

# Clinical practice guidelines

Evidence-Based Guidelines for the optimal use of the Mother Kangaroo Method in the Preterm and/or Low Birth Weight Newborn.

**Update 2007 - 2017** 

Bogotá D.C, Colombia

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This guide covers the topics considered a priority in the management of preterm or low birth weight newborns who constitute the population in which the Kangaroo Mothercare (KMC) method is applied.

## **Declaration of editorial independence**

The scientific research work and the elaboration of the recommendations included in the present document were carried out independently by the Development Group who updated the Evidence-Based Guidelines for the Optimal Use of KMC.

The Kangaroo Foundation, as the funding entity, monitored the development of this document, guaranteeing the unconditional freedom of the contents on the guidelines.

All the members of the Development Group and direct participants in the development processes made the declaration of conflicts of interest.

## Guide update plan

It is intended for this guideline to be reviewed and updated as new evidence or data emerge on the recommendations given.

It is expected for the content of this guideline to be reviewed to verify its currency or any need for further updating, at least 3 years after the date of publication of the present document.

## **Table of Contents**

Introduction	5
Formation of the Guideline Development Group	6
Background: The Kangaroo Mothercare Method (KMC)	6
Purpose and scope of the guide	7
Trajectory of the research group	7
ConceptualFramework	10
State of the art	11
General objective	12
Specific objectives	12
Methodology	12
Final PICO questions with GRADE and Table	27
Aspect 1: Kangaroo Mothercare Method	27
Aspect 2: Kangaroo position	153
Aspect 3: Food (for future development)	244
Aspect 4. Early exit	
General Recommendations	248
Bibliography	273
Appendix - Forest plots for some questions	277

## Introduction

The Evidence-Based Clinical Practice Guidelines for the Optimal Use of the Kangaroo Mothercare (KMC) method in preterm and/or low birth weight newborns were elaborated for the first time between 2005 and 2007.

It was considered relevant to review the work done ten years ago, considering the developments in the elaboration of guidelines that have been presented during this period, both in the theoretical and methodological fields.

The magnitude in the demand for adequate care for preterm and low birth weight newborns continues to increase despite the efforts made by governments and health authorities.

The first Evidence-Based Clinical Practice Guideline (CPG) for the optimal use of the KMC was presented by the Kangaroo Foundation and the Department of Clinical Epidemiology and Biostatistics of the Faculty of Medicine of the Pontificia Universidad Javeriana - Colombia, in 2007. Since then, this document has guided the clinical practice of professionals who assist this population, mainly in the Kangaroo Mothercare Programs (KMCP).

To date, there are some controversies about the KMC method that need to be clarified. Clinical studies and practices around the world have provided new evidence about the intervention on other critical outcomes that lead to the need of adjusting the recommendations put forward in the first version, among which are those related to morbidity and mortality, the acceptance by the health care team, the supportive environment of the infants' families, the resistance to the intervention, the early discharge home, the duration of kangaroo positioning, the preterm feeding, the use of other feeding alternatives, the kangaroo position as a mean of neonatal transport, the need to offer assistance to the families while the baby is in the NewBorn Unit, the openness of New Born Units to parents' presence, as well as other barriers and facilitators on the implementation of the KMC in healthcare institutions.

The current healthcare overview in Colombia and the number of therapeutic alternatives available for patients who can take advantage of KMC, converge in two main areas: hospitalization with management in a neutral thermal environment until reaching pre-established levels of maturity and/or weight, or initiation and maintenance of the KMC intervention during in-hospital and outpatient care.

Both the clinician in charge of this type of patient and the child's parents do not always have clear, timely, scientifically supported and updated information that allows them to decide freely and rationally whether to use the method or not. In addition, greater variability has arisen in the scientific literature and in the practice of neonatology as to what the method is about, what are its components, and how it can be appropriately used. There is also a need for a rational standardization process that clearly distinguishes which aspects of the practices that try to be covered under the "Kangaroo Mothercare method" denomination, are scientifically

valid, achieve the objectives they claim to satisfy and provide an adequate balance between risks and benefits.

The updating of these guidelines will be an exercise in generating new evidence-based statements regarding questions raised about each of the fundamental elements of the KMC, which will allow clinicians to be adequately updated, improve the consistency, the quality of care provided and the utilization of resources to contribute reducing the gap between the production/updating of knowledge and its use in clinical practice.

## Formation of the Guideline Development Group

## To form the Development Group for the update of the Evidence-Based CPG, we counted with the participation of:

- » A methodological leader, clinical epidemiologist, who coordinated the proposed activities: Dr. Adriana Bohórquez.
- » A methodological and thematic expert, clinical epidemiologist and neonatologist: Dr. Adriana Montealegre-Pomar.
- » A leading pediatric expert in the field: Dr. Nathalie Charpak.
- » A panel of clinical experts, Kangaroo Mothercare Program's Coordinators (KPC) and neonatologists, supported and validated the information on the subject through meetings where the PICO questions were formulated.
- » Two research assistants with skills in systematic searches and literature evaluation: Diana Girón and José Guerrero.
- » A conflict-of-interest statement and analysis was conducted by the guide's Development Group.

# Background: The Kangaroo Mothercare Method (KMC)

The Kangaroo Mothercare Program (KMCP) was initiated at the Instituto Materno Infantil (IMI) in Bogotá, Colombia by Dr. Edgar Rey, head of the pediatrics service and professor of pediatrics at the Universidad Nacional de Colombia, in 1978. It was consolidated during the first 15 years under the coordination of the IMI's pediatricians Héctor Martínez and Luis Navarrete and it was known as the "Kangaroo Mothercare Program" (1).

A group of researchers initiated the rigorous scientific evaluation of IMI's Kangaroo Mothercare Program from 1989(2). The same group then later gave birth to the Kangaroo Foundation (1994) (a non-profit foundation dedicated to the evaluation, improvement and dissemination of the KMC worldwide).

The Kangaroo Foundation research group is currently rated A1 for the quality of its KMC research, which has convinced healthcare professionals around the world about the safety and efficacy of the KMC in lowering mortality and improving the quality of survival on preterm and/or low birth weight infants.

Since 1994, the Kangaroo Foundation has received more than 80 teams from 35 developing countries who came to learn this method in Colombia. Our country currently has 53 KMCP's and kangaroo technical guidelines updated in 2017 that were published by the Colombian Ministry of Health.

The Kangaroo Mothercare (KMC)method is the set of organized activities aimed at carrying out a specific health intervention, in this case the Kangaroo Mothercare intervention, with a team of health care personnel duly trained and organized, within a defined physical and administrative structure, the Kangaroo Mothercare Program (KMCP) (3).

## Purpose and scope of the guide

The purpose of this document is to describe, characterize, and examine the scientific bases and updated empirical evidence on each of the components of the KMC between 2007-2017. It was sought to identify and support with evidence the key aspects of the processes involved in the interventions in which the different components of the method are applied.

This work allowed the development of specific recommendations about the performance of practices that have been validated as the most effective in producing specific results in terms of global KMC and the kangaroo position as the first component of the KMC (e.g., growth, thermal regulation, prevention of apnea of prematurity, etc.); additionally, it allowed defining the indications for each recommended intervention and describing its advantages over other interventions.

These guidelines do not seek to make recommendations on the design, approach, implementation, development and evaluation of Kangaroo Mothercare Programs, nor to describe the structural components that define the quality of a Kangaroo Mothercare Program. For this purpose, it is recommended to consult the updated kangaroo technical guidelines for the implementation of KMCP in Colombia, published in November 2017 (4).

## Trajectory of the research group

In 1989, Dr. N. Charpak and Dr. J. G. Ruiz, Pediatrician-Epidemiologist and Professor at the Pontificia Universidad Javeriana, Colombia, assembled a clinical and epidemiological research team with the purpose of scientifically and rigorously evaluating and developing the Kangaroo Mothercare (KMC) method and the Kangaroo Mothercare Program (KMCP) for outpatient follow-up of preterm and/or low birth weight (LBW) newborns.

The KMC was created and implemented in 1978 by Professor Edgar Rey Sanabria (U. Nacional de Colombia) and a group of teaching clinicians from the Instituto Materno Infantil de Bogotá, Colombia. At that time, there was much controversy about the effectiveness and safety of this intervention and the quality and quantity of scientific literature was limited. The scientific evaluation of KMC was initiated in

order to determine fundamental aspects of safety and possible effectiveness through observational studies (1989). Subsequently, experimental studies were developed (1993) which have been published in renowned international journals such as Pediatrics and Acta Pediatrica (2,4-6). Through these studies it was possible to demonstrate healthcare professionals in Colombia and in developing countries that the KMC is not an alternative "for the poor", but rather a scientifically based, safe and effective alternative to complement and improve the care of preterm and/or LBW newborns.

The Kangaroo Foundation was created in 1994 linked to the Kangaroo Foundation's research group that was previously recognized by Colciencias and is currently classified as A1, the highest score. Currently, new studies continue to be planned and executed to not only improve the intervention, but also to have a better understanding of its impact and mechanism of action on the health of the preterm and/or LBW newborn.

We outline the main clinical research projects that the Kangaroo Foundation's research group has carried out throughout its 25 years. These projects correspond to specific stages in the development of ideas of the Kangaroo Foundation based on concrete problems perceived that needed to be solved, such as: 1) Establishment of the safety of KMC in newborns, as a prerequisite to advance experimental studies. 2) Evaluation of the clinical effectiveness (mortality, morbidity, growth and development) of all the components of the intervention in an experimental study. 3) Dissemination of KMC nationally and internationally 4) Psycho-affective and emotional developmental outcomes. Mother-infant bonding. 5) Refinement of the intervention: improving nutritional aspects and management of oxygen-dependent infants. 6) Creation of Kangaroo Centers of Excellence (Integral Kangaroo Mothercare Programs) for the training of national and international teams and to be able to monitor the quality of kangaroo practice. 7) Generalization of the intervention: dissemination and transfer of acquired knowledge and analysis of resistance.

8) Evaluation of the cerebral impact of the KMC (7-19).

The results of these investigations were also published in international peer-reviewed journals (Pediatrics international peer-reviewed journals (Pediatrics, Acta Pediatrica, IBAD, among others).

Since 1994, the Kangaroo Foundation has obtained important results in the dissemination and transfer of the knowledge acquired and has managed to revolutionize many aspects of the care for LBW and/or preterm infants and their families. It has also endeavored to socialize and disseminate the results of the studies through local and international forums, training of teams of national and international professionals, with funds from non-governmental organizations or public entities such as the World Laboratory, the Rockefeller Foundation, USAID, APPEL, APC, the Colombian Ministry of Health, the World Food Program, the Pan American Health Organization, Grand Challenges Canada, among others.

In the last few years, young researchers are carrying out their graduate theses either master's or doctoral on topics that are researched by the Kangaroo Foundation's group in collaboration with universities, such as:

- Master in Neurosciences; Universidad Nacional de Colombia, Fixation patterns and visual tracking involved in face recognition in premature infants of the Kangaroo Program by means of eye tracking technology. Author Sandra Parra, Universidad Nacional. Tutor: Jairo Alberto Zuluaga Gómez - MD Associate Professor Universidad Nacional, Tutor: Eleonora Rodríguez - MD Pediatrician, PMCI, Bogotá, Colombia.
- 2. Master in Neurosciences; National University of Colombia, Motor outcomes of low birth weight and preterm birth in young adults: effects of the Kangaroo Mothercare Method. Jairo Alberto Zuluaga Gómez - MD Associate Professor Universidad Nacional. Tutor: Nathalie Charpak - MD Pediatrician, director Kangaroo Foundation, Bogota, Colombia, Tutor: Catherine Mercier O.T. PhD. Professor of Rehabilitation, Université Laval.
- 3. Doctoral thesis in Psychology, Evaluation of the implementation of a massage technique adapted to the premature infant in a population of preterm newborns hospitalized in 3 hospitals in Bogota. Andrea Aldana, University of Laval, Canada. Tutor: Rejean Tessier, Co-Tutors: Nathalie Charpak, Pediatrician, George Tarabulsy, PhD.
- 4. Doctoral thesis; Universidad de Los Andes. A multifaceted visual analysis tool for exploratory analysis of data sets about the human brain and its functions. Angulo Pabón, D. A., Hernández Peñaloza, J. T., Oliver, J., Schneider, C., Charpak, N., Hernández Hoyos, M., Uriza Carrasco, L. http://biblioteca.uniandes.edu.co/ acepto201699.php?id=8506.pdf.

The Kangaroo Foundation collaborated with the Colombian Ministry of Health for the standardization of the KMC by updating the Technical Guidelines for the Implementation of Kangaroo Mothercare Programs in Colombia, as a result of the experience of the Kangaroo Foundation's research group, the permanent review of the kangaroo practice in the Centers of Excellence (KMCP) and the research and practice of the Kangaroo Mothercare Programs in the country (3). During the development of the III National Kangaroo Meeting, held in the city of Bogotá, on November 17th, 2017, the Ministry of Health and Social Protection released the document containing the Update of the Technical Guidelines for the implementation of Kangaroo Mothercare Programs in Colombia. This event was attended by health professionals belonging to Kangaroo Mothercare Programs from all over the country.

The International Meeting of the Kangaroo Mothercare method, held at the Pontificia Universidad Javeriana in Bogotá, Colombia in November of 2018, deserves a special mention, where 172 professionals in KMC from 33 countries met to design strategies for the dissemination of the KMC at the country level, as well as on transport in KMC, follow-up in KMCPs and application of the KMC in term infants. These results were published in the journal Acta Pediatrica in an open access

article (20).

In the last year, the Kangaroo Foundation has been developing research projects on Bronchopulmonary Dysplasia and home oxygen therapy, as well as treatment of Gastroesophageal Reflux, of which articles are in the process of publication.

## **Conceptual Framework**

Under the titles of "Kangaroo Care"or " Kangaroo Mothercare Program", a number of interventions primarily aimed for preterm and/or low birth weight newborns have been grouped together. These interventions have some degree of heterogeneity, which is manifested in the diversity of the names by which they are identified: Kangaroo Care, Kangaroo Mothercare, Kangaroo Method, Kangaroo Mothercare method, Kangaroo Mothercare Intervention, Kangaroo Technique, Kangaroo Program, Kangaroo Mothercare Program and skin-to-skin contact. In particular, the term "skin-to-skin contact" has been frequently used in the Anglo-Saxon scientific literature to describe interventions that use at least one of the main components of the Kangaroo Mothercare Method (KMC).

The name Kangaroo Mothercare Program has specific meanings: "Program", because it is a set of actions whose main objective is to reduce premature infant mortality and compensate for the lack of incubators. "Mother", refers to the fact that the mother of the child is asked for her active participation in the care of the premature infant.

"Kangaroo", the term evokes the extrauterine maturation of the fetus as it occurs in nonplacental mammals, and refers to the mother, as the provider of the so-called kangaroo position, continuously carrying the preemie.

In order to characterize and understand what the Kangaroo Mothercare Method (KMC) can consist of, it is necessary to define some basic points: what is the target population, what is the kangaroo position, how is kangaroo feeding and nutrition based on breastfeeding conceived, and what are the kangaroo policies for hospital discharge and outpatient follow-up? Based on the specification of these characteristic elements of the KMC, a "typical" or baseline scenario is then defined, which serves to characterize the elements and circumstances of the KMC application. This scenario contains the elements that are considered to be fundamental for the KMC. The exercise of generating evidence-based statements focuses on identifying, retrieving, critically analyzing and summarizing the evidence for the questions raised about each of these fundamental elements. The specification of this typical scenario also serves as a checklist, to avoid leaving out any of the important aspects or elements in the provision of kangaroo care. The different variants of this typical scenario are also described. The intervention (Kangaroo Mothercare Intervention) consists of a series of components that are applied in an organized and systematic way, following a method: The Kangaroo Mothercare Method (KMC).

