-41 weeks, and lower respiratory tract disease at six months follow up.

Question 3: Is there any evidence that Kangaroo Position decrease the length of hospitalization?

Answer: KMC decreased length of hospital stay by 2, 4 days in a meta-analysis of 9 studies that used intermittent KMC.

Question 4: Is there any evidence that Kangaroo Position have a cost impact for health facility and for families?

Answer: No study reported data on mean total medical and non-medical costs. The overall costs were “about 50% less for KMC” in the Cattaneo 1998 study.

4.

Evidence On Kangaroo Position (Kp)

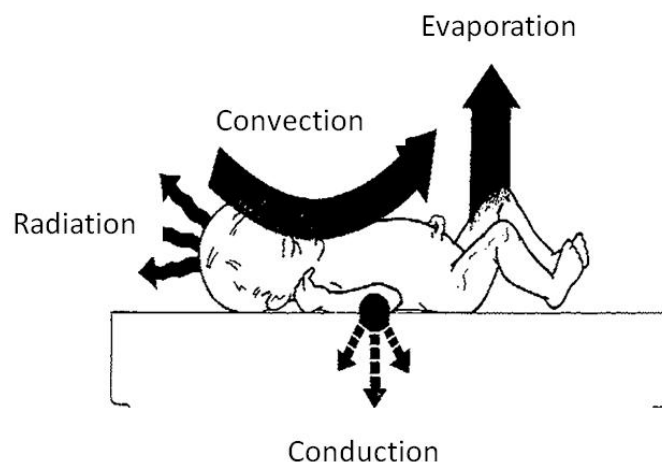
4.1 Kangaroo position and thermoregulation

Question: Is there any evidence that skin-to-skin contact between the infant's body and the mother's chest in KP is as efficient as an incubator to enable temperature regulation?

Evidence-based Answer: Skin-to-skin contact in KP is as efficient as an incubator to maintain an adequate temperature for preterm and/or LBW infants, therefore KP can be safely and effectively implemented until the preterm infant is able to regulate himself his temperature.

Preterm and some LBW infants are not physiologically ready to regulate and maintain their own body temperature. Therefore it is necessary to provide them with a neutral thermal environment. Neutral thermal environment means a thermal condition to minimize oxygen consumption and caloric expenditure while the normal body temperature is maintained.

4 Ways for newborn heat loss



When the infant is maintained in kangaroo position, the mother transmits heat through her skin, until both temperatures are in equilibrium. This means that skin-to-skin contact not only minimizes heat lost by conduction but also warms actively the infant. In kangaroo position (KP), circulation of cold air around the infant's skin is limited by the Lycra girdle and the hat covering his back and his head, which also limits loss by evaporation and conduction while being warmed through heat conduction by his mother's body.

As per loss of heat by radiation it is also minimal as the ventral part of the infant is in direct skin to skin contact and the dorsal face is covered by clothes and Lycra girdle. Only limited parts of the skin exposed to air could radiate minimal amounts of heat so the head of infant must be covered.

Evidence demonstrated that skin-to-skin contact between the infant's body and his mother's chest, in KP, provides a neutral thermal environment which allows temperature regulation as efficient as an incubator. There is no significant difference between kangaroo position and incubator to maintain adequate body temperature in preterm or LBW infants. Kangaroo Position may be safely and effectively used until the preterm is able to regulate his temperature.

When healthy preterm infants are placed in KP, infant body temperature rises. Infant warming in KP, no matter how the body temperature has been measured. Infant temperature can exceed 37,5 °C when provided by father in tropical un-air conditioned units as man's skin is warmer by 1°C than woman's skin due to testosterone. If an infant is febrile don't placed him in KP these is no research on this issue. Fewer episodes of hypo and hyperthermia occur in KP than during incubator care.

Table 1 Kangaroo position and thermoregulation

Year	Ref	Name of Article	Author	Type of design	Description and contribution
1989	[1]	Oxygenation, heart rate and temperature in very low birth weight infants during skin-to-skin contact with their mothers	Acolet, D & al	Clinical experiment, pretest and post test	14 infants, 5 of them with BPD were subject to equal incubator and KP sessions. Conclusion: there was no higher risk of cold-related stress in Kangaroo position patients.
1991	[2]	"Physiological effects of kangaroo care in very small preterm infants,"	De Leeuw, R, & al	Clinical experiment, pretest and post test	8 preterm infants with very low birth weight, less than 1200 g and less than 30 weeks, were exposed to 1-hour random kangaroo position sessions. Results show stable rectal temperature in the kangaroo position.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
1995	[3]	Physiological measures of kangaroo versus incubator care in a tertiary-level nursery	Bosque, EM, &.al	Clinical experiment, pretest and post test	<p>8 babies with more than 1200 g, with AGE were included in this experiment. The newborns were exposed to 4 hours in KP and 4 hours in the incubator. Abdominal temperature was continuously measured and. Results show that heart and respiratory rates are identical in both situations. Less total sleeping time in the patients in KP kangaroo position, with slight but not meaningful decrease in temperature.</p>
1996	[4]	Comparison of skin-to-skin contact with standard contact in low-birth-weight infants who are breast-fed	Bier, JA, & al	Randomized control trial	<p>In 50 preterm infants weighting less than 1500g, oxygen saturation, HR, RR, temperature and breast milk production were measured. Results show better O2 saturation in KP with less desaturation episodes. It was no difference at in-hospital breast milk production.</p> <p>It was also, no difference in temperature or heart rate between the two groups.</p>

Year	Ref	Name of Article	Author	Type of design	Description and contribution
1997	[5]	Body temperatures and oxygen consumption during skin-to-skin (kangaroo) care in stable preterm infants weighing less than 1500 grams	Bauer, K, & al	Clinical experiment, pretest and post test	22 preterm newborns weighing less than 1500 g were subject to identical periods in incubator and in KP. It was no statistically significant differences in thermoregulation when comparing the 2 interventions
1998	[6]	Effects of gestational and postnatal age on body temperature, oxygen consumption, and activity during early skin to skin contact between preterm infants of 25 – 30 week and their mother	Bauer, K, et.al	Clinical experiment, pretest and post test	27 preterm infants in their first week of life, without apnea in the last 24 hours, were included in this study. Results showed temperature loss in 25 to 27 week-old babies, especially during transport in KP. Weight gain occurred in infants' s born at 28 to 39 weeks The conclusion was that for children 25 to 27 weeks, skin-to-skin contact must be postponed.
1998	[7]	Kangaroo mother care for low birth weight infants: a randomized controlled trial in different settings	Cattaneo, A, & al	Controlled randomized clinical experiment	285 patients weighing 1000 to 1999 g were randomly allocated in a control group receiving traditional hospital care, the 2nd group implementing KP for at least for 20 uninterrupted hours. 90% of the patients in KP has a good thermoregulation.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2000	[8]	Kangaroo care compared to incubators in maintaining body warmth in preterm infants	Ludington-Hoe, S,&.al	Controlled randomized clinical experiment	29 newborns, between 26 - 35 weeks, with adequate weight for GA, were randomly distributed in a control group in incubator, the 2nd group placed in KP. Conclusion: the mother's temperature was higher in the KP group maintaining infant's homeothermia
2002	[9]	Randomized controlled trial of early kangaroo care for preterm infants: Effects on temperature, weight, behavior, and acuity.	Chwo, M.J. & al	Controlled randomized clinical experiment,	34 healthy preterm infants, 34 to 36 weeks of GA, were randomly included in a control group or in KP group. Conclusion: Patients in KP have a calmer sleep (62% vs. 22%) and less episodes of waking and crying (2% vs. 6%). Tympanic temperature was higher in the kangaroo group, with less changes.
2004	[10]	A comparison of kangaroo mother care and conventional incubator care for thermal regulation of infants < 2000 g in Nigeria using continuous ambulatory temperature monitoring	Ibe, O.E. & al	Non-randomized Crossover	13 patients weighing between 1200-1900 g with GAs between 32 and 38 weeks were included. Conclusion: patients placed in KP have less hypothermia episodes.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2004	[11]	Randomized Controlled Trial of Kangaroo Care: Cardio respiratory and thermal effects on healthy preterm infants	Ludington-Hoe, S. & al.	Controlled randomized clinical experiment	24 preterm newborns AGE, were randomly included in a control group in incubators and a KP group. Conclusion : KP was better for thermoregulation and a decreases episodes of periodical breathing
2004	[12]	Randomized controlled trial of skin-to-skin contact from birth versus conventional incubator for physiological stabilization in 1200- to 2199-gram newborns. [see comment]	Bergman, N.J. & al.	Controlled randomized clinical experiment	34 newborns were randomly included in two groups: 18 in kangaroo position and 13 in the control group, receiving incubator care. Conclusion: KP has a positive effect on hypothermia
2004	[130]	Bradycardia and desaturation during skin-to-skin care: no relationship to hyperthermia	Bohnhorst, B.& .al.	Clinical experiment, pretest and post test	22 newborns less than 32 weeks GA were studied. They received three 2-hour sessions: first in incubator, then in KP and again in incubator. Results temperature was stable while in KP.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2005	[14]	Feasibility of kangaroo mother care in Mumbai	Kadam, S.& al	Controlled randomized clinical experiment	44 newborns in kangaroo position vs. 45 newborns in the control group, all below 1800 g. Results show that the KP group presented less hypothermia episodes, better RR and HR and there was no difference in frequency of apnea.
2005	[15]	Breast and infant temperatures with twins during shared kangaroo care.	Ludington-Hoe, S. & al.	Case report	Two pairs of twins, both in kangaroo position were evaluated. Each child's and the mother's temperatures were continuously monitored. Results show that the mother's temperature and the temperature of each child is regulated separately, making possible to hold both infants without physiological compromise.
2009			Ali	Randomize controlled Trial	2 cohorts(58 and 56) KMC reduce the risk of hypothermia at discharge
2010	[16]	Early versus late KMC	Nagaii	Randomize controlled Trial	2 cohorts(37 and 36) KMC early introduction not statistically difference between the 2 groups a

4.2 Kangaroo Position and physiological outcomes (heart and respiratory rates, oxygen saturation and episodes of desaturation)

Question: Is there any evidence that the Kangaroo Position has some effects on heart rate, respiratory rate, oxygen saturation therefore in **the physiological stability in preterm and/or low birth weight infants?**

Answer: Kangaroo in a stable infant maintains and even improves vital parameters.

Different authors have studied the impact of KP on the physiological stability in preterm infants, analyzing heart rate, vagal tone, respiratory rate, oxygen saturation, desaturation episodes, cerebral oxygenation, oxygen consumption and metabolic indicators. These studies conclude that regardless of heterogeneous conditions of preterm and/or LBW infants KP maintains and even improves the physiological stability of the newborn.

Table 2 Kangaroo Position and physiological stability

Year	Ref	Name of Article	Author	Type of design	Description and contribution
1991	[16]	Physiological responses to skin-to-skin contact in hospitalized preterm infants	Ludington-Hoe, S & al	Clinical pretest and posttest experiment	12 stable preterm infants were included in this clinical test; they were placed in kangaroo position after feeding, and vital signs were measured. Conclusion: KP has a positive effect on temperature, increasing heart rate, without tachycardia.
1992	[17]	Selected physiological measures and behavior during paternal skin contact with Colombian preterm infants	Ludington-Hoe, S & al	Descriptive study	11 preterm healthy infants, 34 weeks or older, during the first 17 post-delivery hours, their vital signs were continuously monitored while in KP Conclusion: all physiological variables were within normal range.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
1993	[18]	Skin-to-skin contact beginning in the delivery room for Colombian mothers and their preterm infants	Ludington-Hoe, S&.al	Descriptive study	6 newborns between 34 - 36 weeks receiving continuous KMC were included. Physiological variables were evaluated to decide on early discharge with breastfeeding. Conclusion: The infants were well stabilized while their transition to extra uterine life, without admission to the neonatal unit.
1994	[19]	Kangaroo mother method: randomized controlled trial of an alternative method of care for stabilized low-birth weight infants. Maternidad Isidro Ayora	Sloan, N.L. & al	Random, controlled clinical experiment	128 newborns were included in the KP group and 147 in the control group, all weighing less than 2000 g. Growth, duration of initial hospitalization and re hospitalization were assessed/, as well as breast feeding rate and illnesses during follow up. Results show less apnea in KP during follow up. KP infants have less morbidity and infections during the first 6 months
1997	[20]	Effect of kangaroo care on sleeping time in neonates	Messmer P. R & al	Non-random pretest and posttest study	20 preterm infants and their parents were included in a non-invasive monitoring system was applied. The infant's behavior and physiological stability were assessed. Results: No apnea in KP, no differences in oxygen saturation, heart or respiratory rates.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
1998	[21]	Cardiorespiratory stability of preterm boys and girls during kangaroo care	Fischer, C. B & al	Pretest and posttest clinical experiment	20 newborns aged 32 weeks or less weighing less than 1600 g were included. SCRIP (Stability of the CardioRespiratory System In Premature Infants) scoring was applied. Results showed that 7 patients in KP were physiologically stable; they presented less apnea less paradoxical breathing and less bradycardia. But for 6 infants these conditions worsened while in KP
2000	[22]	Skin-to-skin contact improves gas exchange in preterm infants	Fohe, K & al	Pretest and posttest clinical experiment	53 newborn patients, weighing less than 1800 g were included. Vital signs were continuously monitored and it was found that KP has a positive effect on temperature, decreasing respiratory rate and increasing both heart rate and oxygen saturation.
2001	[23]	Skin-to-skin (kangaroo) care, respiratory control, and thermoregulation	Bohnhors B & al	Pretest and posttest clinical experiment	22 newborns less than 32 weeks GA were studied. They received three 2-hour sessions: first in incubator, then in KP and again in incubator. Results showed that in KP oxygen saturation was lower, but clinically non-significant. Moreover bradycardia episodes with hypoxemia were observed more frequently in KP