The KMC is a standardized and protocolized system of care for preterm and/or low birth weight infants based on skin-to-skin contact between the preterm infant and his/her mother, which seeks to empower the mother (the parents or caregivers) and gradually transfer the responsibility for the care of the fragile infant to the family (3,21).

## State of the art

Since the last update on the Kangaroo Mothercare method (KMC) in 2007, we have had great advances: in 2016 was released the Cochrane review by Conde-Agudelo et al, where the KMC is associated with reduction of mortality risk, infection and hypothermia and a decrease in hospital stay (22). Likewise, there is increasing evidence on the benefits of skin-to-skin contact, one of the fundamental components of the KMC on factors such as attachment, lactation, thermoregulation and hemodynamic stability.

This evidence allowed us to consolidate the KMC at a national and international level as an intervention that impacts not only on survival but also on macro-environmental factors such as the effect it has on the family and the child nutrition, among others. In addition, we have obtained new evidence on the long-term benefits of psychomotor development and pain management. Also, new financial studies support this intervention as highly effective and low cost (6,10,23-26).

The Kangaroo Foundation has been working on a study with a 20-year outcome in the KMC with a cohort of patients who participated in the first clinical experiment from 1994-1996. The first results were published in 2017. Between the years of 2012 and 2014, 494 living participants (69%) were successfully located out of the 716 who participated in the original study in 1994; 441 (62%) were able to be enrolled, 264 of them with 1800 g or less at birth. The study showed that the effects of the KMC at one year on their IQ and family environment persisted 20 years later, with a particular benefit in the most fragile children (very low birth weight, hospitalization in NICU, neurological injury at hospital discharge); additionally, kangaroo fathers were more protective and collaborative with parenting. On the other hand, a decrease was found in school absenteeism compared to control patients, as well as in hyperactivity, aggressiveness, externalization of emotions and social adaptation problems. Neuroimaging studies showed a greater volume of the caudate nucleus (10).

Subsequently, results on the effect of the KMC on brain volumes were published with similar findings. The results show that participants assigned to KMC who had neurological vulnerability at 6 months had higher IQ and attention scores compared to those assigned to the control group (9,19,27).

## **General objective**

To update the Evidence-Based Kangaroo Clinical Practice Guidelines for the optimal use of the Kangaroo Mothercare Method that was developed between 2005 and 2007 to care for preterm and/or low birth weight newborns.

## **Specific objectives**

- » To identify the best available scientific evidence (qualitative and quantitative), from 2007 to 2018, that supports the scientific basis of the Kangaroo Mothercare Method (KMC).
- » To establish the quality of the available evidence and to formulate recommendations on the implementation of the Kangaroo Mothercare method (GRADEpro).

## Methodology

The development of the guidelines required a critical review of the literature on the new evidence available on the topics already addressed, in order to adjust and improve the recommendations that had been developed. The purpose of the Kangaroo Foundation was to include other outcomes not considered in the existing version: From the program as a whole: health team satisfaction and parental satisfaction with the open unit, mortality, initiation of the KMC from delivery room, initiation of the early KMC, from the NICU vs the incubator, KMC and bonding, KMC and neurodevelopment.

From the kangaroo position: kangaroo position (KP) and physiological stability, KP and apnea, KP and gastroesophageal reflux (GER), KP and pain, initiation and duration of the position and somatic growth, impact of the kangaroo position on bereavement and neonatal transport, KP and NIDCAP.

Inthefuture, it is considered to review existing points of controversy such as: early discharge home in kangaroo position vs. kangaroo accommodation, initiation of sucking in the preterm infant, use of bottle nipple, barriers and facilitators in the implementation of the program and the impact of a multidisciplinary high-risk follow-up on neurodevelopment and physical and psychological morbidity of preterm or low birth weight infants. The work was carried out in several phases, which included in general terms the following steps:

- 1. Creation of a group to develop the guidelines, which included a leader expert in the subject, a coordinator epidemiologist and a methodological expert, two research assistants and a consultant epidemiologist, as described above. In addition, a group of thematic experts participated in formulating the questions for updating the guidelines.
- 2. Review of the existing guidelines and definition of the topics to be updated and the new ones to be developed. Included review and adjustment of critical questions and outcomes for decision making.
- 3. Development of the systematic literature search, synthesis and grade of the quality of the evidence. According to the problem statement and the questions

in PICO format, the scientific databases for the systematic review of the literature were identified, such as: Index Medicus online (Medline, both PUBMED and MEDLINE OVID), National Guideline Clearinghouse, Cochrane Library (OVID), Virtual Health Library (LILACS/BIREME, COL-OPS, MedCarib, PAHO, WHOLIS, Maternal and Perinatal), HIRUNET, Dynamed (EBSCOhost), MedicLatina (EBSCOhOST), Nursing Journals (ProQuest), EBM Reviews (OVID) ISI Web of Science, Science Direct, Database of Abstracts of Reviews of Effectiveness (DARE) and TRIP Database.

Regarding this last point, a systematic literature search was conducted in the Pubmed, Embase, Cochrane and Virtual Health Library (VHL) databases to identify systematic reviews, experimental and observational studies that responded to one or more of the proposed questions. Studies published in English, Spanish, Portuguese and French were included, initially limiting the search from 2007, except for new questions. It was updated until January 2017. The search yielded 1,114 references in the different bases, whose titles and abstracts were reviewed by two GDG members independently, thus pre-selecting 325 potentially useful articles. A full-text quality peer review was performed using the SIGN tools developed by the group of the same name, with a third member as mediator in case there was no agreement. We eliminated 95 repeated articles and excluded 179, including 5 references that had updated versions, 5 articles that did not directly answer any research question but were considered potentially useful as a supporting bibliography, 24 references whose evidence is reported in included systematic reviews, 55 articles whose evidence was not included because there were other studies of better quality, and 90 references that were considered to be of unacceptable quality.

Finally, 51 relevant articles of acceptable or high quality were included, and in addition, 4 original publications included in systematic reviews that are part of the source of evidence for this update, were reviewed.

- » Search: 1,114 articles [383 (Pubmed) + 203 (Skin to Skin) + 383 (EMBASE) + 77 (BVS) + 28 (Cochrane) + 7 (Apnea) + 1 (Bereavement) + 32 (New Literature)].
- » Rejected by abstract: 784.
- » Downloaded to appreciate (preselected): 325.
- Excluded: 179 (Does not include those that were rejected by abstract; were downloaded in error and were downloaded by mistake and were excluded after being assessed or not).
- » Updated: 5.
- » Substantiation: 5.
- » No evidence was included because better sources were available: 55.
- » They are in systematic reviews already included: 24.
- » Others: 90.
- » Repeated: 95.
- » Total included: 51, plus 4 originals included from systematic reviews from which further information was extracted.

Total number of articles included: 55.

## Critical appraisal of the literature of articles and publications according to the SIGN (28) format.

Table 1. Studies included

REFERENCE	DESIGN	QUESTION
Acharya 2014	Randomized experimental	11
Ahmed 2010	Systematic review	4
Anderzén-Carlsson 2014 (1)	Qualitative systematic review	4,6
Anderzén-Carlsson 2014 (2)	Qualitative systematic review	4,6
Baylis 2014	Qualitative	1
Bazzano 2012	Qualitative	4,12
Benoit 2016	Qualitative	13
Blencowe 2009	Observational	21
Bonhorst 2001	Observational	11
Brown 2016	Systematic review	16
Burkhammer 2004	Case Report	14
Charpak 1997	Randomized experimental	4,8
Charpak 2016	Observational	4,7
Chi 2016	Randomized experimental	3
Cho 2016	Quasiexperimental	4
Collados-Gómez 2011	Observational	11
Collins 2016	Systematic review	19
Conde-Agudelo 2016	Systematic review	2,3,4,6,7,8,12

Cong 2009	Randomized experimental	13
Cong 2011	Randomized experimental	13
de Sousa 2008	Randomized experimental	13
Dehghani 2015	Randomized experimental	12
Flacking 2013	Observational	1
Gao 2015	Randomized experimental	13
Grevesse	Abstract	15
Henriksen 2008	Randomized experimental	19
Kadam 2005	Randomized experimental	11,12
Kostandy 2008	Randomized experimental	13
Kuschel 2000 (1)	Systematic review	16
Kymre 2013 (1)	Qualitative	6
Ludington-Hoe 2005	Randomized experimental	13
Lumbanraja 2016	Randomized experimental	4,8
Maastrup 2010	Observational	11
Marín 2008	Randomized experimental	13
Mitchell 2013 (2)	Randomized experimental	13
Moore 2016	Systematic review	3,12
Mörelius 2015 (1)	Randomized experimental	3
Mörelius 2015 (2)	Qualitative	4
Nanavati 2013	Randomized experimental	13
Neu 2010	Randomized experimental	4,6
Ohgi 2002	Observational	4,7
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Pillai-Riddell 2011 (2)	Systematic review	13
Pimenta 2008	Randomized experimental	17
Pratiwi 2009	Randomized experimental	3,12
Raiskila 2014	Observational	1
Santos 2013	Qualitative	4,6
Schneider 2012	Quasiexperimental	7
Seidman 2015	Qualitative systematic review	4
Sharma 2016	Randomized experimental	4,8,11
Sloan 2008	Randomized experimental	5
Swarnkar 2016	Quasiexperimental	11
Tessier 2003	Randomized experimental	7
Tessier 2009	Randomized experimental	6
Vittner 2015	Qualitative systematic review	4
Young 2013	Systematic review	16

## Table 2. Excluded studies

Abouelfettoh 2011	Crossover experiment without randomization of the order of interventions (skin-to-skin contact/usual care) and none of the outcomes are of interest for the guideline.
Ahn 2010	Not included because of better sources of evidence for the outcomes of interest.
Akcan 2009	Included in Pillai-Riddell 2011 (2)
Almeida 2010	Not included because of better sources of evidence for the outcomes of interest.
Anderson 1999	Methodological flaws. There is a lack of rigor in the search and it is not clear who participated in the selection of studies.
Arivabene 2010	Included in Anderzén-Carlsson2014 P1
Athanasopoulou 2014	Systematic review. Most of the studies are included in Conde Agudelo 2016.
Atkinson 2000	Cohorts are not comparable, no blinding of the assessment and no confidence intervals.
Axelin 2009	Included in Pillai-Riddell 2011
Azevedo 2011	No evidence was included because of better sources
Badiee 2014	No evidence was included because of better sources
Bala 2016	No evidence was included because of better sources
Barradas 2006	Not relevant to the key question
Beal 2005	Non-systematic literature review
Begum 2008	No evidence was included because of better sources
Bera 2014	No evidence was included because of better sources
Bieleninik 2014	Non-systematic literature review
Bloch-Salisbury 2014	The sample size is small and, although it evaluates physiological variables of neonates, the outcomes do not correspond to the research questions.
Blomqvist 2011	Included in Anderzén-Carlsson 2014 (1).
Blomqvist 2012	Included in Anderzén-Carlsson 2014 (1).

Blomqvist 2013	Evaluates the implementation of skin-to-skin care in the hospital, parental adherence and duration. Serves as a rationale.
Boju 2011	The intervention is the kangaroo position for one hour daily.
Boo 2007	Incluido in Conde-Agudelo 2016
Borck 2012	No evidence was included because of better sources
Boundy 2016	No evidence was included because of better sources
Boyd 2007	The intervention is donor milk
Briere 2014	Systematic review evaluating the effectiveness of various interventions to improve breastfeeding. The references that evaluate the kangaroo mother method are already included in the articles.
Campbell-Yeo 2013	No results published
Carbasse 2013	No evidence was included because of better sources
Castral 2012	Does not evaluate the kangaroo position as an intervention for pain relief.
Castral 2008	Included in Pillai-Riddell 2011
Charpak 2005	No evidence was included because of better sources
Charpak 2007	Describes the composition of preterm milk. Serves as a rationale.
Chermont 2009	The population is term neonates
Chidambaram 2014	The methodology report is not consistent and is incomplete. Comparing stable kangaroo mother infants with unstable infants in intensive care unit, the comparison is not adequate.
Chitty 2013	Non-systematic literature review
Chiu 2005	Included in Mori 2010
Chiu2009	Included in Athanasopoulou 2014
Choudhary2016	No evidence was included because of better sources
Cignacco2007	Pain. It includes studies up to 2004. There is a more recent review (Pillai-Riddell 2011).

Conde-Agudelo 2014	Updated
Conde- Agudelo2003	
Conde- Agudelo2007	
Conde- Agudelo2011	
Cong2012	No evidence was included because of better sources
Da Cunha2016	No evidence was included because of better sources
Dalbye2011	Term newborns
Darmstadt2006	Included in Seidman 2015
de Aquino 2009	No evidence was included because of better sources
de Castro2007	Does not compare KMC with control, only describes neurological development of patients / Could be, but is not directly related to KMC.
De Macedo 2007	Included in Athanasopoulou 2014
Disher2017	It is an analysis of the Cochrane pain study, but it does not provide new evidence
Dodd2005	Comparative literature review / could be useful, but I have doubts about the rigor of the review and whether it is really systematic / It is not a systematic review because there is no detailed methodology of the review.
Doege2007	Formula vs. fortified milk. Unlinked weight, length, CP at <28 weeks. Significant differences in days of parenteral nutrition and volume of milk ingested, no mention of randomization method, no mention of blinding of the evaluator of the results.
Edéll-Gustaff- son2015	Not relevant. Evaluates sleep
Edraki2015	No evidence was included because of better sources
Elipídio Sá2010	No evidence was included because of better sources

Faye2016	Does not compare with control. Only describes events in kangaroo population / Could be for kangaroo implementation. Doubts / Link included elsewhere.
Feldman2014	No evidence was included because of better sources
Ferber2008	Included in Pillai-Riddell 2011
Flacking2011	Does not perform an analysis that clearly shows the association between kangaroo mothercare and breastfeeding rates (JG).
Flacking2012	Non-systematic literature review, no aporta evidencia
Gathwala 2008	Included in Conde-Agudelo 2016
Gathwala 2010	Included in Conde-Agudelo 2016
Ghavan 2012	Included in Conde-Agudelo 2016
Gondwe 2014	Community perceptions of preterm care are assessed, but none of the participants had experience with kangaroo mothercare.
Gonya 2013	No evidence was included because of better sources
Hake-Brooks 2008	Included in Ahmed 2010
Hartley 2015	The outcomes do not correspond to any research question
Heidarzadeh 2013	No evidence was included because of better sources
Heimann 2009	No evidence was included because of better sources
Heimann 2013	Methodological flaws. No comparison groups comparison
Heimann 2014	No evidence was included because of better sources
Heinemann 2013	Included in Anderzén-Carlsson 2014 (1).
Hernández 2015	Systematic review with high heterogeneity in studies due to different interventions
Holditch-Davis 2013	No evidence was included because of better sources
Holditch-Davis 2014	No evidence was included because of better sources

Husebye 2014	Retrospective review of medical records without a comparison group
lp 2007	No evidence was included because of better sources
Johnson 2007	Included in Anderzén-Carlsson 2014 (1).
Johnston 2008	No evidence was included because of better sources
Johnston 2009	Compares normal kangaroo care and kangaroo care with additional stimuli
Johnston 2014	Included in Disher 2016
Kaffashi 2013	No evidence was included because of better sources
Karlsson 2012	Very small sample with no comparison group.
Kennell 2006	This is a comment in response to another article
Kesler 2015	Incomplete systematic review
Khanam 2015	Methodological flaws. Many biases that are difficult to correct
Koo 2014	Systematic review without meta-analysis. Studies almost entirely included in Ip 2007
Korraa 2014	No evidence was included because of better sources
Kostandy2013	Term neonatal population
Krawczyk2016	The outcome does not correspond to the research questions.
Kristoffersen2016 (1)	No evidence was included because of better sources
Kristoffersen2016 (2)	Protocol
Kuschel2000 (2)	Included in Brown 2016
Kymre2013 (2)	Included in Vittner 2015
Kymre 2014	Included in Vittner 2015
La Orden-Izquier- do 2012	There is no outcome measure for the guideline.
Lamy-Filho 2008	Included in Boundy 2016
Lanari 2013	The outcome does not correspond to the research questions.