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2002	[24]	Effect of head-up body tilt position on autonomic function and cerebral oxygenation in preterm infants	Schrod, L Walter J	Crossover	36 preterm infants weighing less than 3000 g were monitored with continuous EEG, respiratory impedance, and oxygen saturation. Conclusion: the respiratory rate decreases by 10% during KP, but without decreasing oxygen saturation.
2002	[25]	Effect of nursing in the head elevated tilt position (15 degrees) on the incidence of bradycardic and hypoxemic episodes in preterm infants	Sher, TR	Crossover study	Continuous monitoring of vital signs was performed on 12 patients with GA 31 weeks or less and weighing less than 1500 g Conclusion: less bradycardia and hypoxemia episodes were occurring while in an elevated position vs. horizontal position
2003	[26]	Effect of posture on oxygenation, lung volume, and respiratory mechanics in preterm infants studied before discharge	Bhat, R. Y & al	Crossover study	Prone vs. supine positions was compared in 20 preterm infants Conclusion: oxygen saturation and need for oxygen was lower in prone position. In addition residual pulmonary capacity was significantly higher in prone position

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2004	[12]	Randomized controlled trial of skin-to-skin contact from birth versus conventional incubator for physiological stabilization in 1200- to 2199-gram newborns. [see comment]	Bergman, N. J & al	Controlled, random clinical experiment	34 newborn babies were randomly included in the study: 18 in kangaroo position and 13 in the control group, who received habitual care. Conclusion: there is a significant effect of the KP on hypothermia, and on the number of hypoglycemia episodes.
2005	[27]	Heart Rate Variability Responses of a Preterm Infant to Kangaroo Care	Mc Cain, G.C & al	Case and control study	Study of 4 cases of preterm infants in kangaroo position. They Conclusion : Kangaroo position decreases stress, improves behavior and reduces heart rate changes for these infants
2005	[28]	Kangaroo care: A randomized controlled trial effectiveness of early kangaroo mother care for the low birth weight infants in Addis a babies, Ethiopia	Worku, B y Kassie, A.	Controlled, random clinical experiment	Out of 259 newborns with low birth weight 123 were eligible, 62 were assigned to the kangaroo group and 61 to the control group. A comparison was made between the 2 groups: kangaroo mother intervention vs. patients in in traditional care Conclusion: there was a faster stabilization and lower mortality in the kangaroo group, with good parent acceptance.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2005	[14]	Feasibility of kangaroo mother care in Mumbai	Kadam, S & al	Controlled, random clinical experiment	44 newborns in KP and 45 in the control group, in incubator, all below 1800g. The 2 groups were compared. Results show that the kangaroo group presented less hypothermia episodes, better respiratory rate, better heart rate. It was no difference in the frequency of apnea.
2008	[29]	Cerebral oxygenation responses during kangaroo care in low birth Weight infants	Begun, B.A & al	Revision	16 preterm infants were monitored before, during and after KP. Conclusion: the Kangaroo Mother Method has a positive influence on cardiorespiratory and hemodynamic parameters. It also seems it contributes to the activation of the central nervous system and brain function.

4.3 Kangaroo position and apnea

Question: Is there any evidence that Kangaroo position decreases the apnea of prematurity?

Evidence-based Answer:

It is no direct evidence that KP prevents incidence, or severity of the apnea of prematurity.

Preterm infants frequently present apnea, which places their lives and integrity at risk. Studies show that physiologically stable patients placed in kangaroo position present

episodes of apnea and periodic breathing similar in incidence and severity to patients in incubators.

There are no good quality data concerning continuous and prolonged Kangaroo Position, however, two randomized controlled clinical trials using clinical monitoring (low probability for detecting apneas both in the kangaroo and control groups) do not report any differences in the frequency of apneas

In physiologically stable infants, there is no evidence that KP increases the risk of apnea.

There is no evidence supporting that kinetic stimulation (such as those experienced by an infant in KP, rhythmic stimulation due to the mother breathing or non-rhythmic due to the mother moving, walking) **may be used to treat or prevent primary central apnea of prematurity. Despite the fact that tactile and kinetic stimulation is currently used as the initial treatment of apnea in preterm infant.**

Reports state that Kangaroo Position is not well tolerated by seriously ill or physiologically unstable preterm infants

Table 3 Kangaroo position and apnea

Year	Ref	Name of Article	Author	Type of design	Description and contribution
1989	[1]	Oxygenation, heart rate and temperature in very low birth weight infants during skin-to-skin contact with their mothers	Acolet, D & al	Randomized control trial	14 newborn infants, 5 of which presented BPD, were subject to equal incubator and KP sessions. No major risk of cold-related stress was found in the patients in KP and also, no apnea was present.
1991	[2]	Physiological effects of kangaroo care in very small preterm infants	de Leeuw, & al	Pretest and posttest clinical experiment	8 VLBW preterm infants, weighing less than 1200 g and less than 30 weeks old, were subject to 1-hour random sessions of KP a day. Results show that there is no difference in the respiratory patterns and apnea episodes amongst both groups.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
1992	[30]	Effect of positioning on the breathing pattern of preterm infants	Heimler, L & al	Pretest and posttest clinical experiment.	14 healthy preterm infants with clinical apnea were included. Results conclude that the incidence of apnea in supine position is greater than that in prone and that in supine position periodic breathing increases up to 77%-
1994	[19]	Kangaroo mother method: randomized controlled trial of an alternative method of care for stabilized low-birth weight infants. Maternidad Isidro Ayora StudyTeam.[see comment]	Sloan, NL & al	Controlled random clinical experiment	128 preterm infants all below 2000g were included in the KP group and 147 in the control group, Growth, length of initial hospitalization and re hospitalization, as well as breast feeding rate and illnesses during follow up were monitored. . Results show less re hospitalization in kangaroo position
1994	[31]	Kangaroo care research results and practice implications and guidelines	Ludington-Hoe, S et al	Pretest and posttest clinical experiment.	25 newborn infants, between 32 and 36 weeks old AGE, were subject to equal periods of incubator and KP. Conclusion: KP had a positive effect on thermoregulation, without affecting oxygen saturation and apnea

Year	Ref	Name of Article	Author	Type of design	Description and contribution
1994	[32]	Effect of nursing position on incidence, type, and duration of clinically significant apnea in preterm infants	Kurlak, L.O. & al	Crossover random study	35 full term infants presenting apnea episodes and bradycardia were included in this study. Results conclude that there is more central or mixed apnea in supine than in prone position.
1997	[20]	Effect of kangaroo care on sleep time for neonates	Messmer, P.R & al	Nonrandom pretest and posttest study	20 preterms and their parents were included. monitoring system was applied. The infants' behavior and physiological stability were evaluated. There was a significant increase in sleeping time in KP. Children were calmer, with less apnea and bradycardia episodes and oxygen saturation was stable during kangaroo position.
1998	[21]	Cardiorespiratory stability of preterm boys and girls during kangaroo care	Fischer, C.B et al	Pretest and posttest clinical experiment.	20 newborns aged 32 weeks or less weighing less than 1600 g were included. SCRIP scoring is applied. Cardio-respiratory stability in KP and in incubator was evaluated..Results showed that in 7 patients in KP there was physiological stability, less apnea less paradoxical breathing and less bradycardia. In 6 children these conditions worsened while in KP.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
1999	[33]	First week kangaroo care in sick very preterm infants	Tornhage, C.J et al	Descriptive study	17 sick preterm infants with an average gestational age of 28 weeks and an average weight of 1238g were placed in KP, for one hour in their first days of life. Results make evident that oxygen requirements did not change or decreased in 15 children, and increased in 2. Changes in arterial gas and transcutaneous PCO ₂ , heart rate and temperature were minimal. One of the admitted patients presented apnea and deterioration in KP.
2000	[34]	Kinesthetic stimulation versus theophylline for apnea in preterm infants	Osborn, DA, Henderson DJ	Meta-analysis	Theophylline is better than kinesthetic stimulation for the prevention of apnea.
2001	[23]	Skin-to-skin (kangaroo) care, respiratory control, and thermoregulation	Bohnhorst, B et al	Pretest and posttest clinical experiment.	22 preterm infants of less than 32 weeks GA were subject to three 2-hour sessions: first in an incubator, then in KP and again in the incubator. Results showed that during KP oxygen saturation was lower, but clinically non-significant. Besides, bradycardia episodes with apneas were observed more frequently in Kangaroo Position patients

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2002	[35]	Kinesthetic stimulation for treating apnea in preterm infants	Osborn, D.A Henderson DJ	Meta-analysis	Concludes that kinesthetic stimulation is no good for treating apnea of prematurity.
2004	[11]	Cardio respiratory and thermal effects on healthy preterm infants	Ludington_Hoe, S & al	Random controlled clinical experiment	24 preterm newborns were randomly included in a control group in incubators and a KP group. Conclusion: KP was better for thermoregulation and a decreases episodes of periodical breathing. There was no difference between the groups in terms of apnea or bradycardic episodes.
2005	[14]	Feasibility of kangaroo mother care in Mumbai	Kadam, S et al	Random controlled clinical experiment	44 newborn infants in KP and 45 in the control group, all below 1800 g. Results show that Kangaroo position group presented less hypothermia episodes, better respiratory frequency and heart rate, with no difference in the frequency of apnea

4.4 Kangaroo position and gastro esophageal reflux

Question: Is there any evidence that Kangaroo position prevents gastro esophageal reflux (GER)?

Evidence-based Answer:

It is no direct evidence that KP prevents incidence of GER.

Kangaroo Position seems not to increase GER.

It would be expected that incidence, duration and severity of the reflux episodes

will be less frequent than in other since the infant is constantly kept in a prone position, with his head is higher than the rest of his body, in an almost vertical position.

Although there are no studies that have evaluates the relationship between the Kangaroo Position and the incidence or severity of gastro esophageal reflux, it can be assumed that given the similarity between KP and the ground anti-reflux position, KP could have a protective effect, since while the child is held in skin-to-skin contact with the mother’s chest, he is maintained in vertical prone decubitus during the day and in an incline of 30 to 45 ° during night or mother’ rests. This affirmation is based on clinical observations, on physio- pathological reasoning and on the analogy between Kangaroo Position and the recommended anti-reflux positions, in which children show fewer gastro esophageal reflux episodes. On the other hand, a lower incidence of gastro esophageal reflux has been reported in breastfed infants, a practice promoted by the Kangaroo Position part KMC.

Table 4 Kangaroo position and gastro esophageal reflux

Year	Ref	Name of Article	Author	Type of design	Description and contribution
1990	[36]	Prone positioning in infant gastro esophageal reflux: is elevation of the head worth the trouble?	Orenstein, SR	Crossover study	100 infants, aged less than six months with documented gastro esophageal reflux were included in this study. pH was assessed with probe and they were randomly placed in different positions. Conclusion: neither a flat position nor an elevation of the head reduces the number of reflux episodes.
1991	[37]	Effect of body tilting on physiological functions in stable very low birth weight neonates	Dellagrammaticas, HD & al	Pretest y posttest study	22 preterm infants weighting less than 1500 g were included. Vital signs, gastric emptying, and weight gain were assessed. They were exposed to mechanical position variations. Results show that those in prone position, with a 45° head elevation presented better gastric emptying and weight gain.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
1997	[38]	Posture and gastro-esophageal reflux: a case for left lateral positioning	Tobin, JM & al	Crossover study	24 full term infants were included in this study. They were monitored with a gastric tube for 48 hours and randomly distributed in 4 possible positions. The study showed a tendency, when placed in elevated position to have a lower number of GER episodes. GER is significantly less important in prone and left lateral decubitus than in right lateral decubitus and in supine position.
1999	[39]	Prone and left lateral positioning reduce gastro-esophageal reflux in preterm infants	Ewer, AK & al	Crossover study	18 preterm infants with enteral nutrition were included in this study. 24 hour pH metric monitoring was conducted. Results showed that prone position decreases the incidence and duration of GER episodes.
2004	[40]	Diagnosis and management of gastro-esophageal reflux in preterm infants in neonatal intensive care units	Dhillon, AS, Ewer, AK	Descriptive study	Surveys were conducted in 77 neonatal units. It was found that GER diagnosis in preterm infants was done by pH metria and that in 98% of all cases GER was managed with positioning (prone or left lateral decubitus position) and medication

4.5 Kangaroo position, bonding and attachment.

Question:

Is there any evidence that Kangaroo position improves bonding between mother and infant?