Lawn 2010	No evidence was included because of better sources
Lee 2007	Artículo en coreano
Lee 2014	No evidence was included because of better sources
Lehtonen 2004	Non-systematic literature review
Lemmen 2013	No evidence was included because of better sources
Lucas 2015	It does not directly answer the research question, but it serves as a foundation for the research question.
Lucas 1990	Block randomization, no evaluation of group comparability, no discussion of losses
Lucchini 2012	Does not show included and excluded studies, does not show characteristics of the studies, does not clarify how many people were selected, does not discuss the quality of articles.
Ludington-Hoe 2005	No evidence was included because of better sources
Ludington-Hoe 2006	Methodological flaws. Does not apply to any question, assesses sleep regulation in kangaroo position.
Ludington-Hoe 2011	It is a non-systematic review that does not provide evidence
Lunze 2013	Systematic review including a single kangaroo mother method study that does not include control group
Lyngstad 2014	No evidence was included because of better sources
Maastrup 2012	Survey describing policies in neonatal units with respect to breastfeeding
Mahmood 2011	Included in Moore 2016
Marín 2010	Included in Moore 2016
McCain 2005	Case Report
McCall 2010	Systematic review including only one article relevant to this review, already included in Conde-Agudelo 2016.
McGuire 2003	The procedure is donor milk
McInnes 2008	Included in Collins 2016

Menezes 2014	No clear statistical analysis
Miles 2006	Included in Athanasopoulou 2014
Mitchell 2013 (1)	No evidence was included because of better sources
Moore 2012	Updated version Moore 2016
Mörelius 2012	Describes the average time it takes for extreme preterm infants to initiate skin-to-skin contact and describes the possible factors involved. Does not answer any questions
Mori 2010	No evidence was included because of better sources
Mullany 2010	The prevalence of hypothermia in neonates at home is examined. It associates the use or not of skin-to-skin contact with hypothermia, but it is not known whether the groups are comparable, and it is not compared with incubator care but at home.
Nagai 2010	Included in Conde-Agudelo 2016
Nagai 2011	Included in Conde-Agudelo 2016
Ndelema 2016	Does not directly answer the questions in the guide
Ndiaye 2006	No full text
Nguah 2011	Included in Seidman 2016
Nimbalkar 2013	No evidence was included because of better sources
Nimbalkar 2014	Included in Conde-Agudelo 2016
Okan 2010	Population is term neonates
Olsson 2016	No evidence was included because of better sources
Oras 2016	Single cohort, the measurement instrument may not meet WHO criteria for exclusive breastfeeding
Padhi 2015	Descriptive case series study, does not provide provides no evidence
Park 2014	No evidence was included because of better sources
Parmar 2009	No evidence was included because of better sources
Pattinson 2006	Qualitative approach not appropriate
Penalva 2006	Does not answer any questions

Pervin 2015	No evidence was included because of better sources
Pestvenidze 2007	Non-systematic literature review
Pillai-Riddell 2011 (1)	No evidence was included because of better sources
Raffray 2014	Describes barriers to early exit without directly answering the research questions
Quigley 2014	The procedure is donor milk
Renfrew 2009	No evidence was included because of better sources
Reynolds 2013	No evidence was included because of better sources
Roller 2005	No evidence was included because of better sources
Saeidi 2009	Population is term neonates
Samra 2013	No evidence was included because of better sources
Samra 2015	No evidence was included because of better sources
Scher 2009	No evidence was included because of better sources
Schorn 2015	Population is term neonates
Seo 2016	Population is term neonates
Shah 2014	Discusses preterm mortality in a community care cohort community
Silva 2016	No evidence was included because of better sources
Singh 2012	It studies neonatal care for mortality without comparison. Does not specifically study kangaroo mothercare
Skouteris 2014	Links included in Conde-Agudelo 2016
Soukka 2014	Serves as a theoretical basis for benefits in breathing
Srinath 2016	No evidence was included because of better sources
Strand 2014	No evidence was included because of better sources
Subedi 2009	No control

Suman 2008	Included in Conde-Agudelo 2016
Sutan 2014	No evidence was included because of better sources
Symington 2009	No mention of kangaroo position, therefore, it cannot be used as evidence for the guideline, even though it is intended for NIDCAP.
Tabata 2015	Study of the composition of different milk preparations. milk preparations
Tallandini 2006	Included in Athanasopoulou 2014
Törnhage 1999	Very small sample size with 1 hour of kangaroo position.
Tourneux 2015	No evidence was included because of better sources
Trevisanuto 2016	No evidence was included because of better sources
Tudehope 2013	Non-systematic literature review
Tully 2016	No evidence was included because of better sources
Tuoni 2012	No evidence was included because of better sources
Vanderveen 2009	It lacks some rigor in the systematic review, it focuses on meta-analysis. Has 25 studies included, but the only kangaroo care study is Charpak 2001, included in Conde-Agudelo 2016.
Wallin 2009	Neither kangaroo position nor kangaroo mother method is mentioned, therefore, it cannot be used as evidence for the guideline, even though it is intended for NIDCAP
Worku 2005	Included in Conde-Agudelo 2016
Yu 2008	No full text
Zaoui-Grattepan- che 2016	No evidence was included because of better sources

- 4. Consensus meetings for the revision of previous recommendations in the light of new evidence and formulation of new recommendations using the GRADE strategy.
- 5. Preparation of the document with the adjustment and incorporation of the new evidence.
- 6. Corrections of the document and delivery of the final document.
- 7. Dissemination of the final document. The results of the update of the guide were presented at the National Kangaroo Congress, held at the Colombian

Clinical practice guidelines for the optimal use of the Kangaroo Mothercare Method

Ministry of Health in Bogota, November 2020.

## Final PICO questions with GRADE and Table

The questions arising from the meeting with the experts were modified to obtain 23final questions. This document shows the evidence in response to the first 15 questions related to the KMC in general and the kangaroo position.

## **Aspect 1: Kangaroo Mothercare Method**

## Clinical Question 1

For the hospitalized preterm newborn and its family, is it more effective to be in an open neonatal unit (parents can enter at any time and stay as long as they wish and can be with their child), compared to a closed unit (visiting hours, parents stay for limited periods) in relation to better somatic growth, higher frequency of exclusive breastfeeding, and a shorter stay in the hospital?

Population	Exhibition	Control	Unraveling
Hospitalized preterm or low birth weight newborn and his or her family	Open neonatal unit	Closed neonatal unit	Practice of exclusive breastfeeding Exclusive breastfeeding Somatic growth Infant behavior Hospital stay Parental stress

## Response.

#### Moderate certainty of evidence

The evidence comes from observational studies whose quality in the context of their design is good. Given the type of intervention, a clinical experiment is not ethically feasible. Therefore, the evidence mentioned below is considered to be the best available evidence.

For critical outcomes such as initiation of the KMC and lactation, the results were favorable in the open unit when compared to the closed unit.

Although low quality on outcomes such as weight gain and effects on infant behavior, the results were also found in favor of the open unit.

Regarding maternal stress, the results were inconclusive in the included study. However, it can be considered that fathers can interact with their children more

Clinical practice guidelines for the optimal use of the Kangaroo Mothercare Method

quickly. (Baylis et al., 2014).

The practice of the kangaroo position should be allowed as soon as possible, with the benefits that come with it, which has a high quality and favorable evidence, with long-term effects.

Earlier initiation of breastfeeding prevents unfavorable outcomes, such as necrotizing enterocolitis (Brown et al., 2016).

We found no evidence of outcomes that compromised the safety of the preterm infant with this intervention.

#### Strong recommendation in favor of the intervention

The 24-hour opening of the newborn units is recommended for parents and relatives of premature or low birth weight newborns.

#### **Good Clinical Practice Point**

Open units must have the necessary adjustments so that parents can stay 24 hours a day in optimal conditions.

#### Justification

Despite the variability in the quality of the evidence available, the desirable effects in terms of favoring the initiation of the KMC, earlier breastfeeding initiation, the wish for the parents to remain with their children, along with the absence of undesirable effects, except for the concerns of the NBU staff, the open unit is superior to the closed unit.

## GRADEpro recommendation

Should an open neonatal unit vs. a closed neonatal unit be used for the care of the preterm or low birth weight newborn?				
Population:	Infants born prematurely or with low birth weight			
Intervention:	open neonatal unit			
Comparison:	neonatal unit closed			
Principal outcome measures:	Practice of the kangaroo method; Maternal breastfeeding; Hospital stay; Maternal stress; and Somatic growth			

Certainty of evidence: What is the overall certainty of the evidence on effects?						
FINDING	INTERVENTIONAL EVIDENCE		ADDITIONAL CONSIDERATIONS			
oVery low oLow •Moderate oHigh	Outcome measures	Importance	Strength of evidence (LEVEL)	The evidence comes from observational studies that have a good design quality. Given the type of intervention		
oNot applicable	Initiation of kangaroo mothercare method (Pierrat 2016) Evaluated on: Proportion of neonates that initiated the mothercare method	CRITICAL	⊕⊕⊕○ MODERATE	a clinical experiment is not ethically viable. For this reason, this is considered the		
	Days alive at initiation of the kangaroo mothercare method (Raiskila 2014) Evaluated on: Postnatal days alive	CRITICAL	⊕⊕⊕○ MODERATE®	best available evidence.		
	Gestational age at initiation of the kangaroo mothercare method (Raiskila 2014) Evaluation on: Gestational age in weeks	CRITICAL	⊕⊕⊕○ MODERATEª			
	Inicio de la lactancia (Pierrat 2016) evaluado con: Proporción de neonatos que inician de forma rápida la lactancia (inicio express)	CRITICAL	⊕○○○ VERY LOW <sup>b</sup>			
	Edad gestacional al inicio de la Lactancia materna (Raiskila 2014) evaluado con: Edad gestacional en semanas	CRITICAL	⊕⊕⊕○ MODERATEª			
	Crecimiento somático (Raiskilia 2014) evaluado con: Aumento de peso en gramos por semana durante la estancia hospitalaria en la cohorte 2011-2012 vs cohorte 2001-2002	CRITICAL	⊕○○○ VERY LOW <sup>a,c</sup>			
	Behavior (Reynolds 2013, Pineda 2018) Evaluated on: NUIC Network Neurobehavioral Scale (NNNS)	CRITICAL	⊕⊕○○ LOW			

FINDING	INTERVENTIONAL EVIDENCE		ADDITIONAL CONSIDERATIONS	
	Outcome measures	Importance	Strength of evidence (LEVEL)	
	Maternal stress (Flacking 2013)Evaluated on: Swedish Parenthood Stress Questionnaire (SPSQ) Scale of: 1 to 5	CRITICAL	⊕○○ VERY LOW <sup>d</sup>	
	a. Is a retrospective cohort study, based on medical history records; the invequality control by excluding subjects with incomplete or unavailable data (2 conducted a careful review of the records and a random audit of the data by b. The result of the multivariate analysis did not find statistically significant interval indicated no difference with the control group.  c. It doesn't report the standard deviation, therefore, it's not possible to calculate data of the deviation of the confidence interval in the effect size with results for and against the deviation of the data by the confidence interval in the effect size with results for and against the data of the confidence was found to reliably report hospital stay.			

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATION
oUncertainty o Significant variability o Likelihood of significant uncertainty or variability o Likelihood of no significant uncertainty or variability  o No significant uncertainty or variability	Parents who have the possibility to remain with their children in open neonatal units state that this allows for active participation in the care of their newborn, including activities such as changing diapers, tube feeding and bathing. In addition, parents acquire the confidence to perform these tasks without supervision. Parents also highlight the importance of events such as eye contact, direct contact, the first time the baby receives breast milk and the first time they can stay with their child without being disturbed. (Baylis et al., 2014)	The right to non-separation of parents from their sick child and the right of non-separation of sick children from their parents are two rights that must be respected. (Declaration of the Rights of the Child). The only way to do so is to open the neonatal units an adapt these to allow parent to stay with their child under acceptable conditions

Balance of effect Does the balance	s between desirable and undesiral	ole effects favor inter	vention or compariso	on?		
FINDING	INTERVENTIONAL EVIDENCE					ADDITIONAL CONSIDERATIONS
o Favors comparison o Likely to favor	Outcome	With closed neonatal unit	Con open neonatal unit	Difference	Relative effect (CI 95%)	In the Colombian clinical practice guideline for the care of the healthy preterm NB published in 2013, this question was answered in this
comparison o Probably does not favor intervention or comparison oLikely to favor the intervention • Favors intervention o Varies o Don't know	Initiation of the kangaroo mother method evaluated with: Proportion of neonates who initiated KMC. (Pierrat 2016)	390 per 1.000	<b>678 per 1.000</b> (490 to 826)	288 more per 1.000 (100 more to 436 more)	<b>OR 3.3</b> (1.5 7.4)	way: "There is analytical observational evidence, experimental and qualitative research results suggesting
	Days of life at initiation of kangaroo mother method practice assessed with: Postnatal age in days (Raiskila 2014).	The mean number of days of life at the beginning of the kangaroo mother method was <b>24.4</b> days.	The mean number of days alive at the start of the kangaroo mother method in the intervention group was 19.3 days less (24.09 less to 14.51 less)	MD <b>19.3 days less</b> (24.09 less to 14.51 less)	-	that the open unit policy favors bonding, is valued by families, empowers parents, allows the use of the Kangaroo mothercare method and translates into better growth, maturation, timely neonatal discharge and improved parental competencies for the post-exit management of their preterm infant. There is observational evidence (epidemiological
						surveillance) that demonstrates that open unit policies do not increase the risk of infection or other unfavorable outcomes".