Is there any evidence that Kangaroo position helps the infant to develop a secure attachment with his mother?

Is there any evidence that KMC helps establish an earlier and better mother-child postnatal relationship?

Answer.

a) When post-delivery mother-infant separation occurs, the use of KP as soon as possible, allows the bonding process initiated during pregnancy to be reestablished, which may generate a healthy and appropriate attachment and a secure relationship and development.

b) The Kangaroo Position, and particularly the skin-to-skin contact, helps establish a healthy bond, or rather resume the bonding initiated during pregnancy and interrupted after neonatal separation of mother and child. Skin-to-skin contact reestablishes the mother-child relationship interrupted after the neonatal separation or initiates a caregiver-child relationship in such a way that more appropriate bonding and secure attachment are more likely.

c) The Kangaroo Position, particularly if provided continuously, helps transfer the direct responsibility over baby care to the parents, thus making them active

The establishment of a healthy emotional bond between the mother and her baby is of great importance for adequate personality development. Observed evidence is consistent with the hypothesis that, a series of psycho-biologically regulated transactions between the child and his caregiver, incorporated in the bond relationship, seems to be of great importance for the optimal development of the regulatory functions and the organization of a resilient personality, able to handle stress.

Mother-child bonding is a unique, specific relationship which is long-lasting and intense. This relationship has effects over the infant's physical, psychological and intellectual development. In their developmental tasks, infants should learn to differentiate between trust and mistrust during the first two years of life, and develop a secure attachment to their environment through an attachment to their mother. If the mother consistently responds to the infant's requests adequately and appropriately, satisfying their physical and psychological needs, the infant is more likely to learn to trust their mother, see the world as a safe place, and grow as a secure person, capable of self-trust and trust in others, of cooperating and of being useful. In contrast, babies raised by mother not providing the necessary condition for developing secure attachment are at risk for delayed development in various areas such as the emotional, cognitive, linguistic and social.⁵⁹ What's more, a non-attaching mother tends to ignore the baby

and therefore puts them at risk of neglect, abuse, and non-organic failure to thrive.

The process of establishing the bond begins during pregnancy and continues through the post natal period. When there is a premature birth, an immediate, prolonged separation to often occurs between mother and child, interrupting this normal bonding process. The sooner this process is reestablished, the better it is to restore an appropriate bond development influencing the parental abilities of the caregiver and the development of a healthy attachment on the part of the child. However it is clear that there are no definitive critical or sensitive periods to establish post natal bond (as it occurs with other mammals), and that a successful bond can be established regardless of early mother-infant separation, this does not mean that early physical contact, hopefully immediately following delivery is not desirable, if nothing else, simply for being emotionally satisfying for both mother and child.

Table 5 Kangaroo position, bonding and attachment

Year	Ref	Name of Article	Author	Type of design	Description and contribution
1970	[41]	Human maternal behavior at the first contact her young	Klaus M,H. & al.	Qualitative, phenomenological study.	Describes the existence of a sensitive period lasting a few hours to days.
1972	[42]	Maternal Attachment, importance of the first post-partum days	Klaus M,H. & al.	Review	Describes the existence of a sensitive period lasting a few hours to days.
1975	[43]	Evidence for sensitive period in the human mother	Kennell JH & al	Review	Describes the existence of a sensitive period lasting a few hours to days.
1981	[44]	Maternal attachment and mother neonate bonding: a critical review	Hwang, CP & al	Review	Considers that contact may affect some mothers under certain circumstances.
1982	[45]	Early contact maternal infant bonding: one decade later	Lamb, M.E	Review	Considers that no single event (such as contact immediately following birth) has significantly persistent long-term effects.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
1982	[46]	The bonding Phenomenon: misinterpretation and their implications	Lamb, M.E	Review?	Considers that even without uncontested proof to sustain the idea that contact immediately following birth is essential for the subsequent optimal development of the child, it doesn't mean that such contact is not desirable, simply because it is emotionally satisfying for mother and child.
1983	[47]	Maternal Infant bonding: a joint rebuttal	Anisfield et al	Review?	Concludes that contact following birth is not the only determining factor in the subsequent development of the infant, independent from all other things which may happen afterwards.
1983	[48]	Parent to Infant Bonding: Setting the record straight	Klaus M, Kennell, J	Review?	Concludes that, during the sensitive period, contact with the baby's skin may trigger to the maximum, the attachment between mother and infant.
1983	[49]	Joint reply to Maternal infant bonding: Joint rebuttal	Lamb, ME et al	Review?	Concludes that observed evidence is not sufficiently strong to support the affirmation that contact immediately following birth has significant clinical effects in the majority of women.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
1992	[50]	Mother Infant Bonding a Scientific fiction	Eyer D. E	Review?	Considers that the accumulation of proofs from animal and human studies cannot demonstrate nor invalidate the existence of a brief period following birth during which the mother is in optimal condition to bond with her infant.
1993	[51]	Reconciliation and healing for mothers through skin-to-skin contact provided in an American tertiary level intensive.	Affonso Det al	Descriptive study	Concludes that the kangaroo mother method is a way to treat the initial trauma represented by the initial separation of the mother and her child.
1998	[52]	Kangaroo mother care and the bonding hypothesis	Tessier, R & al	Randomized controlled clinical experiment	The sample is a subgroup of the Colombian RTC (Charpak, 2001). 488 newborn babies below 2001 g were randomly included in kangaroo or control groups. The mothers of the kangaroo group felt more competent with their preterm infants and were more sensitive to their needs, especially during their stay in the NICU.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2001	[53]	Bonding: putting an end to the debate	Cristo ME	Review?	Advancements in the knowledge and understanding of the development of cerebral functions allow for the formulation of the hypothesis that early experience plays a determinant role in the formation of the personality and adaptive functions.
2002	[54]	Comparison of skin-to-skin (kangaroo) and traditional care: parenting outcomes and preterm infant development	Feldman & al	Cohort study	Kangaroo position cohort included 73 patients as well as a control cohort. Patients were classified in high or low risk according to CRIB (Clinical risk index for babies score). Results show that at 37 weeks there is improvement in the mother-infant interaction, especially in the low risk CRIB group, with mothers that look and touch their babies more and adapt better to their signals, as well as more alert children. Kangaroo position has a greater impact in the high risk group improving motor development.
2004	[55]	Sensitive periods in the development of the brain and Behavior	Knudsen, E	Review?	The hypothesis that environment-mediated experience is critical for cerebral tissue differentiation is proposed. Also, that the bonding-mediated early relationship of the baby with his mother has psychological and neurobiological consequences, since its influence modulates, within certain limits, the cerebral structure in the newborn.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2007	[185]	Immediate skin-to-skin contact: its effect on maternal postpartum anxiety and depression and on neonatal adaptability to early breastfeeding.	Rivara G, & al	Prospective, randomized, double blind (clinical trial)	Two randomly formed groups were compared: a kangaroo group n=38 and control group n=41: anxiety levels and maternal depression were lower in the study group (ISSC) 48 hours after birth, as compared to the control group (p < 0,0001). Newborns in the study group were more successful in immediate breastfeeding vs. those in the control group. The degree of satisfaction of maternal perception about the delivery was higher in the study group. Skin-to-skin contact decreases levels of anxiety and maternal depression 40 hours post-partum, improves neonatal adaptive behavior and increases maternal satisfaction of perception of the delivery.
2009	[184]	Kangaroo Mother Care, home environment and father involvement in the first year of life: a randomized controlled study	Tessier,R & al	Controlled random study	Results from HOME and GRIFFITHS evaluation were compared in 194 families in the KMC group vs. 144 families in the traditional care group. The KMC group created a much more stimulating care environment for the children and produced a positive impact by involving both parents in direct care.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2010	[169]	Maternal Holding of Preterm Infants During the Early Weeks After Birth and Dyad Interaction at Six Months.	Madalynn Neu and Jo-Ann Robinson,	Controlled random study	Evaluation of social interaction at 6 months of age. Fogel Scoring System for Still Face Observation was used: The mother-baby dyads that were in kangaroo position or skin-to-skin contact in the first weeks developed more social interaction strategies in play at six months, than those dyads who did not practice the kangaroo position.
2010	[186]	The relation between early mother–infant skin-to-skin contact and later maternal sensitivity in South African mothers of low birth weight infants	Bigelow, AE & al	Controlled random study	Q-Sort Maternal Scale and the Maternal Behavior Sub-Scale from NCAST Scale was applied to the dyads. The relationship of early skin-to-skin contact and subsequent maternal sensitivity towards their very low weight infants was studied in 12 mother-infant dyads. Dyads were visited at home before the child’s first year. The amount of SSC in the child’s first 24 hours, justified maternal sensitivity in both measurements, finding that early skin-to-skin contact between infant and mother subsequently produces greater maternal sensitivity.

4.6 Kangaroo position and neurological development

Question: Is there any evidence that Kangaroo position has a positive effect on the neurological and psychomotor development of preterm and/or low birth weight infants?

Answer:

Kangaroo position seems to favor an adequate neurological and psychomotor development in preterm infants.

Behavior, sleep/wake cycles and quality of rest are adequately organized and this is achieved earlier among similar infants not exposed to KP.

Maturation of neurological and psychomotor functions as measured by standardized tests (Griffiths, Bailey) during the first year of life is more significant in some subgroups (NICU and transient neurological exam at 6 months). The kangaroo mother method seems to foster neurological development in the preterm infant. This is evident through improvement in the baby's behavioral organization, in the sleep-wake cycles, in the quality of sleep and in the maturation of neurological and psychomotor functions, as measured by standardized tests.

As for the preterm behavioral organization and sleep, it is known that by maintaining skin-to-skin contact, the mother's sounds (voice, heart) can induce sleep in the baby. There is a positive effect in the duration of sleep: there are less waking episodes and a calm waking.

Furthermore, studies propose that neurological and psychomotor development improves in Kangaroo position through two mechanisms: on the one hand, a social mechanism through which the entire family is involved; on the other, a mechanism by which a better regulation in cerebral organization is obtained, reestablishing the development of the corpus callosum.

Table 6 Kangaroo position, neurological development, quality of sleep and stress

Year	Ref	Name of Article	Author	Type of design	Description and contribution
1990	[56]	Energy conservation during skin-to-skin contact between preterm infants and their mothers	Ludington-Hoe, S	Pretest y posttest study	8 preterm infants, between 34 and 36 weeks gestational age, were included and observed before, during and after skin-to-skin contact with their mothers. . It was concluded that in this position, children had less energy expenditure.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
1992	[17]	Selected physiological measures and behavior during paternal skin contact with Colombian preterm infants	Ludington-Hoe S, & al	Descriptive study	11 healthy preterm infants, over 37 weeks were included and observed during the first 17 post-delivery hours. It was reported that heart rate, respiratory frequency and temperature were monitored. It was concluded that 65% of the preterm infants presented quiet sleep the majority of the time and maintained their temperature while in contact with their parents.
1994	[31]	Kangaroo care research results and practice implications and guidelines	Ludington-Hoe, s & al	Pretest and posttest clinical experiment	22 newborn infants, between 32 and 36 weeks old, (AGE), were exposed to equal periods of incubator and kangaroo position. Conclusion: KP induces deeper sleep, which was twice as deep, as in the incubator as well as a decrease in activity and time to reach deep sleep state. There was no temperature loss and both apnea and periodic breathing diminished.
1997	[20]	Effect of kangaroo care on sleep time for neonates. [Review] [42 refs]	Messmer, P.R & all	Nonrandom pretest and posttest study	20 preterm infants and their parents were included. Resprace PT monitoring system was applied. As outcome, the child's behavior and physiological stability was evaluated. It was no apnea during KP, they had a more quiet sleep, compared with the pretest results.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2001	[57]	Randomized controlled trial of kangaroo mother care: Results of follow up at 1 year of corrected age.	Charpak, N & al	Randomized controlled clinical experiment	488 newborn babies below 2001 g were randomly included in kangaroo or control groups. The study concludes that psychomotor development to one year of age , was equal in both groups.
2002	[54]	Comparison of skin-to-skin (kangaroo) and traditional care: parenting outcomes and preterm infant development	Feldman, R & al	Cohort study	Kangaroo position cohort included 73 patients as well as a control cohort. Patients were classified in high or low risk according to CRIB. Results show that at 37 weeks there is improvement in the mother-infant interaction, especially in the low risk CRIB group, with mothers that look and touch their babies, adapting better to their signals, as well as more alert children.. The KP has a significant and positive effect on the perceptual-cognitive and motor development and in the child-rearing process.
2002	[58]	Comparison of kangaroo care and standard care: behavioral organization, development, and temperament in healthy, low-birth-weight infants through 1 year	Ohgi, S & al	Historical control study	26 children were included in the group that receives kangaroo mother intervention and 27 in the control group, with same mean gestational age and weight. NBAS, Bailey and ITQ scales were given. Results showed that the kangaroo group showed better orientation and behavioral regulation; Bailey scale showed higher mental and psycho motor score.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2002	[9]	Randomized controlled trial of early kangaroo care for preterm infants: Effects on temperature, weight, behavior, and acuity.	Chwo, , MJ & al	Randomized controlled clinical experiment	34 healthy preterm infants, 34 to 36 weeks of GA, were randomly included in a control group or in KP group. It was concluded that patients in kangaroo position presented calmer sleep (62% vs. 22%) and less crying episodes (2% vs. 6%).
2003	[59]	Kangaroo Mother Care: a method for protecting high-risk low-birth-weight and preterm infants against development delay	Tessier, R & al	Randomized controlled clinical experiment	The sample is a subgroup of the Colombian RTC (Charpak, 2001). 431 newborn infants below 1801 g were included and randomized. Results show a better psychomotor development in the kangaroo group.
2003	[60]	Skin-to-skin contact (Kangaroo Care) accelerates autonomic and neurobehavioral maturation in preterm infants	Feldman, R; Eidelman, Al	Pretest y posttest study	The control group included 35 children, as did Kangaroo position group. The children were paired according to gender, gestational age, birth weight, and demographic characteristics. Results showed that patients in kangaroo position had longer periods of quiet sleep and shorter periods of active sleep, as well as calm awakenings in the majority of cases. Patients in kangaroo position at 37 weeks, show a NBAS test with more neurodevelopmental maturity in the three items studied.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2004	[140]	Massage therapy facilitates mother–infant interaction in preterm infants behavior, and acuity.	Goldstein Ferber	Randomized controlled clinical experiment	3 groups of 18 newborns each. Two groups received a massage three times a day for 15 minutes, for 10 days. One group given by the mother, the other by the health care provider. The control group received no massage. Interactions between mothers and babies were evaluated at three months. In general, receiving the massage was correlated with positive interactions between mother and baby, decreased stress in the babies and increased their state of alert.
2005	[61]	The skin-to-skin method (kangaroo care) : age adjusted evaluation of neuro-behavior at one year	Acosta, R & al	Cohort study	120 patients were selected from a sample of 348, in unclear way. A Bailey scale was performed at 6 and 12 months. Results show no differences at 6 and 12 months between the KP group and the control group.
2006	[62]	Neuro-physiological assessment of neonatal sleep organization: Preliminary results of a randomized control trial of skin contact with preterm infants	Ludington-Hoe, S & al	Randomized controlled clinical experiment	71 neonates were included. EEG and sleep monitoring was carried out. Results are statistically significant with relation to the number of wake episodes during quiet sleep and REM (rapid eye movement) sleep

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2006	[187]	Relationship between positioning of preterm infants in Kangaroo Mother care and early neuromotor development	Barradas, J & al	Pretest and posttest study	The neurological development of 40 preterm infants in prone kangaroo position was compared to 40 infants in lateral kangaroo position. Results: the lateral skin to skin position showed a positive impact in the early neuro-behavioral development, compared to the prone position. crying episodes (2% vs. 6%).
2007	[141]	Sensory oral motor and global motor development of preterm infants	Guerra de Castro, A & al	Descriptive study	Evaluation of the oral motor and global motor development of 55 preterm infants at 4 and 5 months corrected age, who received kangaroo care. Results: infants with lower gestational age (29-34 weeks) showed greater risk in oral motor and global motor development.
2008	[138]	Cerebral oxygenation responses during kangaroo care in low birth weight infants	Begum, EA & al	Descriptive study	16 stable patients, born at 24-33 GA; weight: 692-1586 gr. Corrected age: 33-42 weeks. Monitoring of vital signs, including PO2 and regionalized brain oxygenation (right and left) pre, during and after KP. It was found that kangaroo position can be beneficial for the activation of the CNS and brain function.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2009	[139]	Effect of early skin-to-skin contact on Mother- Preterm Infant Interaction Through 18 months: Randomized controlled trial	Sheaue Huey Chiu	Randomized controlled clinical trial	Interactions between mothers/babies. 50 days of kangaroo care and 50 control days. GA: 34.6 +/- 1.5. Scale used at 6, 12 and 18 months, evaluating responses to the baby's needs, to stress and positive teaching to the baby among others, during feeding and teaching sessions. In general, kangaroo mothers had more positive relationships with their babies.
2009	[170]	Neurophysiologic Assessment of Brain Maturation after an Eight-Week Trial of Skin-to-Skin Contact on Preterm Infants	Scher, Mark S Ludington-Hoe, Susan, Kaffashi, Farhad Johnson, Mark W Holditch-Davis, Diane Loparo, Kenneth	Randomized controlled clinical experiment	Analysis of 16 EEG's preterm infants , 8 of them who received 1.5 hours of kangaroo position, 4 days a week, for 8 weeks. Results: The (8) preterm receiving skin-to-skin contact presented less REM (Rapid Eye Movement) sleep cycles, and more of inactive sleep. An increase in respiratory regularity, longer sleep cycles, and a lower beta spectrum was noted as compared to the other two cohorts of preterm and full-term infants. At term, less REM cycles and more alertness was found in the preterm in skin to skin contact (SSC) infants than in the non-SSC full term babies. In three regions of the right hemisphere of SSC babies a greater complexity was found.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2011	[142]	Comparison of salivary cortisol, heart rate, and oxygen saturation between early skin-to-skin contact with different initiation and duration times in healthy, full-term infants	Yuki Takahashia	Descriptive	The first study analyzed the HR and O2S of 32 full term newborns that were in kangaroo position during the first 5 minutes of life and 36 newborns that were in kangaroo position for more than 5 minutes after birth. Levels of cortisol in the saliva were measured a minute, an hour and 120 minutes after birth. The second study measured the levels of cortisol in the saliva of 18 newborns held in kangaroo position for less than 60 minutes after birth and of 61 newborns held in kangaroo position for over 60 minutes. It was found that placing the newborn skin to skin in the first 5 minutes of life and for more than 60 minutes within the first 2 hours of life is beneficial for heart stabilization and decrease of stress in the immediate post-delivery.
2011	[183]	Impact of kangaroo care on neonatal stress of the preterm neonate	Collados, Laura. Aragonés Belén. & al	Analytical, quasi-experimental pre-post study with no control group	Signs of physiological stress and behavioral response to stress were measured in 51 preterm infants, between 29-34 GA.. Kangaroo care was linked to a decrease of neonatal stress variables, helping him organize his motor and physiological systems to achieve a calm state.

4.7 KP Kangaroo position and neonatal transportation

Question: Is there any evidence that Kangaroo position is safe and effective to carry newborn infants during /transportation/transfer

Evidence-based Answer:

There is only one published report describing a satisfactory physiological stability in preterm and term babies transferred in the Kangaroo Position.

In absence of further evidence, the transfer in Kangaroo cannot be recommended as a systematic practice or as a policy to replace transfer incubators.

Nevertheless transfer in KP may be considered as a safe and adequate alternative when transfer incubators are not optimal or are unavailable.

Table 7 Kangaroo position and neonatal transportation

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2004	[63]	Kangaroo transport instead of incubator transport.	Sontheimer	Descriptive study	31 preterm and full term infants, who were transported in KP for various reasons, were included in this study. The mother was involved in 27 cases, the father in 1, a physician in 1 and a nurse in 2 occasions. Results shows that parents felt comfortable and rated positively the method of transportation.

4.8 Kangaroo position and pain control

Question: Is there any evidence that Kangaroo Position decrease the pain perception and harmful effects associated to painful procedures on preterm and/or LBW infants?

Evidence-based Answer:

There is evidence showing that keeping the baby in during a painful procedure reduces physiological alterations and facial gestures before pain in preterm babies, with no evidence of harmful effects.

Using Kangaroo Position during a painful procedure is an effective and safe non-pharmacological measure to control pain. Given the positive effects on neurological organization in preterm babies, its systematic use at times other than painful procedures might counterbalance harmful effects of painful procedures on behavior and quality of sleep in these infants.

Immature infants perceive pain. Preterm and/or sick newborn infants undergo many painful and stressful procedures. Painful stimulation is repetitive in neonatal units and their negative effects have been properly documented.

Whilst pain alters both behavior as well as quality of sleep in preterm infants apart from increasing the intensity of their responses to new painful stimuli, Kangaroo position improves organization of behavior and sleep and thus could alleviate negative effects of painful stimuli resulting from repetitive procedures on hospitalized preterm babies.

Pharmacological analgesia, particularly opiates, though necessary clearly beneficial, are associated with many risks, especially during prolonged use. For all this, it is also necessary to use effective non-pharmacological measures for controlling pain, particularly before iterative painful stimuli.

Table 8 Kangaroo position and pain control

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2003	[64]	Kangaroo care is effective in diminishing pain response in preterm neonates.	Johnston, CC & al	Crossed random experiment	74 preterm infants between 32 and 36 weeks were included. The baby's response during a foot puncture was evaluated using PIPP scale. Results showed a PIPP 2 points lower in the kangaroo group and no difference was observed as far as heart rate and oxygen saturation.
2005	[65]	Skin to skin contact analgesia for preterm infant heel stick 2	Ludington, SM & al	Crossed random experiment	Continuous monitoring of the physiologic effects caused by pain during a puncture was monitored in Kangaroo position group vs. the same process while in an incubator. It concludes that Kangaroo position serves as analgesic for the painful procedure
2005	[66]	Salivary cortisol and mood and pain profile during skin to skin care and unselected group of mothers and infants in neonatal.	Morelius, E & al	Pretest and posttest study	16 mother-preterm infant dyads were evaluated for stress during the first and fourth skin-to-skin contact sessions. It was evident that heart rate is highest during pretest and lower during kangaroo position and posttest. Likewise, the mother's mood is quieter during KP. The level of cortisol of infants was stable. Heart rate and reaction to pain decreased during skin-to-skin contact

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2007	[67]	Neurobehavioural assessment of skin-to-skin effects on reaction to pain in preterm infants: a randomized, controlled within-subject trial	Ferber, SG & Makhoul, IR	Random controlled clinical experiment	30 preterm infants were randomly introduced in a KP group vs. a control group. Both with or without a painful stimulus. Results showed that the KP decreases pain in a statistically significant manner.
2007	[131]	The effects of skin to skin contact during acute pain y preterm newborns	Castral, TC &al	Crossover clinical experiment	<p>59 preterm infants > 30 GW, 31 in KP and 28 in traditional incubator, were exposed to heel punctures, while filming their faces and measuring HR and O2 saturation.</p> <p>The most important findings were a reduction of HR and cry and babies in KP fell asleep faster. Scores in the neonatal facial codification system were lower in children in KP.</p> <p>Kangaroo position permits a faster blood sample collection.</p>

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2008	[132]	Neurobehavioral assessment of skin-to-skin effects on reaction to pain in preterm infants: a randomized, controlled within-subject trial.	Goldstein, S & al	Randomized clinical trial	<p>31 preterm infants, 29-34 GW weighing 1000-2000 g. Their faces were filmed (NFCS), HR measurement and sleep observation. Their heels were punctured in KP (15 minutes before and 15 minutes after puncture), in incubator, and without puncture in both positions.</p> <ul style="list-style-type: none"> • Kangaroo group showed less motor disorganized behavior and extension of movement • Increase of organized sleep and reduction of disorganized sleep • Increase of signs of positive and negative attention in the kangaroo group. <p>The study is not very clear. The kangaroo method may, by containing the baby, increase attention and this may protect him during the following painful stimulus.</p>

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2008	[133]	Evaluation of analgesic effect of skin-to-skin contact compared to oral glucose in preterm neonates	Freire , N.B & al	Crossover clinical experiment	<p>95 preterm infants, 28-36 GW (33 in incubator, 31 in KP, 31 receiving glucose).</p> <p>Faces were filmed during heel puncture, HR and saturation were measured.</p> <p>HR and saturation variation was lower in the KP group as in PIPP.</p> <p>Behavioral indicators were lower both in the kangaroo and glucose groups.</p>
2008	[134]	Effect of Kangaroo Care (skin contact) on crying response to pain in preterm neonates	Kostandy, R & al	Crossover study	<p>10 preterm infants 30-32 GW. Faces were filmed during heel puncture, scoring based on audible and inaudible cry and observation of behavior, according to the Anderson Behavioral State Scoring System * Crying time was lower during puncture and recovery shorter in kangaroo position. Maybe the mother presence can influence the response to pain, because preterm babies who are used to the mother's familiar scent do not show t increased crying with respect to the baseline value.</p>

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2008	[68]	Evaluation of analgesic effect of skin-to-skin contact compared to oral glucose in preterm neonates	De Sousa, Freire N.B & al	RCT	<p>The study observed and collected data on reaction to pain in 95 pre-term newborns; variations in heart rate, oxygen saturation and PIPP scores were evaluated.</p> <p>Results showed less variation in heart rate and oxygen saturation in the KP group d, as well as decrease in PIPP scores.</p>
2009	[69]	The effect of kangaroo care on pain in preterm infants during invasive procedures	Akcan, E & al	RCT	<p>During the study an observation of psychological and behavioral response to pain was carried out, measuring PIPP scores.</p> <p>A significantly lower PIPP score was found in the group of newborns under kangaroo mother method.</p>
2009	[136]	Kangaroo Care Modifies Preterm Infant Heart Rate Variability in Response to Heel Stick Pain: Pilot Study	Cong, X & al	Randomized controlled study	<p>14 preterm s, 28 to 32 weeks. Premature behavior was measured based on Heart Rate (HR) and Respiratory F requency (RF) variability. The mean HR had lees fluctuation in KP and was significantly lower during recovery in KP than in incubator. No significant behavior baseline differences between KP and incubator, during heel warming, puncture and recovery.</p>

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2009	[137]	The effect of kangaroo care on pain in preterm infants during invasive procedures	Akcan, E & al	Randomized controlled trial	50 preterm infants (25 KP and 25 in control group), age 26-36 weeks. Their faces were filmed; HR and saturation were measured during heel puncture. Scores in Preterm Infant Pain Profile was significantly lower in each measure during or immediately after puncture in KP children as compared to control group.
2009	[135]	Skin-to-skin contact and/or oral 25% dextrose for procedural pain relief for term newborn infants.	Chermont, A. G & all	Randomized clinical trial	640 children received an intramuscular injection of Hepatitis B vaccine. Group 1: standard care with 1ml of water before the puncture. Group 2: skin-to-skin contact on mother's chest 2 min. before and after the puncture, and administration of sterile water. Group 3: as in standard care, but administered 1 ml 25% dextrose solution. Group 4: skin-to-skin contact plus administration of 1 ml dextrose solution. All strategies lower pain scores, but the combination of skin-to-skin contact and administration of dextrose lower pain significantly.