FINDING	INTERVENTIONAL EVIDENC	ADDITIONAL CONSIDERATIONS				
	Outcomes	Con neonatal unit closed	Con open neonatal unit	Difference	Relative effect (CI 95%)	This was obtained from the evidence provided by the guide  "Care from birth. Recomendaciones
	Gestational age at the start of kangaroo mother method practice assessed with: Gestational age in weeks (Raiskila 2014)	The mean gestational age at the start of the kangaroo mother method practice was <b>32.8</b> weeks	The mean gestational age at the start of kangaroo mothercare practice in the intervention group was <b>2.9</b> weeks less (3.59 less to 2.21 less)	MD <b>2.9 weeks less</b> (3.59 less to 2.21 less)	-	basadas en pruebas y buenas prácticas" (1) of the Spanish Ministry of Health and Social Policy of 2010. The studies are, Greisen G, Mirante N, Haumont D, Pierrat V, Pallas-Alonso CR, Warren I et al. Parents, siblings and grandparents in the Neonatal Intensive Care Unit. A survey of policies in eight European countries. Acta Paediatr 2009 November;98(11), 1744-50.  This descriptive observational study, carried out in 8 European countries (France, Belgium, Great Britain, Italy, Holland, Spain and Switzerland, Denmark) describes the current policies regarding family visits in the Neonatal Intensive Care Units, comparing them with what happened 10 years ago. He concludes that there is an important change with respect to these policies, in favor of visits by parents and other relatives, without ignoring that there are still many barriers, especially in southern European countries. Cuttini M, Rebagliato M, Bortoli P, Hansen G,
	Breastfeeding initiation assessed with: Proportion of neonates with rapid initiation of breastfeeding (express initiation) (Pierrat 2016).	600 per 1.000	<b>730 per 1.000</b> (600 to 828)	<b>130 more per 1.000</b> (0 minus to 228 plus)	<b>OR 1.8</b> (1.0 a 3.2)	
	Gestational age at initiation of breastfeeding assessed with: Gestational age in weeks (Raiskila 2014).	The mean gestational age at the start of breastfeeding breastfeeding was <b>35.2</b> weeks	The mean gestational age at initiation of breastfeeding in the intervention group was <b>2.2 weeks</b> younger (2.72 less than 1.68). (2.72 less to 1.68 less)	MD 2.2 weeks less (2.72 less than a 1.68 lower)	-	

FINDING	INTERVENTIONAL EVIDENCE					ADDITIONAL CONSIDERATIONS
	Outcome	Con neonatal unit closed	Con open neonatal unit	Difference	Relative effect (95% CI)	de LR, Lenoir S et al. Parental visiting, communication, and participation in ethical
	Somatic growth evaluated with: Weight gain in grams per week during the hospital stay in the 2011-2012 cohort vs 2001-2002 cohort (Raiskilia 2014)	The average somatic growth was <b>110 g</b> /week.	The mean somatic growth in the intervention group was intervention group was 49 g/week higher. (0 a 0)	MD <b>49 gr/week</b> <b>higher</b> . (0 a 0)	-	decisions: a comparison of of neonatal unit policies in Europe. Arch Dis Child Fetal Neonatal Ed 1999 September;81(2):F84-F91. Descriptive observational study comparing 123 newborn units in Europe with respect to parental visits, information and ethical
	Behavior assessed with: NNNS (NUIC Network Neurobehavioral Scale) (Reynolds 2013, Pineda 2018).  In the study, they performed a multivariate regression model to evaluate the association between the results of the scale and the time spent with or carried by the parents. In both studies they found a positive and significant association between time and several of the domains of the scale. In particular, they found an improvement in the quality and quantity of spontaneous or demanded movements, a decrease in alertness and excitability as opposed to an increase in hypotonia and lethargy, indicating that the infant is more relaxed, content and more fluid. In the other report, they evidenced an improvement in the development of reflexes and a decrease in asymmetry.			decision making. It concludes that unlimited visitation and interaction regarding the care of their babies, although it is a parental right to be care of their babies, although it is a parental right that should be guaranteed, is not always present. This is basically due to cultural determinants. Fegran L, Helseth S, Fagermoen MS.		
	Maternal stress assessed with: Swedish Parental Stress Questionnaire (SPSQ) Scale from: 1 to 5 (Flacking 2013).	The mean maternal stress was <b>0 SD</b>	The mean maternal stress in the intervention group was 0.2 Standard deviation SD less (0.44 lower than 0.03 higher)	DSM <b>0.2 DE lower</b> (0.44 lower than 0.03 higher)	-	A comparison of mothers' and fathers' experiences of the attachment process in a neonate. of the attachment process in a neonatal intensive care unit. J Clin Nurs 2008 March;17(6):810-6. Descriptive observational study in which 12 parents (6 mothers
						in which 12 parents (6 mothers

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
	In critical outcomes such as initiation of KMC and breastfeeding, the results were favorable in the open unit when compared to the closed unit.	, 6 fathers) and their preterm newborns were included, comparing different experiences and views regarding attachment in newborn units. It concludes that health care
	Although with low quality outcomes such as weight gain and effects on infant behavior, results were also found in favor of the open unit.	professionals should implement measures for that parents initiate permanent contact with their children, skin-to-skin contact,
	Regarding maternal stress the results were inconclusive in the included study. However, it can be considered that fathers can interact with their infants more quickly. (Baylis et al., 2014).	knowing the differences that exist between mothers and fathers. This will contribute to the process of attachment and responsibility of each of them towards their hospitalized child.
	They allow the practice of the kangaroo position as early as possible, with the attendant benefits, the evidence for which is of high quality and favorable (see rest of the guideline) with long-term effects.	Feldman R, Eidelman AI, Sirota L, Weller A. Comparison of skin-to-skin (kangaroo) and traditional care: parenting outcomes and
	Earlier initiation of breastfeeding prevents unfavorable outcomes, such as necrotizing enterocolitis (Brown et al., 2016).	preterm infant development. Pediatrics 2002 July;110(1 Pt 1):16-26
	We found no evidence of outcomes that compromised the safety of the preterm infant with this intervention.	Observational study that included 146 preterm newborns. Seventy-three received Kangaroo Care, and 73 received traditional incubator care. It sought to compare how the Kangaroo Care intervention affected parent-infant interactions and infant development. It was felt that allowing the mother contact with the preterm infant was particularly beneficial for the development of certain motor skills. For this reason, newborn units should newborn units should implement interventions that increase emotional interaction between parents and sick newborns. sick newborns.

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
		Melnyk BM, Feinstein NF, Alpert-Gillis L, Fairbanks E, Crean HF, Sinkin RA et al. Reducing premature infants' length of stay and improving parents' mental health outcomes with the Creating Opportunities for Parent Empowerment (COPE) neonatal intensive care unit program: a randomized, controlled trial. Pediatrics 2006 November;118(5): e1414-e1427.  Randomized controlled study, in which a parent empowerment program was implemented in the neonatal Intensive Care Unit (COPE), compared to traditional management. It concludes that interventions should be implemented that encourage parental interaction should be implemented, thus promoting parental mental health and newborn development. It also mentions the benefits in terms of hospital stay.

Acceptability Is the interventi	Acceptability Is the intervention acceptable to stakeholders?						
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS					
oNo oProbably not •Probably yes oYes oVaries oDon't know	Baylis et al. conducted a study in which they evaluated the timing of fathers' first events with their preterm infants and their interaction during the hospital stay in two intensive care units with different opportunities to be present and involved in the newborn's care, in the care of the newborn, one of these units was open with conveniences for parental stay in which visits by other family members were allowed and the other was a unit that while allowing unrestricted parental visits, there were restrictions for overnight stay and for accompaniment by other close family members. In both they promoted skin-to-skin care and participation in child care activities (Baylis et al., 2014).  In the first encounter 2/3 of the fathers were not able to hold their baby in delivery room and those who did had skin-to-skin contact, most of the fathers touched their children (61% fathers - 53% mothers) at the time of delivery, after birth almost all fathers saw their children in higher proportion fathers than mothers and mothers of babies attended in open unit more frequently did so than those of children attended in the other unit.  In general, mothers in the open unit were able to hold skin-to-skin and smell their babies earlier than in the other unit, and were able to assume caretaking duties earlier, as was also the case with fathers. Of these first encounters, the fathers referred as fundamental experiences the closeness to their child, the eye contact, when the baby took their finger or they heard the baby's voice, the beginning of breastfeeding and the first moment when they could be alone with their child. They similarly highlighted the importance of being with other family members. (Baylis et al., 2014).  Strand et al. conducted a survey of staff in two NICUs belonging to two university hospitals in Sweden for the purpose of describing and comparing attitudes toward KMC in units that provided different opportunities for parents to be with their children and practice it. They included auxiliary nurses, nurse practit	There are stakeholders who may be unwilling to open the units.  They may think and claim that the presence of parents gives more work for the staff, but experience shows that it does not, and parents quickly become permanent helpers in the care needed by the child and, on the contrary, allow the staff to relieve their workload, so that the health staff becomes responsible for teaching the parents how to take care of their children.  There is no evidence of increased infection with the entry of parents and, on the contrary, once parents understand the importance of hand washing, there is a decrease in the number of infections.  Although there is no solid evidence on the decrease in					

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
	Staff in the closed unit felt that the benefits of KMC were exaggerated and that it increased the risks to the infant. Staff in the open unit had a more positive attitude about the kangaroo position in infants requiring ventilator or CPAP and both expressed concern about the use of the position in infants less than 28 weeks with umbilical catheters.  Regarding parental performance, the open unit staff viewed positively giving parents the opportunity to use 24-hour KMC in family rooms or at open nursing stations and felt that parents wanted to sleep with their infants in the kangaroo position, and were concerned about parental comfort needs and how to decrease stress. They also manifested a discharge at work when parents had received adequate infant handling instructions. (Strand et al., 2013).	hospital stay due to the opening of the URN and earlier initiation of KMC, practical experience in centers that practice earlier discharge with the infant in the kangaroo position shows a clear increase in bed rotation in neonatology. If demand exceeds supply this shorter stay is welcome; conversely, if demand is less than supply, hospital staff and management will be concerned about empty incubators and there may be resistance to the implementation of the open
		unit.  However, with the benefits already demonstrated on parental satisfaction and behavioral changes in the preterm newborn and with the support of academic societies in each country and ministries of health, this type of resistance should disappear on its own.

Viability: Is it po	/iability: Is it possible to implement the intervention?					
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS				
oNo oLikely not •Likely yes oYes oVaries oInconclusive	The possibility of having maternity leave, transportation or the chance to stay the night can affect the implementation of the intervention.  As an example, we have the study of Gonya and Nelin. In the NICU of a level III hospital, in a metropolitan area in Midwest, United States, parents are allowed to visit 24 hours a day, seven days a week, and at the time of the study, the hospital had reclining chairs for the parents but not beds. The researchers wanted to evaluate the factors that determined the frequency of maternal visits to extremely premature babies (<27 weeks) and the skin-to-skin contact. They included a sample of 32 mother-child dyads. In the report researchers describe that mothers lived at varying distances from the hospital. Half of them could not visit their child more than once a week. Mothers visited their children on average 78% of the time of the stay, skin-to-skin contact was initiated in the first week of admission, but the average time in contact was 44 hours, with an average time per baby of 2%. On average skin-to-skin contact occurred for 9 weeks with a frequency of 2 times per week and the peak occurred between weeks 29 and 33. Babies were followed up to 40 weeks of corrected age.  The variables associated with the number of hours in skin-to-skin contact identified in the study were the gestational age and the scores on the subscale of maternal communication with the staff. The variables associated with the frequency of the visits were: the score on the subscale of behavior and appearance of the baby, the number of children at home, maternal age and maternal communication. And for both outcomes maternal stress was found as the significant variable. (Gonya, 2012)  In their analysis, the authors discuss the variability in maternal choice of when and how to take their limited time for maternity leave as an important limitation which affected their presence in the NICU (Gonya, 2012) and consequently the validity of the findings.  We clarify that in the United States there is no formal mat	Some interest groups might not be willing to open the units due to economic factors and prejudices, nevertheless the health policies that favor childhood would favor the context for the implementation of the intervention.  The existence of maternity leave is imperative to give parents the opportunity to be with their hospitalized child. In the United States, the working mother reserves her vacation days for when her child returns home.  For implementation, this recommendation requires the existence of a legal framework of social security that favors and protects the time of the working mother to be with her premature baby in the hospital.				

SUMMARY OF FINDINGS	FINDING						
STRENGTH OF EVIDENCE	Very low	Low	Moderate	High			Not applicable
VALUE	Significant uncertainty or variability	Likelihood of significant uncertainty or variability	Likelihood of no significant uncertainty or variability	No significant uncertainty or variability			
BALANCE OF OUTCOME MEASURES	Favors the control	Likely favors the control	Favors neither the intervention nor the control	Likely favors the intervention	Favors the intervention	Varies	Inconclusive
ACCEPTABILITY	No	Likely not	Likely yes	Yes		Varies	Inconclusive
VIABILITY	No	Likely not	Likely yes	Yes		Varies	Inconclusive

# Recommendation

Strong	recommendation	Conditional recommendation	Conditional recommendation	Conditional recommendation	Strong recommendation in
against the	e intervention	against the intervention	in favor of the intervention or	in favor of the intervention	favor of the intervention
			the control		
0		0	0	0	•

# **A** Conclusion

#### Recommendation

It is recommended that neonatal units remain open 24 hours to parents and relatives of infants born prematurely or with low birth weight.

#### **Note of Good Clinical Practice**

Open neonatal units must have the necessary arrangements so that parents can stay 24 hours in optimal conditions.

#### **Justification**

Despite the variability in the quality of the evidence, the open unit is superior to the closed unit due to the intervention resulting in desirable outcomes in terms of favoring the onset of kangaroo mothercare, the earlier start to breastfeeding, the desire of parents to stay with their children, and to the lack of undesirable effects, except for the concerns of the neonatal care staff.

### **Subgroup considerations**

The intervention is applicable to all infants born prematurely or with low birth weight. No analyses were done by subgroups.

## **Considerations for implementation**

Administrative changes that allow unrestricted access to the mother and father of the hospitalized preterm infant. Development of locative facilities for the access and visit of the parents (toilet, lockers, comfortable chairs, cafeteria service, joint lodging).

#### **Investigational priorities**

Further investigation, with valid instruments and qualitative analyses, is needed to evaluate the stress of parents exposed to closed units as comparison to the stress of parents that have 24-hour access to their children in open units.

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# Clinical Question 2

Is the KMC effective in the preterm or LBW newborn compared to the traditional incubator method in reducing neonatal mortality?

Population	Exposure	Control	Outcome
Infants born prematurely or with low birth weight.	Kangaroo Mothercare method.	Traditional handling in incubator.	Neonatal mortality.

# Response.

## Moderate evidence certainty

Conde Agudelo's meta-analysis compiles the best quality clinical trials available; it wasn't possible the blinding of the intervention in any of the studies due to the particularities of the method.

In some of them, selection bias was suspected and for some of the outcomes the results were inconclusive, which is why the quality of the evidence is considered moderate. However, the results are consistent with the clinical practice.

# Strong recommendation in favor of intervention

# Justification Effect balance

There is strong evidence that early use of KMC decreases neonatal mortality, a highly desirable effect. There is no evidence of undesirable effects that outweigh this benefit from the intervention.

#### Feasibility

The implementation of the KMC is feasible if barriers are considered and managed, since the facilitating factors and successful experiences in particular contexts provide favorable indications on the implementability of the method.

# GRADE pro recommendation

Should kangaroo mother method be used over traditional handling in incubator for the care of preterm or low birth weight infants at birth?				
Population:	nfants born prematurely or with low birth weight			
Intervention:	Kangaroo mothercare method			
Comparison:	Traditional handling in incubator			
Principal outcome	Mortality			
measures:				

<b>O</b> 1			
Streng	ith ot	. GAIU	ence
Oticity	, ti i O i	CVIG	CITOC

INTERVENTIONAL EVIDENCE			ADDITIONAL CONSIDERATIONS		
Outcome measures	Importance	STRENGTH OF EVIDENCE (GRADE)	The meta-analysis of Conde- Agudelo compiles the best quality clinical trials available;		
Mortality (Conde-Agudelo 2016) Evaluated on: Number of deaths up until the last follow up	CRITICAL	⊕⊕⊕○ MODERATE®	in no study was it possible to blind the intervention due to the nature of the intervention. In some, the risk of selection bias		
Mortality with continuous kangaroo mothercare (>20 hours/day) (Conde-Agudelo 2016) Evaluated on: Number of deaths at discharge or at 40-41 weeks of gestational age	CRITICAL	⊕⊕⊕○ MODERATE®	was suspected and for some the results were inconclusive, which i why the quality of the evidence is considered moderate.		
			However, the results are consistent with clinical practice.		
	Outcome measures  Mortality (Conde-Agudelo 2016) Evaluated on: Number of deaths up until the last follow up  Mortality with continuous kangaroo mothercare (>20 hours/day) (Conde-Agudelo 2016) Evaluated on: Number of deaths at discharge or at 40-41	Outcome measures  Mortality (Conde-Agudelo 2016) Evaluated on: Number of deaths up until the last follow up  Mortality with continuous kangaroo mothercare (>20 CRITICAL hours/day) (Conde-Agudelo 2016) Evaluated on: Number of deaths at discharge or at 40-41	Outcome measures  Importance    Importance   STRENGTH OF EVIDENCE (GRADE)		

FINDING	INTERVENTIONAL EVIDENCE			ADDITIONAL CONSIDERATIONS
	Outcome measures	Importance	Strength of evidence (LEVEL)	
	Mortality (Conde-Agudelo 2016) Evaluated on: Number of deaths at discharge or at 40-41 weeks of postconceptional age	CRITICAL	⊕⊕⊕○ MODERATE®	
	Mortality when kangaroo mothercare is initiated within the first 10 days of life (Conde-Agudelo 2016) Evaluated on: Number of deaths at discharge or at 40-41 weeks of gestational age	CRITICAL	⊕⊕⊕○ MODERATE®	
	Mortality (Conde-Agudelo 2016) Evaluated on: Number of deaths at 6 months of corrected age or of follow-up	CRITICAL	LOW <sub>b,c</sub>	
	Mortality (Conde-Agudelo 2016) Evaluated on: Number of deaths at 12 months of corrected age	CRITICAL	LOW <sup>a,b</sup>	
	a. Several of the included studies have a risk of selection bia b. The confidence interval was wide and the result not concl intervention c. One of the studies had a risk of selection bias (Conde-Agudelo et al., 2016)		or against the	

# Value

Is there significant uncertainty or variability in how people value the main outcomes?