4.9 Kangaroo position and somatic growth

Question: Is there any evidence that Kangaroo position improve somatic growth in preterm and/or low birth weight babies?

Answer: There is no direct evidence that Kangaroo position by itself , continuously or intermittently, leads to better somatic growth results in preterm and/or LBW infants babies when compared to properly fed and managed infants in a neutral thermal environment and with a comparable health status.

There is clear evidence that KP has no negative effect on weight gain.

When infants in Kangaroo position are compared to infants cared in suboptimal environments with cots or incubators that do not ensure a neutral thermal environment, Kangaroo position has been associated with better short and medium term growth and somatic development. Attributing this effect solely to Kangaroo position is difficult, since it is associated with the mother's presence and appropriate access to breastfeeding.

Two RCT found a discrete increase in head perimeter growth, which could suggest that there is some protective effect of the Kangaroo Mother Care Method on cranial growth.

Table 9 Kangaroo position and somatic growth

Year	Ref	Name of Article	Author	Type of design	Description and contribution
1994	[19]	Kangaroo mother method: randomized controlled trial of an alternative method of care for stabilized low-birth weight infants. Maternidad Isidro Ayora Study Team.	Sloan, N. R & al	Controlled random clinical experiment	128 newborns were included in a KP group and 147 in a control group, all weighing less than 2000 g. Growth, duration of initial hospitalization and re hospitalization were assessed , as well as breast feeding rate and illnesses during follow up. Results are not conclusive in terms of weight gain, but there was a significant patient loss during the follow up, which reduced the statistical power.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
1998	[7]	Kangaroo mother care for low birth weight infants: a randomized controlled trial in different settings	Cattaneo, A & al	Randomized controlled clinical experiment	200 patients weighing from 1000 to 1999 g were randomly distributed in a control group who received routine in hospital care and a KP group.. As an outcome, exclusive breastfeeding and weight gain was measured. Results showed a higher, but not significant weight gain, when looking at each participating institution.
1998	[70]	Kangaroo care versus incubator care in the management of well preterm infants--a pilot study	Kambarami & al	Randomized controlled clinical experiment	74 patients were randomly included in a control group which constituted of a conventional unit and in an intervention KP group. Results showed a significant increase in weight gain in the intervention group.
2001	[71]	Kangaroo mother care in very low birth weight infants	Ramanathan, K & al	Randomized controlled clinical experiment	In each group, 14 children below 1500 g and with hemodynamic stability and temperature regulation were randomly placed in an intervention or a control group. Results: The kangaroo group obtained better weight gain, early discharge, and increased breast milk six weeks after discharge.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2001	[72]	Randomized controlled trial of kangaroo mother care: Results of follow up at 1 year of corrected age.	Charpak, N & al	Controlled random clinical experiment	746 low birth weight for GA(below 2001 g) newborn infants were randomly included in a KP group and a control group. The study concludes that both groups had similar weight gain and somatic growth results.
2003	[73]	Somatic growth of preterm infants during skin-to-skin care versus traditional holding: a randomized, controlled trial	Rojas, M.A & al	Controlled random clinical experiment	In this study, in spite of being a clinical experiment, the group assigned to KP received traditional care during the first days. In spite of methodological errors, the KP group shows higher head circumference and faster growth as compared to the control group.
2005	[74]	Implications of Kangaroo Care for Growth and Development in Preterm Infants	Dodd VL	Systematic review	There is evidence of better attachment and improved behavior on the parent's part,; but insufficient evidence of better weight gain.
2005	[75]	Influence of Feeding Patterns and Other Factors on Early Somatic Growth of Healthy, Preterm Infants in Home-Based Kangaroo Mother Care: A Cohort Study	Ruiz, J. G & al	Cohort study	129 preterm infants AGE in KP were included. Weight was monitored until a 15g/kg/day gain was reached for two consecutive days. It was concluded that 47.6% of newborns presented adequate weight gain through breast feeding and also that the more immature the baby, the greater risk of requiring supplemented breast feeding.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2006	[76]	Método Mãe-Canguru: evolução ponderal de recém-nascidos	Frietas J de O & al	Prospective observational study	The study focused on data collection on weight gain during the first and second phases of the kangaroo method and concluded that there was adequate weight gain during both phases.
2009	[181]	Earlier versus later continuous Kangaroo Mother Care (KMC) for stable low birth weight infants: a randomized controlled trial.	Nagai, S & al	Randomized controlled study	73 children, divided in two groups: one in early skin-to-skin contact, the other in late skin-to-skin care. In the first group, two children died in the first 28 days and in the second group, one in the same period. Weight gain differences, favorable to group one were found. The effect of early kangaroo was better than in the second group. Less weight loss, lower mortality and fewer infections were observed in the early group.
2011	[168]	Short duration of skin-to-skin contact: Effects on growth and breastfeeding	Boo, Nem-Yun Jamli, Faizah Mohamed	Prospective controlled random study	126 preterm infants below <1500g were randomized to receive skin-to-skin contact in the NICU. Head circumference and successful breastfeeding at discharge were measured. It was possible to establish that children on skin-to-skin contact obtained greater head circumference growth and higher percentage of breastfeeding at discharge.

4.10 Kangaroo position and infant in terminal phase

Question: Is there any evidence that Kangaroo Position help the mother to cope with the painful situation and to go through mourning more adequately?

Answer:

In the scientific literature it is no reports of studies or observations documenting the effects of carrying a terminal or dying baby in Kangaroo Position.

There is no evidence, only opinion of experts to support the fact that holding their infant in kangaroo position while he is dying helps the mother and the family to go through the grieving process in a less painful way.

Studies involving mothers with or without physical contact with their stillbirth suggest a lower bereavement quality in mothers with a physical contact. But is less probable that these observations can be extrapolated to the situation where the baby was born alive and is in a critical situation, and is placed in kangaroo position

In summary, there is no information indicating whether the effects of carrying a terminal baby in Kangaroo position are positive or negative.

Table 10 Kangaroo position and infant in terminal phase

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2002	[77]	Assessment of guidelines for good practice in psychosocial care of mothers after stillbirth: a cohort study	Hughes	Cohort study	Mothers were classified in one of three categories: a) physical contact with the body of the still born child, b) mother limits herself to making funeral arrangements and c) none of the above the infant in terminal phase. The level of depression in subsequent pregnancies was higher in the mothers who held their still born child. These results suggest that holding their dead newborns, induces a higher prevalence of depression and anxiety in subsequent pregnancies and a higher degree of post-traumatic stress after a year. However, the situation in the case of preterm birth is different as are the described observations.

4.11 Kangaroo position and acceptance and resistance of parents and health care staff

Evidence has shown that Kangaroo Position is tolerated and accepted by the parents, allowing to redefine the roles of each one within the neonatal units and at home, generating an environment where it is understood that fathers are also responsible for the care of their preterm and/or LBW infant, which allows them to establish a closer relationship with the health staff.

Table 11 Kangaroo position and acceptance and resistance of parents and health staff

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2005	[14]	Feasibiliti ok KMC in Mumbair	Kadam, S & al	Randomized control trial	Newborn babies below 1800 g were included during a year. The control group in open incubators and the intervention group in KMC. It was concluded that 79% of the mothers feel comfortable with Kangaroo position and 73% feel capable of doing it at home.
2006	[79]	KMC: Effects and perceptions of mothers and health personnel	Nirmala, R	Descriptive study	50 newborn babies who received the Kangaroo Mother Method were included. It was concluded that health care personnel agrees on the fact that mothers feel better and more competent with the kangaroo mother method as compared with the traditional method.
2006	[80]	The attitudes and practices of neonatal nurses in the uses of KMC	Chia, P & al	Descriptive study	It is observed that all participant nurses support parents in the kangaroo mother program and the majority agree on its benefits.
2007	[81]	The mood Variation in mothers of preterm infants in KMC and conventional incubator care	De Macedo, EC & al	Descriptive study	30 full term babies and their mothers were included for using a scale called VAPMS, to measure state of mind before and after being carried in kangaroo position. The study is not conclusive.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2008	[83]	Application of the baby friendly initiative to neonatal care: suggestion by Sweedish mothers of very preterm infants	Nyqvist, K. H & al	Descriptive study	13 mothers of very preterm babies were included. The study concludes that there are 3 important stages with the implementation of the Kangaroo Mother Method: 1. Definition of the mother`s role with respect to her decision to breastfeed, 2. Family-centered surroundings 3. Unrestricted father presence, understood as important care provider and source of support for the mother.
2008	[84]	A comparison of mother`s and father`s experiences of the attachment process in a neonatal intensive care unit	Fegran, L & al	Descriptive study	6 fathers and 6 mothers were interviewed in order to evaluate their experience and representation of the bonding process with the preterm baby, during the first week of life. Results showed that the earlier skin-to-skin contact is experienced, the faster an attachment is created.

Table 12 Parental opinions

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2005	[154]	Getting to Know You: Mothers' Experiences of Kangaroo Care	Roller, CG	Phenomenological, qualitative study	<p>10 women who maintained their preterm babies in kangaroo position, 7 of who were transferred to the neonatal intensive care unit (NICU). Interviews: 15-90 minutes long. They were asked: "What was it like for you to hold your baby in kangaroo position while you were in the hospital?"</p> <p>The effect obtained was to know their newborn infant, be able to handle him turning into a mutually gratifying experience which facilitates the development of affectionate bonding.</p> <p>Calm: when the mothers know about their babies, by receiving concrete information they feel more secure. According to the mothers in this study, the KMCM is a warm, relaxing, positive experience that creates bonds. All women stated that Kangaroo position calmed their nervous babies. Some of the women also learned more about themselves because they could see how Kangaroo position relaxed them too.</p>

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2006	[159]	Resistance to implementing Kangaroo Mother Care in developing countries, and proposed solutions	Charpak, N; Ruiz, J. G	Qualitative trial	<p>17 open questionnaires were sent via email to the coordinators of the KMCM Programs operating in 15 countries, and 15 visits were made to the institutes that had problems starting the program. The KMCM is considered a substandard cure. The KMCM seems to represent extra work for the personnel. The skin to skin contact between the naked baby and the provider of the KP is considered unusual or even improper. Mothers don't have the adequate intimacy. Babies do not need to wear a hat and socks in warm climates. The use of diapers is problematic. The health care personnel do not allow continuous KP when indicated that the mother does not wish to maintain the KP 24/7. Sometimes, an authorization is required for mothers to commit to a continuous KP. The father's involvement is limited. The personnel perceive breast feeding as an extra work load. Viable alternatives to complement breast feeding, when indicated, are not available. Feeding with artificial formula is considered an indicator of economic prosperity. The personnel is concerned for the safety of the child at their homes after the early discharge, even though the requirements for a safe discharge have been met. There are no follow up policies. The active vigilance and adequate identification of obstacles often indicates the adequate solution. Some of the obstacles are shared by many second generation KMCM Programs, because of which this information is valuable for the execution of the programs.</p>

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2006	[160]	The attitudes and practices of neonatal nurses in the use objectives, conclusions, results	Chia, Pauline Polytechnic, Nanyang, Sellick, Ken, Gan, Sharon.	Two-phase descriptive study; in depth interview with some participants	A self-report questionnaire was applied in order to obtain demographic data (age, sex and race) and data on the nursing experience. The attitudes of the KC were measured using a list of 14 affirmations that reflected the advantages of KC for parents and children current practices and the role of the nurse. The questionnaire ended with an open question that invited participants to comment on the advantages and disadvantages of KC. All the neonatology nurses saw, assisted and fomented in parents the participation in the KMCM, and most agreed on the advantages of the KMCM for parents and babies. There was a general acceptance that the KMCM can be practiced with babies that have low weight at birth even though they require intubation and all nurses except for two felt that the KMCM gives professional satisfactions. Besides, the results identified practical fears of the practice of the KMCM and some uncertainties about KMCM promoting breast feeding. Noteworthy limitations of the KMCM in the NICU were the work overload of the personnel, the insufficient education,