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
oUncertainty oSignificant variability •Likelihood of significant uncertainty or variability oLikelihood of		The decrease in premature mortality is one of the most important outcomes of the intervention but it is not the ultimate goal. The value of the outcome may vary according to the social and anthropological context of the population.
no significant uncertainty or variability  No significant uncertainty or variability		From a public health point of view, in low-income countries the reduction of neonatal mortality is highly valued due to the impact on public health; in the same way, in developed countries, despite having a lower global mortality, the intervention supports the maintenance of these statistics.

# **Balance of outcome measures**

Does the balance between favorable and unfavorable outcomes favor the intervention or the control?

FINDING	INTERVENTIONAL EVIDENCE					ADDITIONAL CONSIDERATIONS
oFavors the control oLikely favors the control	Outcome measures	With traditional handling in incubator	With kangaroo mothercare	Difference	Relative measure of effect (95% CI)	In the meta-analysis previously published by Law et al., in 2010, there was an analysis of mortality at 28 days of life of the premature
the control oFavors neither the intervention nor the control oLikely favors the intervention oFavors the intervention oVaries oInconclusive	Mortality (Conde-Agudelo 2016) Evaluated on: Number of deaths up until the last follow up  Mortality with continuous kangaroo mothercare	60 per 1.000 85 per 1.000	<b>40 per 1.000</b> (29 to 57) <b>57 per 1.000</b> (39 to 84)	20 less per 1.000 (31 to 3 less)  28 less per 1,000 (46 to 2 less)	(0.48 to 0.95)	infant regardless of their gestational age.  The authors included three clinical trials in which the newborns started kangaroo mothercare within the first 7 days of life and which weighed less than 2000 gr.  The study found that children exposed to kangaroo mothercare had a lower probability of dying, with a RR 0.49 CI 95% (0.29 - 0.82).
	(>20 hours/day) (Conde-Agudelo 2016) Evaluated on: Number of deaths at discharge or at 40-41 weeks of gestational age					

FINDING	INTERVENTIONAL	EVIDENCE				ADDITIONAL CONSIDERATIONS
	Outcome measures	With traditional handling in incubator	With kangaroo mothercare	Difference	Relative measure of effect (95% CI)	Similarly, an analysis of the observational studies was carried out, which included three studies with the same conditions
	Mortality (Conde- Agudelo 2016) Evaluated on: Number of deaths at discharge or at 40-41 weeks of postconceptional age	53 per 1.000	<b>32 per 1.000</b> (21 to 49)	21 less per 1,000 (32 to 4 less)	<b>RR 0.60</b> (0.39 to 0.92)	beginning before the first week of life and weighing less than 2000 gr. It also found a significant reduction in neonatal mortality RR 0.68 Cl 95% (0.58 - 0.79) (1). In the 20-year follow-up of the infants included in the RCT conducted by Charpak et al., the researchers reported a decrease in the risk of accumulated mortality in those under 1800 grams at 20 years adjusted for weight and gestational age (OR 0.39 Cl 95% 0.16 - 0.94) (2). In this analysis it was possible to obtain data of 70% of the subjects included in the original study; to verify in the most approximate way the data of subjects not found, the researchers followed up through the National Registry of Civil Status to identify possible cases. No
	Mortality when kangaroo mothercare is initiated within the first 10 days of life (Conde-Agudelo 2016) Evaluated on: Number of deaths at discharge or at 40-41 weeks of gestational age	62 per 1.000	<b>35 per 1.000</b> (22 to 55)	<b>27 less per 1,000</b> (40 to 7 less)	<b>RR 0.56</b> (0.36 to 0.88)	
						reports were found associated with the identification documents of the mothers.

FINDING	INTERVENTIONAL	. EVIDENCE				ADDITIONAL CONSIDERATIONS
	Outcome measures	With traditional handling in incubator	With kangaroo mothercare	Difference	Relative measure of effect (95% CI)	The studies of Law and Charpak reinforce the findings of the meta-analysis in particular those referring to low birth weight
	Mortality (Conde- Agudelo 2016) Evaluated on: Number of deaths at 6 months of corrected age or of follow-up	80 per 1.000	<b>79 per 1.000</b> (38 to 161)	1 less per 1,000 (41 less to 81 more)	<b>RR 0.99</b> (0.48 to 2.02)	premature infants and with significant findings in the first 28 days and even up to 20 years later.
	Mortality (Conde- Agudelo 2016) Evaluated on: Number of deaths at 12 months of corrected age	55 per 1.000	<b>32 per 1.000</b> (15 to 65)	<b>24 less per 1,000</b> (40 less to 9 more)	<b>RR 0.57</b> (0.27 to 1.17)	
	(kangaroo mothero	care) in terms of a s orns when the overa	ignificant decrease Ill follow-up is evalu	rable effects of the i rable effects of the i rin the mortality of p rated and in particul	oremature and low	

# Acceptability

Is the intervention acceptable to the interested parties?

	s the intervention acceptable to the interested parties?					
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS				
oNo oLikely not oLikely not oYes • Varies oInconclusive	There is no evidence.	There is a probability that some populations will disagree with this benefit (decrease in mortality) of the kangaroo mothercare since it is an intervention that has a series of costs related to the survival of premature and low birth weight babies in terms of attention to future health, the fragility of children, special requirements and implications in care and management for low-income families with a high birth rate.  On the other hand, in other social contexts, the impact of kangaroo mothercare on mortality can be a highly desirable outcome due to the social value of the children and, consequently, the intervention would be acceptable to the parties.  In some scenarios there may be economic interests due to the effect of the intervention in reducing length of stay in the neonatal units.				

Viability Is it possible to i	mplement the intervention?  INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
oNo oLikely not oLikely yes •Yes oVaries oInconclusive	The main universal barrier to the implementation of the kangaroo mothercare is to recognize that the intervention has a cost to the health system (Vesel et al., 2015). In terms of infrastructure (space, chairs, beds for joint lodging), supplies (such as water and food for parents), provisions (nutritional supplement, oximeters, probes, cannula, support strips), and human resources (personnel trained in the unit, accommodation and monitoring during the first year of life) and for parents in terms of transportation. This barrier is rarely reported in the studies and is not recognized by governments, international organizations and NGOs that support the implementation of kangaroo mothercare.  Colombia is an example of a successful implementation in the integration of the kangaroo mothercare into the health system through a package of kangaroo services covered by health insurers. The Ministry of Health in Colombia published in 2017 the technical guidelines for the implementation of the kangaroo mothercare with a list of minimum activities for the care of children born premature and with low birth weight during their first two years of life. (3)  The one-year Colombian Kangaroo follow-up package cost in 2017 the equivalent of 3 days of hospitalization in neonatology, while saving an average 7 days of neonatal unit hospitalization (including ICU).  There are two systematic literature reviews that report a synthesis of evidence from qualitative and observational studies on the barriers and facilitators of the implementation of the KMC, the studies included in the syntheses were not differentiated by the components of the method and are oriented towards three sources: health systems, health professionals, social context and parents (Chan et al., 2017, Smith et al., 2017, Chan et al., 2016, Seidman et al., 2015). They do not incorporate the cost barrier.	For low-income countries with a shortage of incubators, hypothermia is one of the causes of the high mortality rates of premature children. In these scenarios the implementation of the kangaroo mothercare is highly desirable.  However, the kangaroo mothercare method is perceived as the poor's alternative to neonatal care. Kangaroo mothercare does not claim to replace neonatal technology, the method per se does not treat jaundice or sepsis. Kangaroo mothercare is a complex method that complements neonatal care. This is why initiatives to obtain technology and kangaroo mothercare simultaneously must be supported.

Viability Is it possible to implement the intervention?					
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS			
	In table 3 of the Chan et al. publication in the following link: http://www.who.int/bulletin/volumes/94/2/15-157818.pdf the barriers and facilitators of the implementation of the kangaroo mothercare method are synthesized.				

Summary of findings	FINDING						
Strength of evidence	Very low	Low	Moderate	High			Not applicable
Value	Significant uncertainty or variability	Likelihood of significant uncertainty or variability	Likelihood of no significant uncertainty or variability	No significant uncertainty or variability			
Balance of outcome measures	Favors the control	Likely favors the control	Favors neither the inter-vention nor the control	Likely favors the interven-tion	Favors the intervention	Varies	Inconclusive
Acceptability	No	Likely not	Likely yes	Yes		Varies	Inconclusive
Viability	No	Likely not	Likely yes	Yes		Varies	Inconclusive

# Recommendation

Strong	recommendation	Conditional recommendation	Conditional recommendation	Conditional recommendation	Strong recommendation in
against the	intervention	against the intervention	in favor of the intervention or	in favor of the intervention	favor of the intervention
			the control		
0		0	0	0	•

# **A** Conclusion

#### Recommendation

All premature newborns must have access to the Kangaroo Mothercare Method as soon as possible and for as long a period as the baby and mother tolerate it.

#### **Justification**

# Detailed justification Strength of evidence

The general quality of the evidence is moderate, and it is not expected that new evidence will substantially modify the results obtained.

#### Balance of outcome measures

There is strong evidence that the early use of kangaroo mothercare decreases neonatal mortality, a highly desired effect. There is no evidence of undesirable effects that surpass this benefit of the intervention.

### Viability

The implementation of the kangaroo mothercare is viable if the barriers are considered and managed, since facilitating factors and successful experiences in particular contexts give favorable indications of the feasibility of implementation of the method.

# **Subgroup considerations**

Early onset and continuous use of the method (> 20 hours) are significantly associated with reduced mortality, findings that were not established in the intermittent care groups or those that started after 10 days of life (Conde Agudelo 2016).

### **Considerations for implementation**

A public policy that favors the development of programs in different contexts is required.

#### **Investigational priorities**

From a public health point of view, it would be good to design some manuals for equal implementation among all actors (NGOs, Ministries of Health) and adapted to the different levels of care, regardless of the countries and their state of development.

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# Clinical Question 3

Is the initiation of KMC in the delivery room, during the care of preterm infants who do not require specific resuscitation maneuvers, effective in terms of obtaining adequate thermal regulation, preventing heat loss by convection, early bonding, promoting breastfeeding, maintaining physiological stability and hospitalization length when compared to drying and placement under a radiant heat source?

Population	Exposure	Control	Outcome
Recién nacido prematuro en sala de partos	Kangaroo mothercare method	Conventional traditional handling in delivery room	Incidence of hypothermia Episodes of hyperthermia Breastfeeding Physiologic stability Hospital stay

### Response

### Moderate evidence certainty

The certainty in the quality of evidence is moderate for three of the critical outcomes and low for the outcome of the proportion of breastfeeding at discharge. For the outcomes of duration of breastfeeding (long-term) and hospital stay, which are important but not critical, the quality of evidence is very low. For the latter, there are other factors that could have modified the results.

#### Strong recommendation in favor of intervention

The Kangaroo Mothercare method should be initiated from the delivery room for premature newborns over 1200 grams who do not require special resuscitation maneuvers - stable - as long as the mother agrees and is physically able to do it.

### Justification

#### **Values**

It is a highly desirable intervention for the mother-baby dyad as long as the mother is physically able and willing to have skin-to-skin contact with her baby.

#### Effect balance

There is a favorable balance of effects, in particular there is a greater probability of decreasing the risk of hypothermia and increasing physiological stability. Likewise, it is possible to decrease the time of lactation onset.

## *Implementation*

It is easy to implement the KMC method in the delivery room as long as there are precise parameters. It should not be an option but a well-defined routine in its application. Kangaroo positioning should be observed and the observation of the infant should not be the responsibility of the mother in postpartum. KMC should be reconsidered if there is no monitoring of the mother-child dyad, however, the presence of a family member can be encouraged. The need for support of the infant's position with a lycra band should also be considered, as the mother may fall asleep and endanger her baby if the infant slips.

# GRADE pro recommendation

Should kangaroo mothercare method be initiated in the delivery room or should Infants born prematurely or with low birth weight that do not require specific resuscitation maneuvers be dried and placed under a radiant heat source or handled through conventional methods?

Population:	Infants born prematurely or with low birth weight that do not require specific resuscitation maneuvers
Intervention:	Initiation of kangaroo mother method in the delivery room
Control:	Drying and placement of infant under radiant heat source or conventional handling
Principal outcome	Incidence of hypothermia; Incidence of hyperthermia; Maternal lactation; Physiological stability; Hospital stay
measures:	

# **Strength of evidence**

What is the general certainty about the effects of the intervention?

FINDING	INTERVENTIONAL EVIDENCE			ADDITIONAL CONSIDERATIONS
<ul><li>Very low</li><li>Low</li><li>Moderate</li></ul>	Outcome measures	Importance	Strength of evidence (LEVEL)	Only studies in which exposure to the method in the delivery room was clear were selected. Although
∘ High ∘Not applicable	Incidence of hypothermia (Bergman 2004; Nimbalkar 2014; Chi Luong 2015) Evaluated on: Instances of bodily temperature <36.5°C lasting 6 to 48 hours	CRITICAL	⊕⊕⊕ MODERATE <sup>a,b</sup>	other studies reported early onset of the method, it was not clear that all patients included had started the method in the delivery room, this generated heterogeneity in the results and indirect evidence such as those reported in the review of Conde Agudelo (9), reason for which these
	Physiological stability (Bergman 2004 y Chi Luong 2016) Evaluated on: SCRIP at 6 hours of life	CRITICAL	⊕⊕⊕⊖ MODERATE <sup>b</sup>	studies were excluded from being used as evidence for this question.

FINDING	INTERVENTIONAL EVIDENCE			ADDITIONAL CONSIDERATIONS
	Outcome measures	Importance	Certeza en la evidencia (GRADE)	The strength of the evidence is moderate for three of the critical outcomes and low for the outcome of the proportion of maternal
	Time at initiation of breastfeeding (Chi Luong 2015) Evaluated on: Time elapsed in hours	CRITICAL	⊕⊕⊕ MODERATE <sup>c,d</sup>	breastfeeding at discharge. For the outcomes related to duration of breastfeeding (in the long-term) and
	Partial or exclusive breastfeeding at discharge (Anderson 2003, Mörelius 2015) Evaluated on: Number of babies that received lactation at discharge	CRITICAL	⊕⊕⊖⊖ LOW <sup>b,e</sup>	hospital stay, which are important but not critical, the strength of the evidence is very low.  For these latter outcomes, there are other factors that could modify the
	Partial or exclusive breastfeeding after a month (Mörelius 2015; Anderson 2003 y Syfrett 1993) Evaluated on: Number of babies that received maternal lactation at month of life or corrected age	CRITICAL	⊕⊕⊖⊖ LOWb,f	esults.
	Duration of maternal lactation (Syfrett 1993) Evaluated on: Average of days	IMPORTANT	VERY LOW <sup>e,g</sup>	
	Hospital stay (Moore 2016) Evaluated on: Average hours	IMPORTANT	⊕○○○ VERY LOW <sup>b,e</sup>	

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
	a. One of the studies was completed early, which can magnify the effect resulting in an inappropriate perception of increased accuracy, however the other studies that were performed with larger samples replicated the results and completed their follow-up. It was decided not to lower strength of evidence due to this factor since the magnitude of the effect is large, the results are conclusive, and the CI shows a clinically acceptable variability.  b. All the studies are open due to the characteristics of the intervention, there was no blinding of the outcome measures, the risks are not clear in the allocation concealment methods.  c. The study is open due to the characteristics of the intervention, there was no blinding of the evaluator and it is not clear if there was a bias in concealment of the assignment  d. They do not report the standard deviation to look at the differences, the ranges of the comparison groups are wide and there is overlap, however there is a difference in the medians that is clinically significant, therefore the results are not scored negatively e. The results are not conclusive, very wide confidence interval f. The sample size is very small, and the confidence interval is very wide g. g. The study is open, there was no blinding of the evaluator, it is a very small study, it is not clear if the sample is representative of the population (2, 3, 4, 5, 6, 7,8).	