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2007	[155]	The Mood Variation in Mothers of Preterm Infants in Kangaroo Mother Care and Conventional Incubator Care	de Macedo, Elizeu Coutinho Cruvinel, Fernando, Lukasova, Katerina, D'Antino, Maria Eloisa Fam	Qualitative trial	<p>30 mothers of full term newborns (GT), 30 mothers of preterm babies included in the KMCM and 30 mothers of preterm babies placed in incubators (GI).</p> <p>After participating in some sessions of KMCM, mothers informed an improvement, and felt calmer, stronger, well-coordinated, energetic, content, sharp, competent, happy, pleasant, and lucid. On the other hand, mothers in traditional care, with incubators, reported feeling uncomfortable after visiting the child.</p> <p>This study shows a positive effect of the KMCM in the variation of the state of mind of mothers of preterm babies, and shows the need for a more humane experience during care in an incubator</p>

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2007	[161]	Factors influencing implementation of kangaroo holding in a special care nursery	Nagorski Johnson, A	Descriptive trial	<p>67 experienced nurses completed a survey to identify factors that support the implementation of the kangaroo position. Data was collected for over three months in a nursery with 70 beds in a third level hospital. The researcher developed a 12 demographic-item questionnaire identifying the differences in the sample, including educational background, age and clinical experience. the second instrument was a survey around the application of the KMCM in the hospital.</p> <p>The main determining factor for the implementation of the KMCM was the physical stability of the child (as declared by 98.5% of the nurses). Other factors identified as components included adequate personnel patterns, maternal preparation and stimulus to administration. Nurses with more than 5 years of experience, were more prone to implementing the method (KM) as intervention to support attachment for all newborns, regardless of gestational age.</p>

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2007	[164]	Early skin-to-skin contact for mothers and their healthy newborn infants.	Moore, E & al	Randomized and pseudo randomized clinical trials systematic review (Cochrane)	<p>The revision included 30 studies that involved 1925 mothers and their babies.</p> <p>Mother’s feelings: the mothers that held their babies in KP manifested a strong preference for the same postpartum care in the future (86%), while only 30% of the mothers that had babies wrapped in blankets indicated that, without doubt, they would prefer this kind of care in the future (OR 13:58 IC 95% 6,70 a 27,51). The mothers that held their babies in KP showed a decreased anxiety three days after delivery (DMP- 5,00, IC 95% to 1,00) (Shalu 1997) and more confidence in their abilities to care for the child in the hospital.</p>

Year	Ref	Name of Article	Author	Description and contribution
2007	[82]	The Maternal Experience of Kangaroo Holding	Nagorsky Johnson A	<p>18 mothers were interviewed, and expressed a certain joy before, during and after the kangaroo position, in terms of facial expressions, body position and dialog that describes motherly feelings, as well as the motherly interpretation of the response of the lactating baby to the experiences of the kangaroo position. The mother expressed her satisfaction with the interactions before, during and after the experience of the kangaroo position. All mothers had a feeling of connection to their children during the kangaroo experience. The maternal-infant benefits of the kangaroo experience are expressed as moving experiences that increase maternal confidence in knowing their child and their role as mothers. A strong desire to be necessary is expressed by all the mothers in this study. Many mothers spoke of how the kangaroo experience helped them understand the needs of their baby better. Besides, mother spoke of how the kangaroo experience thought them how to be mothers. Nurse orientation: the mothers describe the essential need for the nurses to guide the kangaroo experience, teaching mothers ho to take care of their babies, including diaper changing touching, turning and realizing their baby's behavioral signs. Limitation: a small sample, relatively homogeneous, representative of the hospital's unit and of the geographic location.</p>

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2008	[179]	Parents' lived experience of providing kangaroo care to their preterm infants	Leonard, A. & Mayers, P	Phenomenological study	<p>The participants whose KC experience was considered typical by the nurse staff were initially interviewed, and later the participants with special knowledge of the kangaroo experience, with atypical, negative or different experiences. The preterm birth is a dramatic and possibly lethal crisis, that happens with little or no warning and that fills parents with intense disappointment and overwhelming fear. This are the parent's feelings:</p> <ol style="list-style-type: none"> 1. Experience of an unforeseen delivery, without preparation and uncertainty. 2. Anxiety and barriers. 3. Intimate connection. 4. Adjustments, roles and responsibilities. 5. Measurement of success. 6. A support and encouragement network. 7. Living with today's challenges. 8. Living with the baby outside of the hospital. <p>In the family, the KMCM offers a ray of hope for the parents gives them a sense of purpose when it makes them the primary care givers.</p>

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2009	[158]	Kangaroo Mother Care, home environment and father involvement in the first year of life.	Tessier, R & al.	Randomized controlled study	<p>Questionnaire on the perception of the mother of the preterm delivery.</p> <p>Griffiths scale to obtain a development quotient</p> <p>The mothers felt significantly more sensitive, more involved in the care and in the activities such as diaper changes and sleeping with their babies. They spent more time with their babies than the baby only under basic care, and the moment of breast feeding. The KMCM also improves the father's mood, the perceptions and the interactive behavior. In our study, mothers also reported that they had more trust in their children's abilities and they spoke in a more positive manner about their low weight at birth newborns.</p> <p>Boys and girls appear to get different benefits from the KMCM. Boys are more protected against development deficits in the kangaroo group and this result became apparent in the sub group with low involvement of the father and in the sub group with a low HOME. Our hypothesis is that boys at risk benefit from the intervention more directly, while newborn girls benefit more indirectly through the changes in the family induced by the mother.</p>

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2009	[180]	Experience with Kangaroo mother care in a neonatal intensive care unit (NICU) in Chandigarh, India	Parmar, V. R, & al	TQuantitative clinical trial	<p>135 babies (74 boys and 61 girls) were included, in a minimum 4 hours a day of KP. 30 health care workers (14 physicians and 16 nurses) were interviewed. Acceptance of KMCM by mothers, family members and health care personnel was evaluated in a predesigned questionnaire through the Likert scale. KMCM was accepted by 96.83% of parents, 84% of relatives. Health care staff considers it a safe method for the VLBW infant. The benefits of the KMCM on the baby's behavior, on breastfeeding and maternal confidence were reported by 57%.</p> <p>94% of health care workers considered it an alternative/ supplementary method for the care of the VLBW infant and were successful in motivating mothers to initiate it. 79% reported no extra workload or interference with the care of other sick newborns. 935 reported an effective reduction in the use of heaters and fans in the NICU, 93%, which is reflected in energy saving</p>

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2010	[162]	Neonatal nurses: what about their grief and loss?	McGrath, J. M	Descriptive qualitative trial	<p>62 neonatal nurses, 87 neonatal nurses working in a third level neonatal unit with 37 beds, were invited to participate. Of those neonatal nurses with more parent-baby contact, 25 withdrew for different reasons. A modified 47-item questionnaire was Likert scale-type questions about beliefs about the kangaroo method, 17 true-false questions on knowledge of the KM, and a brief table on the surveyed demographic situation, with questions about age, basic and maximum nursing education, work situation, and main role in the NU nurses who work in neonatology know about the beneficial effects but aren't informed about the suitability for some preterm . 60 neonatal nurses (96.8%) believe that parent-nurse relationship and team work was necessary to apply the KMCM and it was worth the effort. 70.9% indicated they were waiting to introduce the KMCM to the parents. 79% (n=49) agreed that all preterm should be able to participate, regardless of GA. There was also strong support (71%) to placing the children in KP regardless of their weight.</p>

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2010	[178]	Kangaroo mother method: mothers' experiences and contributions to nursing.	Arivabene, João Carlos Tyrrell, Maria Antonieta Rubio	Qualitative trial	13 mothers of preterm newborn babies with low weight at birth were interviewed individually with questions about socio-demographic state. The experiences are related with the expansion of the bond between mother and child; the reduction in the separation time of the baby and its family, besides it leading to an increase in the capability and confidence of the parents in caring for their offspring even before discharge; it improves the relationship between the mother with the family within the family and with the team caring for the baby.

5.

Evidence On Kangaroo Feeding And Nutrition Policy

Question: Does the Kangaroo Mother Care Method prompt successful breastfeeding in preterm and/or LBW infants?

Answer: For both term and preterm infants evidence indicates clearly that the Kangaroo Position results in successful breastfeeding and increases the number of breastfeeding mothers as well as breastfeeding duration. The mechanisms of these positive effects involve biological effects of skin-to-skin contact as well as behavioral and emotional changes in the mother: there is shorter separation between mother and baby, the health staff promotes breastfeeding, trains mothers appropriately and provides efficient support during the process. Furthermore, mothers having a better bond with their infant are more willing to breastfeed, which in turn improves bonding quality.

Initiating and maintaining breastfeeding is a normal, biological event. Hormonal, neurological, emotional, and behavioral factors are involved.

Initiating and maintaining breastfeeding in sick or preterm infants is more delicate. The baby may be too weak or immature to suck, and mother and baby are often separated early for long periods during the transitional phase.

The KMC Method aims at initiate as early as possible in safe condition the mother/baby followed by the adaptation of the mother-child dyad to the Kangaroo Position as soon as possible. This leads to a shorter period of separation for mother and baby and to initiate skin-to-skin physical contact, which helps in the initiation and organization of the mechanisms involved in milk production and let-down reflex.

As part of the adaptation process, the kangaroo team also implements techniques to facilitate breastfeeding, such as mother's milk and colostrum extraction, and administration to the baby until direct suction is established. All these processes favor the initiation and maintenance of successful breastfeeding. The net effect is seen in the higher number of breastfeeding mothers and a longer duration of breastfeeding in mother-child dyads exposed to the KMC method. This is supported by scientific evidence, both for the intermittent skin-to-skin contact provided in the neonatal unit to preterm babies with different degrees of stability (during the transitional or stable growth periods) or the continuous, prolonged KMC Method during hospitalization, for example rooming-in mother and baby in the Kangaroo Position or continuing the Kangaroo Position after discharge

Evidence has demonstrated that breast feeding is the most appropriate and desirable way to feed a term baby. In case of preterm or LBW infant, there are circumstances in which exclusive breast feeding may not be sufficient to satisfy the nutritional needs of the child.

In fact, the nutritional needs, the means and ways to feed the baby vary according to gestational age and birth weight, existence or not of co-morbidity and with the post natal period (transitional, stable growth and post discharge periods. The kangaroo feeding strategy is implemented during the period of stable growth.

The need in macro and micro nutrients during the period of stable growth in preterm and/or LBW infants differ according to their birth weight and gestational age. As far of energy, it is known that preterm infants need to receive an quantity of calories to reach growth rates similar to the one observed during the intrauterine third trimester.

It is important to provide to preterm or LBW infants a sufficient amount of protein to promote adequate nitrogen accretion without generating metabolic stress. On the other hand, the objective of carbohydrate requirements is to satisfy the energetic needs of the brain while keeping glycogenesis and ketosis to the minimum. Finally, it is important to mention that lipids are the main diet source of energy for the preterm infant.

Both calcium and phosphorus requirements may vary according to the gestational age at birth. There is controversy around the appropriate intake for bone development in preterm babies, for LBW infants. the calcium and phosphorus content in the mother's milk is sufficient to prevent osteopenia.

It has been traditionally argued that the preterm infant must reach the intrauterine growth and physical development rhythms and goals.

Researches show that the amount of protein, lipids, calories in general, calcium and phosphorus in the mother's preterm milk, are in general more elevated than in the term mother's. Based on this, the kangaroo nutrition strategy considers that exclusive breast feeding supplemented with soluble in lipids may be enough to produce an adequate weight gain when the child has reached the period of stable growth. However, in those children with a poor gain weight, a supplement with fortifiers or with preterm milk formula must be considered.

It is important to mention that there are other benefits of exclusive breast feeding, such as that both preterm and full term babies have lower basal energy consumption with breast milk intake, due to a better absorption and more efficient use of nutrients. Furthermore, observational studies have demonstrated that breast milk intake decreases the incidence of diarrhea; respiratory illness and necrotizing enter colitis. Finally, it has been described that breast feeding preterm and LBW infants stimulates a better cognitive development; this fact cannot be attributed only to the biological and nutritional content of the milk, but also to the interaction level between mother and baby.

Table 13 Kangaroo Method and breast feeding

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2007	[152]	Short duration of skin-to-skin contact: effects on growth and breastfeeding.	Boo, Nem-Yun & al	Preprospective randomized clinical trial	Mothers were encouraged to breastfeed their babies every 2- 2 1/2 hours. Success was defined as the baby's ability to suck well > 50% of daily feedings.
2007	[143]	Immediate skin-to-skin contact: its effect on maternal postpartum anxiety and depression and on neonatal adaptability to breastfeeding	Rivara, Dávila E:G & al	Prospective randomized study	The aim was to demonstrate the effect of skin-to-skin contact on the levels of maternal anxiety and depression at 2 and 48 hours postpartum, of neonatal adaptation towards immediate breastfeeding and the level of maternal satisfaction with the delivery itself in a group of 38 newborns and a control group of 41 babies. The study group received the benefit of immediate skin-to-skin contact during 30 minutes. The following scales were given at 2 and 48 hours postpartum: the Hospital Anxiety and Depression Scale (HAD) and the Hamilton Anxiety Scale. Two hours following delivery the newborn babies were placed on their mother's chest. Mothers were questioned about their perception and satisfaction with the birthing experience. Maternal anxiety and depression levels were lower in the study group (ISSC) 48 hours postpartum as compared with those of the control group, while two hours postpartum no significant difference was found. The infants in the study group achieved greater success in immediate breastfeeding versus the control group infants.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2008	[144]	Kangaroo care and breastfeeding of mother-preterm infant dyads 0-18 months: a randomized, controlled trial.	Hake-Brooks, S. J & al	Preospective randomized clinical trial	IBS (breastfeeding index) was modified for this study. The group was divided in "medium partial", "medium-high partial"(80-50%) and "medium-low partial" (<20%), adding a category indicating absence of breastfeeding. These additions resulted in 8 categories of breastfeeding. the lowest number, 1, indicates exclusive breastfeeding.
2009	[171]	Volume of Foremilk; Hindmilk, and Total Milk Produce By mother of very preterm infants born at less than 28 weeks of gestation	Bishara, R, et al	Descriptive study	<p>The study measured initial, final and total milk volume in mothers of very preterm babies on the third week following delivery. The study concluded that the degree of prematurity (<26 vs. 26 (0 / 7) -27 (6.7) weeks) is significantly related to the initial and final milk volume</p> <p>(45:55 vs 36:65, respectively).</p>

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2010	[148]	The impact of kangaroo care on exclusive breastfeeding in low birth weight newborns	De Almeida, H & al	Prospective randomized clinical trial	Evaluates the impact of KMCM in LBW newborns with exclusive breastfeeding until 6 months of age. 43 babies were included (23 kangaroo group and 23 controls), weighing less than 2000 g, in the newborn unit, for at least 7 days. Breastfeeding in the groups was compared. The kangaroo group began immediate breastfeeding 3 days before the babies in incubators. a higher prevalence of EBF (exclusive breastfeeding) in the kangaroo group at 40 GA, 3 months and 6 months with significant difference in hospital discharge, 40 GA and 3 months. At 3 months, the control group's EBF dropped up to 5% before discharge. The study showed KMCM as a facilitator of breastfeeding in LBW infants.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2011	[147]	Positive effect of kangaroo mother care on long-term breastfeeding in very preterm infants	Flacking, R et al	Longitudinal prospective trial	<p>Extreme preterm s, EBF(exclusive breast feeding) at 1,2,5, 6 months spent much more time in KP every day than those who were not.</p> <p>A difference has been noted in the extreme preterm group and preterm s at 1, 2 months corrected age: preterm s had more chances to be in EBF. Mothers, who were positive about KMCM, were also positive towards breastfeeding.</p>

Table 14 Breastfeeding and prematurity

Year	Ref	Name of Article	Author	Type of design	Description and contribution
1986	[85]	The effects of infant feeding on rotavirus-induced gastroenteritis: a prospective study	Duffy & al	Cohort study	197 low income mother-infant dyads followed during 6 to 9 months during Rotavirus season. ADD episodes were reported: more than three bowel movements a day for two days, associated with vomit or clinical signs reported by the mother. Nonspecific ADD decreases by 70% in the exclusive breastfeeding group for more than 4 months versus the other groups combined. Risk of the other 2 breastfed groups versus the group that never received breast milk: less severe Rotavirus infection in breastfed children.
1989	[86]	Breast feeding and lower respiratory tract illness in the first year of life. Group Health Medical Associates	Wright, A. L & al	Prospective cohort	1022 patients followed during a year. Duration of breastfeeding was observed: 1) No breastfeeding or with duration of less than one month. 2) Breastfeeding for 2 to 4 months. 3) Breastfeeding for more than 4 months. The presence of ARI was evaluated as outcome. Results showed that there is a higher incidence in the first four months, in those children who were breastfed for less than a month vs. those breastfed for more than a month.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
1990	[87]	Protective effect of breast feeding against infection	Howie, P. W & al	Prospective cohort study	674 mother-infant dyads followed to age two and 545 examined at the age of 7. At 13 weeks, they were classified as; 1) Predominant breastfeeding without supplement, except for water or fruit juice. 2) Mixed nutrition, with supplement, for 13 weeks or more 3) Breastfeeding interrupted before 13 weeks 4) Not breastfed at all. Results showed 1/3 decrease in ADD incidence in breastfed children versus those who were never breastfed.
1990	[88]	Relationship between infant feeding and infectious illness: a prospective study of infants during the first year of life	Rubin, D. H & al	Prospective cohort study	500 children, 461 followed to 1 month and 223 followed to a year (44% of sample). Classification in relation to number of MM meals versus AM. The presence or absence of ADD was evaluated as outcome. Results were confusing; the study offered no conclusive results.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
1995	[89]	Differences in morbidity between breast-fed and formula-fed infants	Dewey, K & al	Prospective cohort study	87 patients were included; 46 breastfed and 41 not breastfed. They were classified in two groups: 1) breastfed, but with the possibility of receiving an occasional artificial or cow's milk bottle in the first 12 months (<120 ml per day) but no solid food before 4 months. 2) Not breastfed or occasional breastfeeding for less than 3 months. AM is the main nutritional source until 12 months of age but no solids before 4 months. ADD episodes were evaluated as outcome. Incidence was twice as frequent in the group that was never breastfed, less middle ear infection. No difference in respiratory infection after adjustment, no differences in the second year.
1995	[90]	Relation between infant feeding and infections during the first six months of life	Beaudry, M & al	Prospective cohort	776 patients were included. Each child is classified weekly during the first 6 months as: 1) Breastfed (exclusive or not, from birth to weaning) 2) Not breastfed. Results showed a 47% global decrease in the density-incidence of ADD during the breastfeeding weeks in relation to the weeks where no breastfeeding occurred.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
1997	[91]	A longitudinal analysis of infant morbidity and the extent of breastfeeding in the United States	Scariati, P. D & al	Prospective cohort	1743 subjects included. They were classified in 1) exclusive mother's milk 2) elevated mixed nutrition 89%-99% 3) medium mixed nutrition (58%-88%) 4) only AM. ADD is defined as: 3 or more episodes of loose stool (liquid or semi-liquid) in a 24-hour period. Results showed risk for ADD after adjustment, of 80% more elevated in the not breastfed group.
1998	[92]	Breastfeeding reduces risk of respiratory illness in infants	Cushing A. H & al	Prospective cohort	1202 patients were included and were classified as: 1) Predominant breastfeeding 2) Mixed breastfeeding 3) No breastfeeding. ARI episodes were evaluated as outcome. Results suggest that breastfeeding does not decrease the incidence of ARI, but it does decrease the severity of episodes.
2001	[93]	Promotion of Breastfeeding Intervention Trial (PROBIT): a randomized trial in the Republic of Belarus	Kramer, M. S & al	Randomized controlled clinical experiment	17046 mother-infant dyads, 31 health care institutions were randomly included: 16 as intervention 15 as control. Results showed that the risk for ADD in intervention institutions is 40% lower than in the control institutions. ADD in 3 to 6 months in children who were exclusively breastfed. decreases by 65% in children with exclusive breastfeeding for 6 months.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2003	[91]	Breast feeding and respiratory morbidity in infancy: a birth cohort study	Oddy, W & al	Prospective cohort	2365 patients were included and classified according to 1) Duration of predominant breastfeeding (age in months when another milk is introduced) 2) Duration of partial feeding (age in months when breastfeeding is suspended) 3) Morbidity. ARI presence was evaluated as outcome. Results suggest that breastfeeding decreases the severity of respiratory infections
2003	[95]	Breastfeeding and the risk of hospitalization for respiratory disease in infancy: a meta-analysis	Bachrach, V.R & al	Meta-analysis	The study concluded that there is augmented risk of a severe ARI which requires hospitalization three times longer in the children who were never breastfed compared with the children who were breastfed exclusively at least during the first 4 months..
2005	[145]	Does the choice of bottle nipple affect the oral feeding performance of very-low-birth weight (VLBW) infants?	Scheel, C. E & al	Randomized clinical trial	During each feeding, the following was monitored: sucking stage, wideness, duration of negative oral pressure, duration of sucking bursts, number of sucking and breast expression. Measurements were taken when babies are fed 1-2 times a day and when fed 6-8 times a day. Every time, 3 feedings with different types of nipples were observed within 24 hours. No specific nipple was found to improve oral feeding ability. However, it is speculated that the election of the bottle's nipple may not be a determining factor in the performance of oral feedings in children with LBW.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2007	[172]	Evaluation of the evidence to support current recommendation to meet the needs of preterm infants: the role of human milk	Schanler, Richard J	Non-systematic literature review	The article reviews the evidence supporting today's recommendations for nutritional needs of the preterm revising the role of mother's milk. It is not a systematic revision, since some elements are missing, but it reviews 41 articles
2007	[190]	Persistent beneficial effects of breast milk ingested in the neonatal intensive care unit on outcomes of extremely low birth weight infants at 30 months of age.	Vorh BR et al	Prospective study	773 infants with extremely low birth weight 593 of which received maternal breast milk and 180 did not. At 30 months of corrected age they were evaluated using the Bayley Scale of Infant Development, and it was concluded that for every 10 ml/kg/day increase of maternal milk administered to the children., there was an increase in mental development index of 0.59 points and of 0,56 points in the psychomotor development index. The total behavioral percentile increased by 0.99 points and re hospitalization risk was reduced by 5%. There needs to be a greater effort to initiate early breast feeding in neonatal care units.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2007	[142]	Randomized controlled trial of very early mother-infant skin-to-skin contact and breastfeeding status	Moore, Elizabeth R Anderson, Gene Cranston	Prospective randomized controlled trial	<p>A group of mothers and healthy babies were randomly assigned by computer either to the skin-to-skin contact group (12) or standard care (11). IBFAT (breast feeding evaluation instrument) measures 4 competency parameters:</p> <ol style="list-style-type: none"> 1) Baby's alertness or preparation to breast feeding 2) Rooting reflex 3) Grasp 4) Suction mode <p>Babies were monitored in kangaroo position and suction patterns.</p> <p>Babies on skin-to-skin contact were more competent in their first approach to breast suction and were placed on breast feeding sooner than those in under standard care. Early skin-to-skin contact improved breast feeding in the postpartum period.</p> <p>Children in skin-to-skin contact tended to exhibit pre feeding behavior earlier (45 minutes after birth).</p>

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2008	[150]	Maturation of oral feeding skills in preterm infants	Amaizu N, Shulman RJ, Schanler, RJ and Lau Ch	Non-systematic literature review	<p>Specific feeding abilities were evaluated in 16 stable preterm babies (26-29 SG with indirect markers of the maturation of feeding. The study concluded that the developmental process of the oral feeding ability matures at different moments and speeds. GA (time elapsed between the last menstrual period and delivery) seems to have more impact than PMA (post menstrual age) on oral feeding ability. Children were introduced to oral feeding around week 33-34 PMA. Both groups of children (26-27 and 28-29) received a comparable number of oral feeding experiences while disconnected from gavage feeding. The idea that experience or "training" improves suction ability was verified with the support of our studies, carried out on a similar preterm population, through which non-nutritive suction offered before introducing oral feedings, accelerates the acquisition of independent oral feeding and a wider specific expression.</p>