Value Is there significant uncertainty	Is there significant uncertainty or variability in how people value the main outcomes?					
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS				
<ul> <li>Significant uncertainty or variability</li> <li>Likelihood of significant uncertainty or variability</li> <li>Likelihood of no significant uncertainty or variability</li> <li>No significant uncertainty uncertainty or variability</li> </ul>		The specific purpose of starting the kangaroo mother method in the delivery room is to avoid the separation of the mother and the newborn and to avoid the stress it may cause to the premature newborn. The reasons why premature and low birth weight babies are separated from their mothers after delivery include concerns about the risk of hypothermia and physiological destabilization. The prevention of separation of the dyad favored an earlier start of breastfeeding. Given that the studies do not evaluate the separation as an outcome, since this is the comparator of the intervention, the main outcomes are - without discussion - the reasons for which they are separated (hypothermia and physiological stability) and additionally the beginning of maternal lactation.				

Balance of outcome measures  Does the balance between favorable and unfavorable outcomes favor the intervention or the control?						
FINDING	INTERVENTIONAL EVIDENCE					ADDITIONAL CONSIDERATIONS
<ul> <li>Favors the control</li> <li>Likely favors the control</li> <li>Favors neither the intervention nor the control</li> <li>Likely favors the</li> </ul>	Outcome measures	With drying and placement of infant under radiant heat source or conventional handling	With initiation of kangaroo mother method in the delivery room	Difference	Relative measure of effect (95% CI)	The intervention was initiated in stable newborns and whose mothers or fathers were able to start the position immediately postpartum. (3) The initiation of the kangaroo mother method in the delivery room likely significantly decreases the risk of
intervention • Favors the intervention • Varies • Inconclusive	Incidence of hypothermia (Bergman 2004; Nimbalkar 2014; Chi Luong 2015) Evaluated on: Instances of bodily temperature <36.5°C lasting 6 to 48 hours	518 per 1.000	<b>41 per 1.000</b> (16 to 109)	476 less per 1,000 (502 to 409 less	<b>RR 0.08</b> (0.03 to 0.21)	hypothermia; in the same way it likely results in a greater and significant physiological stability, measured with SCRIP, which evaluates the parameters of heart rate, respiratory rate and blood oxygen saturation in the first hours of life; and decreases the time to initiate breastfeeding, compared to conventional handling. The results of breastfeeding after one month, although conclusive, come from a very small sample.

FINDING	INTERVENTIONA	ADDITIONAL CONSIDERATIONS				
	Outcome measures	With drying and placement of infant under radiant heat source or conventional handling	With initiation of kangaroo mother method in the delivery room	Difference	Relative measure of effect (95% CI)	No conclusions can be drawn regarding breastfeeding upon discharge, duration of breastfeeding and hospital stay from the evidence found.  No undesirable effects were
	Physiological stability (Bergman 2004 y Chi Luong 2016) Evaluated on: SCRIP at 6 hours of life	Average physiological stability (Bergman 2004 y Chi Luong 2016) was 0 standard deviations	Average physiological stability (Bergman 2004 y Chi Luong 2016) was 0.87 standard deviations more than the control. (0.51 to 1.23 higher)	Standardized mean difference of 0.87 standard deviations higher (0.51 to 1.23 higher)		found with the intervention.
	Time at initiation of breastfeeding (Chi Luong 2015) Evaluated on: Time elapsed in hours	The average time to start lactation in the experimental group was of 0.8 (0.0-36.0) and in the control group 48.0 (12.0-72.0)				

FINDING	INTERVENTIONAL EVIDENCE		ADDITIONAL CONSIDERATIONS			
	Outcome measures	With drying and placement of infant under radiant heat source or conventional handling	With initiation of kangaroo mother method in the delivery room	Difference	Relative measure of effect (95% CI)	
	Partial or exclusive breastfeeding at discharge (Anderson 2003, Mörelius 2015) Evaluated on: Number of babies that received lactation at discharge	806 per 1.000	<b>895 per 1.000</b> (718 to 1.000)	89 more per 1,000 (89 less to 298 more)	<b>RR 1.11</b> (0.89 to 1.37)	
	Partial or exclusive breast-feeding after a month (Mörelius 2015; Anderson 2003 y Syfrett 1993) Evaluated on: Number of babies that received mater-nal lactation at month of life or corrected age	571 per 1.000	<b>817 per 1.000</b> (600 to 1.000)	<b>246 more per</b> <b>1,000</b> (29 to 543 more)	<b>RR 1.43</b> (1.05 to 1.95)	
	Children included in the studies had APG of life and weighted more than 1200 g. (Bergman et al., 2004, Chi Luong et al., 2 al., 2014, Moore et al., 2016) (Syfrett EB.,	016, Mörelius et al.,	, ,			

Is the intervention acceptable to the interested parties?						
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS				
<ul> <li>No</li> <li>Likely not</li> <li>Likely yes</li> <li>Yes</li> <li>Varies</li> <li>Inconclusive</li> </ul>	Among the findings of the systematic review of the qualitative evidence on skin-to-skin care in neonates, the authors (Anderzén-Carlsson et al., 2014) described the following reports of mothers' experiences when starting the method in the delivery room among their findings: - surprise with satisfaction, - feeling of calm and peace, - fascination with the movements and abilities of the baby, - feeling the palpitations of their child, - feelings of love and compassion, - decreased feelings of guilt, anguish, fear and rejection.	It is suspected that some health professionals view the non-separation of the mother-baby dyad as having low importance. They do not consider that moment of life critical in terms of human development since the priority is the survival of the mother and the child and the stabilization techniques required to achieve it.				

Viability Is it possible to implement the intervention?					
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS			
<ul><li>No</li><li>Likely not</li><li>Likely yes</li><li>Yes</li><li>Varies</li><li>Inconclusive</li></ul>	There is no evidence	It is conditioned on the interests and will of institutions and health professionals.			

Summary of findings	FINDING						
Strength of evi-	Very low	Low	Moderate	High			Not applicable
dence	0: :0 1	1 1 1 1 6	1 1 1 1 1 6	Nc .			
Value	Significant uncer-tainty or variability	Likelihood of sig-nificant uncertain-ty or variability	Likelihood of no signifi-cant uncertainty or vari-ability	No significant un-certainty or varia-bility			
Balance of	Favors the	Likely favors the	Favors neither	Likely favors the	Favors the	Varies	Inconclusive
outcome	control	control	the in-tervention	inter-vention	intervention		
measures			nor the con-trol				
Acceptability	No	Likely not	Likely yes	Yes		Varies	Inconclusive
Viability	No	Likely not	Likely yes	Yes		Varies	Inconclusive

# Recommendation

Strong	recommendation	Conditional recommendation	Conditional recommendation	Conditional recommendation	Strong recommendation in
against the	intervention	against the intervention	in favor of the intervention or	in favor of the intervention	favor of the intervention
			the control		
0		0	0	0	•

#### Conclusion

#### Recommendation

The Kangaroo Mothercare method should be initiated in the delivery room for premature newborns greater than 1200 gr that do not require special resuscitation maneuvers - stable - as long as the mother agrees and has the physical condition to do it.

#### **Justification**

## Strength of evidence

The strength of evidence for the critical outcome measures is moderate.

#### **Values**

It is a highly desirable intervention for the mother-baby dyad as long as the mother has the disposition and physical condition to hold her baby in skin-to-skin contact.

#### Balance of outcome measures

There is a favorable balance of the outcomes, in particular there is a greater probability of decreasing the risk of hypothermia and increasing the physiological stability. In the same way, it is possible that the time to initiate lactation can be reduced.

## **Subgroup considerations**

Although a subgroup analysis was not done, the newborns included in the studies weighted more than 1200 gr, with gestational ages of 32 or more weeks, and were stable. There is no evidence of initiation of the Kangaroo Mothercare method in the delivery room with preterm infants weighing less than 1200 gr or younger than 32 weeks.

### **Considerations for implementation**

It is easy to implement the Kangaroo Mothercare method in the delivery room as long as precise parameters exist. It should not be an option but a well-defined routine in its implementation. The placement of the infant in the kangaroo position should be supervised and the supervision of the child cannot be the responsibility of the mother in postpartum; the initiation of the Kangaroo Mothercare method should be reconsidered if there is no monitoring of the mother-child dyad, however, the presence of a family member can be encouraged for support. It is also necessary to consider the need to hold the position of the child using a lycra band since the mother can fall asleep and endanger her baby if the child slips.

#### **Investigational priorities**

Controlled clinical trials are required in which lactation outcomes are measured in addition to hypothermia and physiological stability. From the qualitative point of view, to measure the attitudes and willingness of the staff to initiate the KMC method in the delivery room, as well as the perception of mothers and fathers about it. There is an investigation in progress in Norway, in which they evaluate the use of the Kangaroo Mothercare method in the delivery room on preterm infants from 28 to 31 weeks with a weight higher than 1000 gr. (10).

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## Clinical Question 4

In stable premature or low birth weight newborns, is the early initiated in-hospital KMC, compared to the traditional incubator care, equally effective to favor breastfeeding, decrease hospitalization length and risk of infection, as well as rewarding for parents and the healthcare team?

Population	Intervention	Control	Principal outcome measures
Stable preterm or low birth weight infants tolerant to manipulation	In-hospital Kangaroo Mothercare Method (early kangaroo)	Traditional hatchery handling	Breastfeeding (exclusive and/or partial at discharge or 40 wk, between 1 and 3 months and at 6 months). Hospital stay, stay or rehospitalization according to weight ranges. Healthcare-associated infection Parental satisfaction Health care team satisfaction Postpartum depression

# Response.

## Moderate certainty of the evidence

### Strong recommendation in favor of the intervention

In stabilized preterm infants (those who can be touched and transferred from the incubator to the mother's chest without variations in their vital signs) and who are not regulating their temperature yet, if they have not started KMC in the delivery room, it is recommended to start KMC with adaptation to the position in the NICU or in mother-child accommodation. If it is initiated intermittently when the infant is in the NICU, it can be gradually lengthened as the mother and infant tolerate the position. The idea is to ensure that the mother and child maintain the kangaroo position permanently, at least during 12 to 24 hours a day depending on the existing facilities in the neonatal unit (comfortable chairs, food for the mother). If it is demonstrated that the infant properly regulates temperature and gains weight while in the kangaroo position, it is recommended to keep the infant in the position, as long as possible, during hospitalization.

The second component of the KMC method, nutrition based on exclusive breastfeeding when possible, should be initiated as soon as it is tolerated by the infant and in accordance with the recommendations formulated in questions 17 to 19.

The third component, early discharge home in the kangaroo position, is based on the success of the kangaroo adaptation (position and nutrition) as well as on the compliance with the criteria formulated in the latest recommendations in this quideline.

#### **Justification**

Early initiated in-hospital KMC is an effective intervention for the care of preterm infants. Specifically, the evidence found of moderate quality demonstrates that infants under KMC are more likely to receive exclusive or partial breastfeeding than those receiving traditional incubator care. Regarding hospital stay (length or rehospitalization) up to 40 weeks of gestational age from the time physiological stability is obtained is less, there is less risk of nosocomial infection, and a greater maternal satisfaction with less risk of postpartum depression.

No evidence of staff satisfaction was found, however, the qualitative evidence found gives us clarity about the acceptance of the intervention by health professionals. In the same way, the parents value, in a meaningful way, the possibility of being with their babies, providing them with the necessary care from their parental role.

# GRADEpro recommendation

	Should kangaroo mothercare method be initiated early/implemented in-hospital for stable infants born prematurely or with low birth weight or should conventional handling in an incubator be used?					
Population:	Stable infants born prematurely or with low birth weight					
Intervention:	Early initiation, in-hospital implementation of kangaroo mothercare method					
Control:	Conventional handling in incubator					
Principal outcome	Incidence of hypothermia; Incidence of hyperthermia; Psychomotor maturation; Maternal lactation; Hospital stay; Nosocomial					
measures:	infection or sepsis; Parental satisfaction; Staff satisfaction					

# Strength of evidence

What is the general certainty about the effects of the intervention?

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS		
<ul><li>Very low</li><li>Low</li><li>Moderate</li><li>High</li><li>Not applicable</li></ul>	Outcome measures	Importance	Strength of evidence (LEVEL)	The certainty of the evidence is moderate for most of the outcomes related to breastfeeding
	Maternal lactation (Conde-Agudelo 2016; Hake-Brooks 2008) Evaluated on: Exclusivity of breastfeeding at discharge or at 40-41 weeks of gestational age	CRITICAL	⊕⊕⊕⊖ MODERATEª	and hospital stay and high for those related to maternal satisfaction.
	Maternal lactation (Conde-Agudelo 2016; Hake-Brooks 2008) Evaluated on: Partial or exclusive breastfeeding at discharge or at 40-41 weeks of postconceptional age	CRITICAL	⊕⊕⊕○ MODERATE <sup>a,b</sup>	For the postpartum depression outcome, the clinical trials found were of very low quality and the measurements used showed only changes in the scores on the depression scales.

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS		
	Outcome measures	Importance	Strength of evidence (LEVEL)	However, in a recent observational study, better quality evidence was found to determine the frequency
	Maternal lactation (Conde-Agudelo 2016, Hake-Brooks 2008) Evaluated on: Partial or exclusive breastfeeding at 1- to 3-month follow up	CRITICAL	⊕⊕⊕⊖ MODERATE <sup>b,c</sup>	of outcome measures between the control and intervention groups, but only for women who underwent a caesarean section.
	Maternal lactation (Conde-Agudelo 2016) Evaluated on: Partial or exclusive breastfeeding at 6-month follow up	eding at IMPORTANTE DOWN,c,d Hospital stay differently am affecting the control of the control o	Hospital stay was measured differently among the studies, affecting the certainty of the	
	Hospital stay (continuous stay or rehospitalization) up to 40 weeks of gestational age from the moment in which physiological stability is obtained (eligibility) in the subgroup of children hospitalized in the newborn unit, adjusted by Ballard for newborns weighing 1200 grams or less. Evaluated on: Number of days Follow up: 40 weeks	CRITICAL	⊕⊕⊕ HIGH <sup>e</sup>	evidence. Nonetheless, better quality evidence was found in the subgroup analysis by weight and gestational age of the Charpak study.
	Hospital stay (continuous stay or rehospitalization) up to 40 weeks of gestational age from the moment in which physiological stability is obtained (eligibility) in the subgroup of children hospitalized in the newborn unit, adjusted by Ballard for newborns weighing between 1201 and 1500 grams Evaluated on: Number of days Follow up: 40 weeks	CRITICAL	⊕⊕⊕ MODERATE <sup>e</sup>	

FINDING	INTERVENTIONAL EVIDENCE				
	Outcome measures	Importance	Strength of evidence (LEVEL)		
	Hospital stay (continuous stay or rehospitalization) up to 40 weeks of gestational age from the moment in which physiological stability is obtained (eligibility) in the subgroup of children hospitalized in the newborn unit, adjusted by Ballard for newborns weighing between 1501 and 1800 grams. Evaluated on: Number of days.Follow up: 40 weeks	CRITICAL	⊕⊕⊕○ MODERATE <sup>e</sup>		
	Hospital stay (continuous stay or rehospitalization) up to 40 weeks of gestational age from the moment in which physiological stability is obtained (eligibility) in the subgroup of children hospitalized in the newborn unit, adjusted by Ballard for newborns weighing more than 1800 grams. Evaluated on: Number of days. Follow up: 40 weeks	CRITICAL	⊕⊕⊕○ MODERATE <sup>d</sup>		
	Hospital stay with in-hospital kangaroo mothercare method (Conde-Agudelo 2016; Lumbanraja 2016) Evaluated on: Number of days until discharge	CRITICAL	LOW <sup>f,g</sup>		
	Nosocomial infection or sepsis (Conde-Agudelo 2016) Evaluated on: At discharge or at 40-41 weeks of chronological age	CRITICAL	⊕⊕⊕○ MODERATE®		
	Parental satisfaction (Conde-Agudelo 2016) Evaluated on: Mother (Yes or No)	CRITICAL	⊕⊕⊕⊕ HIGH		
	Parental satisfaction (Conde-Agudelo 2016) Evaluated on: Father (Yes or No)	CRITICAL	⊕⊕⊕○ MODERATE <sup>d</sup>		
	Postpartum depression (Athanasopoulou y Fox, 2014)	CRITICAL	⊕○○○ VERY LOW <sup>h,i</sup>		

FINDING	INTERVENTIONAL EVIDENCE			ADDITIONAL CONSIDERATIONS
	Outcome measures	Importance	Strength of evidence (LEVEL)	
	Postpartum depression in women taken to caesarean section, mothers of preterm infants (Herizchi, 2017). Evaluated on: Frequency of cases measured with the Edinburgh scale of postpartum depression. Follow up: Average 20 days	CRITICAL	⊕⊕⊕○ MODERATE <sup>j</sup>	
	a. In the studies Ali 2009 and Charpak 1997 there is no information about the nather possible risk of predicting future allocation. Kumbhojkar 2016 does not ade study, but reports that there were significant losses in the control group. b. Significant percentage of losses in Suman 2008 c. Although the heterogeneity in the studies is high, the results of the individual mothercare method intervention. The heterogeneity can be explained by the was (continuous, intermittent, in-hospital or outpatient) and the way in which the ou at which it was measured (chronological age or corrected age), among other fad. In the studies Ali 2009 and Charpak 1997, randomization by groups was use predicting future allocation e. It is not conclusive. It is a single study that does not have enough power to describe the studies and charpak 1997.	equately report loss studies are all in fa by the kangaroo me actome was measul actors. d, which has the po	es throughout the vor of the kangaroo thod was applied red and the moment ssible risk of	
	f. The sample size is very small but the difference is both statistically and clinic g. In the studies Ali 2009 and Acharya 2014, randomization methods were used future allocation.  h. Significant percentage of losses in Suman 2008 i. There is great heterogeneity in the results of the studies, a variability is observed direction of the results that is not clearly explainable j. Multiple sources of risk of bias were found in the included studies due to non-interventions were found, there is suspicion of selection bias due to differences	eally significant of that have the possource wed in the length of comparability of the salls and the salls are salls.	sible risk of predicting stay and in the e groups: co-	

Value Is there significant un	certainty or variability in how people value the main outcomes?	
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
oUncertainty o Significant variability o Likelihood of significant uncertainty or variability o Likelihood of no significant uncertainty or variability • No significant uncertainty or variability	Also in some studies there was no independent or blind evaluation. Quasi-experimental studies were included. There are differences between the results of the studies.  The experimental group had a frequency of using the kangaroo position at least 3 times for one hour each day and the control group an exposure of less than 3 times or less than one hour per day (1, 2, 3, 4, 5, 6, 7, 8).  Regarding the outcome of parental satisfaction, there are qualitative studies that report the experiences and satisfaction of the parents with the use of the kangaroo mothercare method. The results are consistent in the positive descriptions associated with the method.  Ikonen et al. (2015), conducted a systematic review of qualitative studies that evaluated the experiences related to breastfeeding of premature babies in neonatal intensive care units. Among their findings, they recount mothers' perceptions of maternal breastfeeding. The benefit of breastfeeding as the best source of nutrition for their babies is of particular relevance for mothers, because it prevents exposure to health problems and produces benefits for the mothers themselves (9).	From the perspective of healthcare personnel, breastfeeding is a highly desirable result.  The initial separation of the mother and child is harmful and the decrease in hospital stay goes hand in hand with the involvement of parents in the care of their child and their empowerment as the best caregivers. When the Kangaroo Mothercare Program was started at the Maternal and Child Institute in 1978, one of the most striking findings was the decrease in dropouts due to the shorter stay of the child in the neonatal unit. In addition to this, experience shows that only when parents finally have their baby at home with them, do they manage to feel completely as "parents", they are willing to do anything necessary to return home with their child.

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
	In another qualitative study conducted on the experiences of mothers over 35 years old, whose premature babies were treated in the kangaroo program of San Ignacio University Hospital (10), the researcher found that the majority (78%) experienced breastfeeding as a positive experience. In particular, this research highlights that breastfeeding for these mothers was a very special moment of emotional intimacy in which the mother could caress, sing and talk to her baby. Although a proportion had negative experiences related to the difficulties of breastfeeding, including the frustration related to not achieving exclusive breastfeeding and the concern of having to supplement with another milk, these results indicate a high value of exclusive maternal breastfeeding for the care of the premature baby.  With respect to outcomes related to hospital stay, nosocomial infections, parental and staff satisfaction, as well as the effects on postpartum depression, there is no evidence that indicates a variability or difference in the value that neither parents nor healthcare personnel would place on these.	Given these arguments, length of hospital stay can be considered a highly valued outcome by the parents.  Nosocomial infection is an outcome directly related to hospital stay. Infection in babies is a permanent concern of the parents because of the health consequences that infections bring, as well as the accompanying devastating emotional effects. In this sense, this outcome is also critical for parents and healthcare personnel due to the epidemiological implications and the increase in neonatal mortality.  Postpartum depression is another highly valued outcome that has previously not been considered.  Finally, the evaluation of neonatal unit staff satisfaction is a highly relevant aspect because the staff is a fundamental factor in the implementation of the intervention.

# Balance of outcome measures

Does the balance between favorable and unfavorable outcomes favor the intervention or the control?

etween lavorable a	ilu ulliavolable ou	tcomes lavor the in	iter verition or the	control.	
INTERVENTIONA	L EVIDENCE				ADDITIONAL CONSIDERATIONS
Outcome measures	With conventional handling in incubator	With early initia- tion or in-hospi- tal implementa- tion of kangaroo mothercare method	Difference	Relative measure of effect (95% CI)	The studies indicate that the kangaroo mothercare method results in higher rates of exclusive or partial breastfeeding at discharge or at 40 weeks of life and at 3 months of follow-up. The intervention with the kangaroo mothercare method
Maternal lactation (Conde-Agudelo 2016; Hake-Brooks 2008) Evaluated on: Exclusivity of breastfeeding at discharge or at 40-41 weeks of gestational age	562 per 1.000	<b>652 per 1.000</b> (607 to 702)	90 more per 1,000 (45 to 140 more)	<b>RR 1.16</b> (1.08 to 1.25)	decreased the length of hospital stay, particularly in the smaller preterm infants the difference in length of stay is greater than in preterm infants of greater weight. Similarly, the studies found a reduction in the risk of nosocomial infection or sepsis, and a higher probability of satisfaction was found among mothers than among fathers related to the use of kangaroo mothercare method. Lastly, a lower risk of postpartum depression was found in mothers of premature babies who had used the kangaroo mothercare method
	Outcome measures  Maternal lactation (Conde-Agudelo 2016; Hake-Brooks 2008) Evaluated on: Exclusivity of breastfeeding at discharge or at 40-41 weeks of	Outcome measures  With conventional handling in incubator  Maternal lactation (Conde-Agudelo 2016; Hake-Brooks 2008) Evaluated on: Exclusivity of breastfeeding at discharge or at 40-41 weeks of	INTERVENTIONAL EVIDENCEOutcome measuresWith conventional handling in incubatorWith early initiation or in-hospital implementation of kangaroo mothercare methodMaternal lactation (Conde-Agudelo 2016; Hake-Brooks 2008) Evaluated on: Exclusivity of breastfeeding at discharge or at 40-41 weeks of562 per 1.000 (607 to 702)	INTERVENTIONAL EVIDENCEOutcome measuresWith conventional handling in incubatorWith early initiation or in-hospital implementation of kangaroo mothercare methodMaternal lactation (Conde-Agudelo 2016; Hake-Brooks 2008) Evaluated on: Exclusivity of breastfeeding at discharge or at 40-41 weeks of562 per 1.000652 per 1.000 (607 to 702)90 more per 1,000 (45 to 140 more)	Outcome measuresWith conventional handling in incubatorWith early initiation or in-hospital implementation of kangaroo mothercare methodDifferenceRelative measure of effect (95% CI)Maternal lactation (Conde-Agudelo 2016; Hake-Brooks 2008) Evaluated on: Exclusivity of breastfeeding at discharge or at 40-41 weeks of562 per 1.000 (607 to 702)90 more per 1,000 (45 to 140 more)RR 1.16 (1.08 to 1.25)

FINDING	INTERVENTIONAL	EVIDENCE				ADDITIONAL CONSIDERATIONS
	Outcome measures	With conventional handling in incubator	With early initia- tion or in-hospi- tal implementa- tion of kangaroo mothercare method	Difference	Relative measure of effect (95% CI)	Regarding post-partum depression, one mother's answer to the question of a visitor at the kangaroo mothercare program in Colombia was that experience shows that parents are so involved in the care of their premature child in the
	Maternal lactation (Conde-Agudelo 2016; Hake-Brooks 2008) Evaluated on: Partial or exclusive breastfeeding at discharge or at 40-41 weeks of postconceptional age	762 per 1.000	<b>914 per 1.000</b> (823 to 1.000)	<b>152 more per 1,000</b> (61 to 259 more)	<b>RR 1.20</b> (1.08 to 1.34)	hospital and then in the home that they do not have time left over to dedicate to depression. A father in Spain also responded that, for him, the kangaroo mothercare program was better than an antidepressant treatment, and a mother added that the kangaroo mothercare made her go from worrying to taking care of her son. These simple sentences from parents of the Hospital 12 October in Madrid illustrate the relationship between kangaroo mothercare and post-partum depression. Parents recover their role of caregiver without minding the workload, the important thing is being able to be and act as a parent.

FINDING	INTERVENTIONA	L EVIDENCE				ADDITIONAL CONSIDERATIONS
	Outcome measures	With conventional handling in incubator	With early initiation or in-hospital implementation of kangaroo mothercare method	Difference	Relative measure of effect (95% CI)	No evidence was found regarding staff satisfaction, the information available in observational studies refers to attitudes, beliefs and knowledge about the method. Qualitative studies describe perceptions of healthcare personnel and barriers and
	Maternal lactation (Conde-Agudelo 2016, Hake-Brooks 2008) Evaluated on: Partial or exclusive breastfeeding at 1- to 3-month follow up	711 per 1.000	<b>847 per 1.000</b> (754 to 953)	135 more per 1,000 (43 to 242 more)		enablers to the implementation of the intervention, which do not correspond to the desired outcome measure.  Based on the experience in Colombia, participating healthcare personnel pass through different phases: the first is fear for the safety of the baby and the concern for having additional work, the second in which they assume their role and educate the parents in the care of the premature baby, and third in which they feel proud of the results obtained by their students.

FINDING	INTERVENTIONAL EVI	INTERVENTIONAL EVIDENCE						
	Outcome measures	With conventional handling in incubator	With early initiation or in- hospital implementation of kangaroo mothercare method	Difference	Relative measure of effect (95% CI)			
	Evaluated on: Number of days Follow up: 40 weeks	of gestational age from the moment in which physiological stability is obtained (eligibility) in	The average length of hospital stay (continuous stay or rehospitalization) up to 40 weeks of gestational age from the moment in which physiological stability is obtained (eligibility) in the subgroup of children hospitalized in the newborn unit, adjusted by Ballard for newborns weighing 1200 grams or less in the intervention group was 7.71 fewer days (12.55 to 2.87 fewer days)	Difference of averages of 7.71 fewer days (12.55 to 2.87 fewer days)				

FINDING	INTERVENTIONAL	EVIDENCE				ADDITIONAL CONSIDERATIONS
	Outcome measures	With conventional handling in incubator	With early initiation or in-hospital implementation of kangaroo mothercare method	Difference	Relative measure of effect (95% CI)	
	Hospital stay (continuous stay or rehospitalization) up to 40 weeks of gestational age from the moment in which physiological stability is obtained (eligibility) in the subgroup of children hospitalized in the newborn unit, adjusted by Ballard for newborns between 1201 and 1500 grams Evaluated on: Number of days Follow up: 40 weeks	stay (continuous stay or rehospitalization) up to 40 weeks of gestational age from the moment in which physiological stability is obtained (eligibility) in the subgroup of children hospitalized in the newborn unit, adjusted by Ballard for newborns between 1201 and 1500 grams	The average length of hospital stay (continuous stay or rehospitalization) up to 40 weeks of gestational age from the moment in which physiological stability is obtained (eligibility) in the subgroup of children hospitalized in the newborn unit, adjusted by Ballard for newborns between 1201 and 1500 grams in the intervention group was 5.2 fewer days (8.24 to 2.16 fewer days)	Difference of averages of <b>5.2 fewer days</b> (8.24 to 2.16 fewer days)		

FINDING	INTERVENTIONAL EVIDENCE							
	Outcome measures	With conventional handling in incubator	With early initiation or in- hospital implementation of kangaroo mothercare method	Difference	Relative measure of effect (95% CI)			
	the subgroup of children hospitalized in the newborn	The average length of hospital stay (continuous stay or rehospitalization) up to 40 weeks of gestational age from the moment in which physiological stability is obtained (eligibility) in the subgroup of children hospitalized in the newborn unit, adjusted by Ballard for newborns between 1501 and 1800	The average length of hospital stay (continuous stay or rehospitalization) up to 40 weeks of gestational age from the moment in which physiological stability is obtained (eligibility) in the subgroup of children hospitalized in the newborn unit, adjusted by Ballard for newborns between 1501 and 1800 grams in the intervention group was 3.36 fewer days (5.85 to 0.87 fewer days)	Difference of averages of <b>3.36</b> fewer days (5.85 to 0.87 fewer days	-			

	LINOL	INTERVENTIONAL EVIDENCE						
Outcome measures	With conventional handling in incubator	With early initiation or in-hospital implementation of kangaroo mothercare method	Difference	Relative measure of effect (95% CI)				
Hospital stay (continuous stay or rehospitalization) up to 40 weeks of gestational age from the moment in which physiological stability is obtained (eligibility) in the subgroup of children hospitalized in the newborn unit, adjusted by Ballard for newborns weighing more than 1800 grams Evaluated on: Number of days Follow up: 40 weeks	The average length of hospital stay (continuous stay or rehospitalization) up to 40 weeks of gestational age from the moment in which physiological stability is obtained (eligibility) in the subgroup of children hospitalized in the newborn unit, adjusted by Ballard for newborns weighing more than 1800 grams was 0 days	The average length of hospital stay (continuous stay or rehospitalization) up to 40 weeks of gestational age from the moment in which physiological stability is obtained (eligibility) in the subgroup of children hospitalized in the newborn unit, adjusted by Ballard for newborns weighing more than 1800 grams in the intervention group was 0.85 fewer days (3.67 fewer to 1.97 more days)	Difference of averages of <b>0.85 fewer days</b> (3.67 fewer to 1.97 more days)	-				