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2009	[182]	Breastfeeding promotion for infants in neonatal units: a systematic review.	Renfrew M. J et al	Revisión sistemática	48 studies were revised; 31 were controlled randomized studies, 7 of them of high quality and 28 of moderate quality. It was concluded that there is strong evidence to support that short periods of skin-to-skin contact prolong breast feeding a month beyond discharge and over six months in clinically stable children; that peer support at home has a positive effect on breast feeding up to 24 weeks in mothers of full term very low birth weight babies and for exclusive breast feeding in and out of the hospital. A more limited evidence exist on the support given by a nurse specialized in breast feeding. Lack of experience on the part of the staff is a barrier to the success of breast feeding.
2009	[146]	A Controlled-flow Vacuum-free Bottle System Enhances Preterm Infants' Nutritive Sucking Skills	Fucile, S & al	Random clinical trial	30 babies, 27 ± 1 GA were randomly assigned to a controlled-flow vacuum-free bottle (CFVFB) or standard bottle. The study confirmed that babies given CFVFB demonstrated better transference in general and of milk, and a more mature suction stage. Children with VLBW can tolerate a faster milk flow than thought. Finally, CFVFB can reduce energetic expenditure, since it improves performance feeding without increasing suction effort.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2010	[174]	Differences in fat content and fatty acid proportions among colostrum, transitional and mature milk from women delivering very preterm, preterm and term infants	Molto-Puigmarti C & al	Descriptive study	Revising maternal milk of 43 women, taking samples of colostrum, transitional and mature milk, the study showed differences in fat and the proportion of fatty acids in the different stages and also in gestational age
2010	[149]	Mechanics of sucking: comparison between bottle feeding and breastfeeding	Moral, A & al	Open, crossed, transversal randomized trial	Study of 21-28 day-old newborns, on exclusive maternal or artificial milk and unweaned babies 3-5 months old with mixed feeding. The main variables were suction patterns and pauses. Neonates exclusively on artificial milk, showed less suction motions and same number of (longer) pauses than babies on mother's milk. The children on mixed feeding, number of sucking motions on the bottle was similar, and pauses less numerous and shorter as compared to the breast., both at 21-28 days and 3-5 months. Children on mixed feeding, mix both types of movements, and adopt their own pattern.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2011	[176]	Fortification of breast milk in VLBW infants: Metabolic acidosis is linked to the composition of fortifiers and weight gain and bone mineralization	Rochow.N & al	Double-blind randomized study	<p>There is considerable incidence of metabolic acidosis with the introduction of a new fortifier in VLBW infants, with a decrease in weight gain and bone mass.</p> <p>The relation of metabolic acidosis is higher in the lower weight group (< 1000 g) due to cardiopulmonary, renal and metabolic immaturity to compensate for buffer systems, easily unchaining an acid-base imbalance.</p> <p>Fortifiers must be assessed to reduce the incidence of metabolic acidosis in patients</p>
2011	[175]	Nutrient Enrichment of Mother,s Milk and Growth of very Preterms Infants After Hospital Discharge	Zachariassen G & al	Controlled, randomized cohort prospective study. Not blind for lack of placebo.	<p>Good quality study, similar, clearly identified comparison groups. Initial questions are answered.</p> <p>Fortifiers are not for sale in Colombia. They are difficult to get; pharmaceutical sales representatives carry them as samples. The results of this study is that there are no modifications in the growth curves at a year; only something transitive during the intervention. The financial and availability analysis was not done.</p>

6.

Evidence On The Kangaroo Mother Method And Early Discharge With Follow-Up Up To 40 Weeks

Question : Is there any evidence that it is safe and appropriate for stable preterm infants not regulating their temperature spontaneously, but having a stable temperature while in kangaroo position to be discharged regardless of their weight or gestational age?

Answer: Evidence has demonstrated that discharging a preterm baby from a neonatal unit, independent of his weight or gestational age, does not represent a risk if he regulates his temperature in Kangaroo position and has gain weight gain for several consecutive days prior to discharge being fed by his mother. Thus, as the permanent kangaroo position allows appropriate temperature control in hospital and at home, discharge does not represent a risk for patients. Besides, there is empirical evidence to support that discharge in kangaroo position not only does not generate more problems or the need for re hospitalization, but protects against the risk of severe nosocomial infections.

In addition, the emotional adjustments of discharge help parents to perform fully their role, taking total responsibly for their fragile child.

After discharge parents are fully reinstalled in their role of primary care givers.

Question: Is there any evidence that kangaroo follow-up should be maintained until 40 weeks of gestational age?

Answer: The KMC method goal is to help the child born prematurely to have a development as close to possible to the one he should have had if he was born at term after 40 weeks of gestation.

The period of "stable growth" is from the end of the transitional period usually around 10th day of life (until the baby reaches full term (40 weeks of GA). This period of growth is considered similar to the period of intra uterine growth which may have occurred if the infant was not born prematurely. During this period it is appropriate to use enteral feeding, predominantly oral.

These children who have completed the transitional period face a double challenge: having to grow at the rate they would have grown while still "in utero", and to recover from the deficits accumulated during the transition period.

During this period preterm infants should receive adequate nutrition to obtain adequate growth and short term nutrient retention, which allow the preterm infant to come close

to the intra uterine growth charts and to the fetal composition of reference.. Even some catch-up growth is expected and growth during this period should by no means be sub-optimal. **For that reason, whether in hospital or an ambulatory environment, a close monitoring is kept and appropriate interventions are carried out daily through the so-called "kangaroo follow-up "until 40 weeks GA.**

The growth of the infant is carefully monitored and he is closely assessed to diagnose any clinical or neurological disorders, particularly changes in tone which can be early and sensitive predictors of neuro motor alterations. Routine screening for the retinopathy of prematurity is organized. During ambulatory follow up visit the child will receive routine preventive drugs to reduce the risk of gastro esophageal reflux and the apnea of prematurity.as well as a vitamin and iron supplementation.

The decision of maintaining a kangaroo follow-up until 40 weeks is not arbitrary. Reaching full term is an important milestone in the development both of the fetus and of the preterm baby, and the chronological age of the preterm infant must be adjusted according to gestational age at birth, to evaluate growth and development sensibly.

The American Academy of Pediatrics suggests to the corrected age for neurodevelopmental assessments of infants born before 37 weeks GA during the first 2 to 3 years of life. They suggest using the gestational age until week 40 GA and then to use the "corrected age"..

TERMINOLOGY FOR AGE IN THE PERINATAL PERIOD - AAP

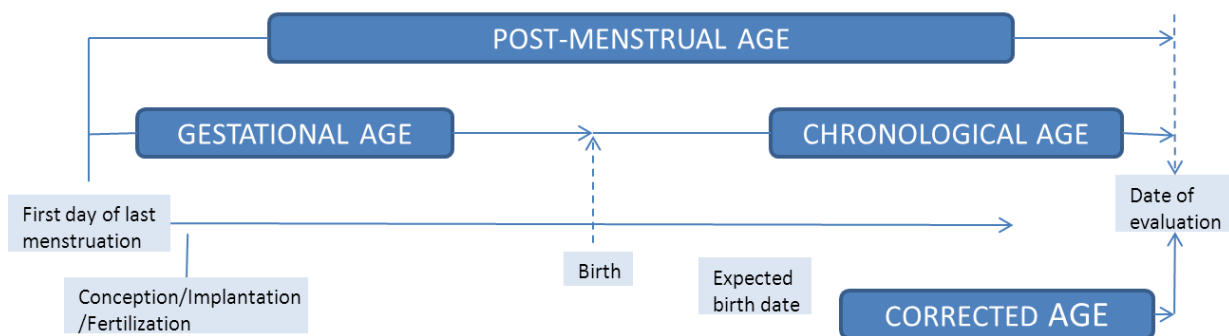


Table 15 Early discharge

Year	Ref	Name of Article	Author	Type of design	Description and contribution
1983	[96]	Benefits of early maternal participation in care of low birth weight infants leading to early discharge	Karan	Descriptive study,	610 low birth weight newborns. Clinical stability, temperature regulation and ability to suckle adequately were the established discharge criteria. They are discharged as criteria are met, regardless of weight. It is evident that 20 days of hospital stay are saved.
1986	[97]	A randomized clinical trial of early hospital discharge and home follow-up of very-low-birth-weight infants	D. Brooten,	Randomized controlled clinical experiment	79 preterm infants below 1500 g at birth were randomly placed in two groups: control group, discharges at 1200 g and early discharge group, leaving the hospital as soon as they could regulate temperature. Results showed that 11 patients were able to be discharged early. However, there were no significant differences. The only real difference was that the early discharge group caused a lower hospitalization cost.
1995	[98]	Shortened hospital stay for low birth weight infants: nuts and bolts of a nursing intervention project	Shapiro C	Randomized controlled clinical experiment	Stable low birth weight newborns, who regulate their temperature, were randomly assigned to an early discharge group versus discharge at 2300 g. It is concluded that at a year, corrected age, there is no difference in terms of morbidity in the two groups.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2000	[99]	Does early hospital discharge with home support of families with preterm infants affect breastfeeding success? A randomized trial	Thompson JM, Jackson Gunn	Randomized controlled clinical experiment	308 preterm babies, less than 37 weeks old, who could suckle adequately. They were randomly assigned to an early discharge group or a control group. No difference was found as far as duration of breastfeeding at six months, and as related to early discharge-.
2001	[57]	Randomized controlled trial of kangaroo mother care: Results of follow up at 1 year of corrected age.	Charpak	Randomized controlled clinical experiment	746 low birth weight for gestational age newborns, weighing 2001 g, were randomly included in a group in kangaroo position and a control group. It was concluded that the earlier discharge in Kangaroo position group did not generate more risk for the baby, nor when reaching 40 weeks post gestation age. It did not increase re-hospitalization either.
2001	[71]	Kangaroo mother care in very low birth weight infants	Ramanathan	Randomized controlled clinical experiment	14 children below 1500 g, with hemodynamic stability and regulating their temperature in an incubator, were randomly placed in an intervention and a control group. The kangaroo group obtained better weight gain, early discharge and better breastfeeding, six weeks after discharge.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2004	[100]	Reducing of staying hospital for very low birth weight infants by involving mothers in a step down unit	Bhutta Z	Descriptive study comparing a historic cohort	500 new neonates below 1500 g were included. They met the discharge eligibility criteria of regulating temperature in the crib. However, use of kangaroo position is not described in the method. Results do not show somatic growth or malnutrition data.
2009	[101]	Kangaroo mother care for low birth weight babies	Subedi K	Observational Prospective	Skin-to-skin contact was provided to 60 children with weight equal or less than 2000 g hospitalized in a neonatal unit. Upon discharge, they were in kangaroo position, with exclusive breastfeeding and weekly follow up when weight gain was 10g/kg/day which amounted to a gain of 30g/day.

Table 16 Benefits of home stay for the preterm

Year	Ref	Name of Article	Author	Type of design	Description and contribution
1997	[102]	Kangaroo mother versus traditional care for newborn infants < 2000g : a randomized controlled trial	Charpak N; Ruiz, J. G	Randomized controlled clinical experiment	Newborns below 2000g were randomly included a control group versus a group of care under kangaroo mother method. It concluded that the newborns under the kangaroo mother intervention, who were discharged early, presented less nosocomial infections

Table 17 Monitoring the somatic growth of the child in kangaroo position

Year	Ref	Name of Article	Author	Type of design	Description and contribution
1999	[103]	Longitudinal Growth of hospitalized very low birth weight infants	Ehrenkranzra, Y. N.º		Initially, daily follow up is as follows: child's nutrition and quality of food received is evaluated. A weight gain of around 15 g/kg/day is expected, until he is 37 weeks old (intra uterine growth velocity). Then it is expected to be from 8 to 11 g/kg/day until the post conception age of 40 weeks. Size must increase an average of 0.8 cm a week and the cephalic perimeter is between 0.5 and 0.8 cm until full term.

Year	Ref	Name of Article	Author	Type of design	Description and contribution
2002	[104]	Predictional need for supplementing breastfeeding in preterm infants under kangaroo mother care	Ruiz JG, et.al.	Observational study	A prediction rule was developed to determine the probability of the need to supplement breast feeding with formula for preterm infants. It was concluded that nearly 50% of preterm babies who received exclusive breast feeding are not at risk for growth problems, but children smaller than 42 cm. and discordant twins >2000g. must receive supplements even beyond 40 weeks post conception.
2003	[105]	Early discharge with home support of gavage feeding for stable preterm infants who have not established full oral feeds.	Collings CT, et.al.	Review	Only one study contributed a sample for revision. Reviewers concluded that this practice is not reliable and it is therefore not recommended.

7.

Evidence On The Impact Of A Follow Up Until 1 Year Of Corrected Age (High Risk Follow Up)

Question : Is there any evidence of the benefit of follow up in ambulatory KMC program until one year of corrected age?

Answer: This chapter do not aim at discussing about the healthcare of preterm infants and in general of high-risk newborn infants after reaching full term, which is the primary scope of the care strategies covered by the KMCM. Of note, however, is the fact that these children still need systematic and specific care that includes surveillance of their growth and development, early problem detection, specific therapies, and rehabilitation. This type of systematic activities corresponds to the follow-up programs of high-risk babies, usually extending at least during the first year of life. In many healthcare systems the ambulatory kangaroo programs pioneered the systematic management and follow-up of high-risk newborn infants, to the extent that KMCM is frequently identified with this follow-up.

Even if the intrinsic value of life of a high-risk preterm babies was not adequately considered, it would be financially unreasonable not to provide care to high-risk infants after the post-neonatal period. Even when the objective is to keep at bay the commonly high healthcare resource investments, it is reasonable to have appropriate follow-up, detection and early intervention programs for these babies discharged from neonatal units. These guides are not addressed at examining the evidence or recommending appropriate strategies for the follow-up of high-risk infants, including of course babies receiving Kangaroo Mother Care.

However, it is appropriate to highlight at least some of the attributes such follow-up and management strategies should have:

- Appropriate monitoring of somatic growth and neurological and psychomotor development, with comparisons to adequate standards.
- Screening of sense organs: visual acuity, visual disturbances, auditory acuity. Use of early and appropriate measures of defect correction and rehabilitation.
- Active immunization.

8.

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This document aims to present the contents to be included in the Teacher Manual and other manuals which comprise the Pedagogic Kit and Kangaroo Mother Method Training Web Site