FINDING	INTERVENTIONAL EVIDENCE						
	Outcome measures	With conventional handling in incubator	With early initiation or in- hospital implementation of kangaroo mothercare method	Difference	Relative measure of effect (95% CI)		
	Hospital stay with in-hospital kangaroo mothercare method (Conde-Agudelo 2016; Lumbanraja 2016) Evaluated on: Number of days until discharge	The average leng- th of hospital stay with intrahospital kangaroo mother- care method (Con- de-Agudelo 2016; Lumbanraja 2016) was 7.8 days	The average length of hospital stay with in-hospital kangaroo mothercare method (Conde-Agudelo 2016; Lumbanraja 2016) in the intervention group was 1.96 fewer days (3.64 to 0.29 fewer days	Difference of averages of <b>1.96</b> <b>fewer days</b> (3.64 to 0.29 fewer days)			
	Nosocomial infection or sepsis (Conde-Agudelo 2016) Evaluated on: At discharge or at 40-41 weeks of chronological age	114 per 1.000	<b>40 per 1.000</b> (25 to 61)	<b>74 less per 1,000</b> (89 to 52 less)	<b>RR 0.35</b> (0.22 to 0.54)		

FINDING	INTERVENTIONAL EVI	ADDITIONAL CONSIDERATIONS				
	Outcome measures	With conventional handling in incubator	With early initiation or in- hospital implementation of kangaroo mothercare method	Difference	Relative measure of effect (95% CI)	
	Parental satisfaction (Conde-Agudelo 2016) Evaluated on: Mother (Yes or No)	778 per 1.000	<b>910 per 1.000</b> (817 to 1.000)	<b>132 more per</b> <b>1,000</b> (39 to 233 more)	<b>RR 1.17</b> (1.05 to 1.30)	
	Parental satisfaction (Conde-Agudelo 2016) Evaluated on: Father (Yes or No)	810 per 1.000	<b>826 per 1.000</b> (737 to 923)	16 more per 1,000 (73 less to 113 more)	<b>RR 1.02</b> (0.91 to 1.14)	
		I				

NDING	INTERVENTIONAL EVIDENCE					ADDITIONAL CONSIDERATIONS
	Outcome measures	With conventional handling in incubator	With early initiation or in- hospital implementation of kangaroo mothercare method	Difference	Relative measure of effect (95% CI)	
		found significant digroup compared to Badiee 2016 study, when reviewed in is	dies reported in the review by Afferences in the mood of wome those in the control group, whi no differences were found with colation, but a difference was for everall evaluation of the scale	en in the kangaroo rile the other four did the GHQ depression the GHQ depression	nothercare not. In the on subscale	
	Postpartum depression in women taken to caesarean section, mothers of preterm infants (Herizchi, 2017) Evaluated on: frequency of cases measured with the Edinburgh scale of postpartum depression Follow up: Average 20 days	800 per 1.000	<b>248 per 1.000</b> (136 to 456)	<b>552 less per 1,000</b> (664 to 344 less)	<b>RR 0.31</b> (0.17 to 0.57)	

Acceptability Is the intervention	Acceptability Is the intervention acceptable to the interested parties?					
FINDING	INTERVENTIONAL EVIDENCE	A D D I T I O N A L CONSIDERATIONS				
o No o Likely not • Likely yes o Yes o Varies o Inconclusive	Acceptability to the parents:  In multiple studies, parents mainly recount good experiences with skin-to-skin contact, such as joy and immediate love at first contact in the kangaroo position and with first eye contact, some even described it as a gift from God, which in turn was accompanied by a decrease in the feeling of guilt, anguish, fear and rejection (14, 15).  Even though some mothers experienced some initial discomfort feeling sweaty, they appreciated the experience. During the experience of providing skin-to-skin contact, mothers describe that they experienced calm, peace and relaxation, as well as fascination with the movements of the baby and their efforts to look around. Studies found that parents were delighted to observe the growth of their baby and to feel their beating heart (15).  Additionally, skin-to-skin contact helped the mothers reflect on and manage their feelings about having given birth to a premature child, and contributed to the mothers' need for affection after the birth experience. Seeing the child's growing strength helps alleviate feelings of guilt and fear, increasing the parents' hopes for their child's survival. Parents also consider that skin-to-skin contact is a natural instinct, related to the desire to protect their baby (15).					

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
	Mothers believe that providing skin-to-skin contact helped them with managing the baby with confidence and with breastfeeding, preparing them to take responsibility for the baby's care after discharge, as well as contributing to their need to feel that they have some responsibility related to the care of their child while hospitalized. The fathers, in turn, manifest wanting to be instructed on the method by their partners. (15).	
	Additionally, in many societies, the role of mother is of utmost importance in the construction of the social identity of women, and the method of skin-to-skin care helps many mothers in this process, as well as their partners to assume their role as the father. Likewise, the consequent increase in the parents' self-esteem helps in other aspects, such as the decrease in fear generated by the baby's monitoring equipment and an increase in the feeling of control (15, 16).	
	As for other positive practical effects, mothers learn to recognize the normal pattern of breathing, temperature, hunger and sleep of their baby, and can therefore recognize alterations easier and faster. This sense of security and competence decreases their anxiety. Fathers recognize that skin-to-skin contact is an important intervention in the recovery of their premature baby and in the establishment of maternal breastfeeding, in addition to considering it a pleasant experience for the baby. Mothers feel that skin-to-skin contact conveys affection, security, courage and hope to their child (15).	
	Some mothers who expressed fear of establishing a bond with their child, if he or she is very fragile, considered that skin-to-skin contact is necessary (15, 16).	
	Some fathers believe that skin-to-skin contact should preferably be carried out by the mother since the baby prefers her smell and the comfort of breastfeeding and some even state that they do not consider the male body appropriate to provide contact. Additionally, some mothers with older children may feel they are neglecting them by spending so much time caring for their premature baby in skin-to-skin contact, although in general their partners accepted having to take care of the older children (15).	

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
	Some mothers reported other difficulties in making skin-to-skin contact, including having a lot of pain due to childbirth; fear of harming the baby, especially their navel; and some believe that the chest is not a comfortable place to carry their baby, as the back is stronger since there are communities accustomed to carrying their children in this way (13).	
	Acceptability to the healthcare personnel:	
	Qualitative evidence supports the notion that nursing staff view skin-to-skin contact positively for several reasons, such as: the possibility for parents to see their child earlier, the close contact that allows parents to learn to interpret their child's signals, and their greater participation in the care of their newborn, which fosters greater confidence in the parents. The nurses also consider that the practice is beneficial for the babies themselves, including their stability, growth, sleep, lactation, and even indicate that there is a lower risk of infection by manipulation (12).	
	The staff is also aware of the importance of their participation and support of parents for the success of the kangaroo mothercare method and that it is important to listen to their preferences and decisions. They consider that an environment without a lot of noise or light is important for a better practice of the method (12). In some countries, especially Scandinavian countries, skin-to-skin contact has been fully incorporated into the role of the nursing staff, so the parental bond is seen as a priority in the care of the baby. The nurses consider it an essential part of their work to support the development of an empowered fatherhood, and even consider that the importance of skin-to-skin contact is proportional to the fragility of the newborn and express positive personal emotions when implementing the method (11).  On the other hand, it has been described that the practice of kangaroo mothercare can be a cause of stress for nurses because of the feeling of not having control over the care of the baby and the difficulty of observing changes in the babies and in performing the necessary procedures (12). In certain communities, healthcare professionals feel that patience is needed to introduce the practice into the community, since most women adopt it enthusiastically in the hospital but not at home because of social pressure (13).	

Viability Is it possible to implement the intervention?						
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS				
<ul><li>No</li><li>Likely not</li><li>Likely yes</li><li>Yes</li><li>Varies</li><li>Inconclusive</li></ul>	There are multiple reports on the implementation of the kangaroo mothercare method in countries around the world. Chan et al. (17, 18, 19), conducted a systematic review of good quality studies in which they evaluated the implementation of the kangaroo mothercare method. Their analysis included 86 studies, 61% of which were published between 2010 and 2015, and most of which were carried out in American countries. The authors developed a matrix of barriers and enablers for the implementation of the kangaroo mothercare method.					
	In their analysis they found three levels for implementation, these were: parents, healthcare workers and health institutions; and six main aspects that facilitate or hinder implementation of the intervention: buy-in to the method and bonding, social support, time necessary to provide care, medical concerns, access to care and cultural norms. The main findings are described in the attached table. (see appendix 1)					
	Some examples of barriers and enablers of implementation are demonstrated in the following qualitative evidence findings:					
	Difficulties of the position					
	Parents report that they sometimes feel exposed during skin-to-skin contact and that it is an activity that may require a lot of energy. In low-resource countries, it may be difficult to find chairs with backrest to ensure comfort for the mother (Bazzano et al., 2012).					
	At times, mothers may want a break from the position and appreciate if the staff allows for this, but at other times the parents feel that their wishes about the intensity of the contact y with their child are ignored and they					

Is it possible to implement the intervention?	
FINDING INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
may become frustrated if they are not allowed contact when they desire it or when they are not permitted rest (Seidman et al., 2015).  **Related to the context of application of the method** Parents say they rather make skin-to-skin contact in their homes than in the hospital, where they can feel uncomfortable exposing their body, where there is more noise, where they may be criticized by staff and where they are likely to have to sit around all day, unable to rest adequately. Even the practice of skin-to-sk contact in the home can have difficulties such as being unable to perform other activities including going bathroom, eating and having relationships with other people (Anderzén-Carlsson et al., 2014, Seidman et 2015).  In some communities where skin-to-skin contact is new, both healthcare professionals and mothers may consider it unlikely that the method will continue to be used after discharge, even if they report enthusiast the practice (Bazzano et al., 2012).  For nurses there are some situations that can hinder the practice of skin-to-skin contact, such as the increasin workload, especially if there is not enough staff; when parents do not have confidence in the effectivence in workload, especially if there is not enough staff; when parents do not have confidence in the effectivence the method; and concerns about the baby's medical condition (Seidman et al., 2015).  **Enablers**  To overcome all barriers, mothers rely heavily on the following: the positive attitude of the healthcare work the support of family, the feelings of trust and empowerment that they acquire and the evidence of the effectiveness of the method (Seidman et al., 2015).	to  kin to the al.,  m for ease ess of

Summary of findings	FINDING						
Strength of evidence	Very low	Low	Moderate	High			Not applicable
Value	Significant uncer- tainty or variabi- lity	Likelihood of significant uncer- tainty or variabil- ity	Likelihood of no signif-icant uncertainty or variability	No significant un-certainty or vari-ability			
Balance of outcome measures	Favors the control	Likely favors the con-trol	Favors neither the intervention nor the control	Likely favors the inter-vention	Favors the intervention	Varies	Inconclusive
Acceptability	No	Likely not	Likely yes	Yes		Varies	Inconclusive
Viability	No	Likely not	Likely yes	Yes		Varies	Inconclusive

# Recommendation

Strong	recommendation	Conditional recommendation	Conditional recommendation	Conditional recommendation	Strong recommendation in
against the	intervention	against the intervention	in favor of the intervention or	in favor of the intervention	favor of the intervention
			the control		
0		0	0	0	•

### Conclusion

#### Recommendation

In stabilized premature infants (those who can be touched and moved from the incubator to the mother's chest without variations in their vital signs) and who are not regulating their temperature yet, in case KMC has not been started in the delivery room, it is recommended to start the method with the adaptation to the position in the NBU or during mother-child accommodation. If the method is started intermittently when the child is in the NICU, it can be gradually lengthened as the mother and infant tolerate it. The idea is to ensure that the mother and baby maintain the position permanently, at least during 12 to 24 hours a day based on the available facilities of the neonatal unit (comfortable chairs, food for the mother). If it is demonstrated that the child properly regulates temperature and gains weight while in kangaroo position, it is recommended to keep the infant in the position, as long as possible, during hospitalization.

The second component of the kangaroo mothercare method, nutrition based exclusively on breastfeeding when possible, should be started as soon as the baby tolerates it and in accordance with the recommendations formulated in questions 17 to 19.

The third component, early discharge from hospital using the kangaroo position, is based on the success of the kangaroo adaptation (position and nutrition) and the fulfillment of the criteria formulated in the recommendations of questions 21 to 23.

### **Justification**

Early initiated in-hospital KMC is an effective intervention for the care of premature newborns. Specifically, the evidence found of moderate quality demonstrates that infants under KMC are more likely to receive exclusive or partial breastfeeding than those who receive traditional care in an incubator. Up to 40 weeks of gestational age from the time when physiological stability is obtained, hospital stay (length or rehospitalization) is lower; there is less risk of nosocomial infection, and a greater maternal satisfaction with less risk of postpartum depression. No evidence of staff satisfaction was found, however, the qualitative evidence found gives us clarity about the acceptance of the intervention by healthcare professionals. In the same way, the parents value, in a meaningful way, the possibility of being with their babies, providing them with the necessary care from their parental role.

### **Subgroup considerations**

None

# **Considerations for implementation**

Prior to implementation, it is very important to verify that the following aspects are available and ready for the execution of the Kangaroo Mothercare method in the newborn unit, the delivery room or in the joint accommodation:

- 1. Infrastructure preparation (chairs, Lycra bands, food for the mother, privacy screens, water and soap)
- 2. Care protocols including:
  - » Open Unit Protocol,
  - » Kangaroo mothercare initiation protocol in the NICU,
  - » Kangaroo mothecare initiation protocol in Intermediate Care,
  - » Registration protocol for kangaroo practice,
  - » Protocol for parental participation and stay in the unit,
  - » Protocol for family visits
  - » Protocol for social work

These protocols must be accepted by all the staff, applied at all times and in all types of units, from the auxiliary nurses to the neonatologists, including the administrative staff.

- 3. Previous training for the staff in the Kangaroo Mothercare method and in how to train and educate parents.
- 4. Education and training materials adapted to the parents. Parents' education is basic, such as initial position support, until they feel confident enough in their kangaroo knowledge to manipulate their baby on their own.
- 5. Follow up to the impact on children, parents and staff.
- 6. Regular meetings to support staff in case of difficulties.

# **Investigational priorities**

Research focused on the satisfaction of staff and parents in the medium and long term.

Evaluation of the necessary tools to facilitate the implementation of the Kangaroo Mothercare method by healthcare personnel in a unit where there is no KMC. Costs of implementing the Kangaroo Mothercare method in a unit where there is no KMC.

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# Appendix 1. Question 4

LEVEL OF IMPLE- MENTATION	CATEGORY	ENABLERS	BARRIERS
	Buy-in	Management support Companions for mothers Posters in the facility	Management reluctan- ce to allocate space for program High leadership turnover Lack of leadership buy-in
	Social support and empower- ment	Use of technology Use of guidelines Use of committees to advocate for KMC	KMC protocols perceived as inflexible Staffing shortages, high staff and leadership turnover Staff resisted changing protocols
Health facilities	Time necessary to provide care	Greater or unlimited visitation time enhanced support from family and promoted KMC KMC-specific ward Comfortable chairs Providing food and beverage to the mothers so that they can remain the kangaroo position Access to private space including family rooms or privacy screen	There was limited visitation time due to staff shortages The shorter the visitation period was, the more of an interference staff thought parents were Visitation policies were difficult due to strained communication between parents and staff Visitors were an obstacle to breastfeeding and KMC performance
	Medical concer- ns	Shorter crying times in response to pain with KMC compared with incubator care Higher breast milk feeding rates at discharge when breast feeding was allowed and encouraged throughout the hospital stay	Lack of written KMC protocols, no checklist for KMC admission procedures Follow-up and discharge procedures not well structured Facilities did not provide food for mothers

### Access to care

Access to private space/privacy screens
Relaxed atmosphere with dim lighting Quiet atmosphere within facilities allows mothers to rest
Breast milk banks provide milk and can be an educational tool among mothers

Lack of privacy
Space limitations induced
discharge within hours
Crowding and insufficient
space in the NICU
Lack of money at the
facility for mother's transportation
Distance to the hospital
for mothers without
hospital-provided transportation
Poor management of
resources donated to the
hospital

# Context, cultural norms

Include KMC in health facility statistics Use of performance standards and quality improvement measures No record of the program Difficulty adapting/ teaching electronic medical records for KMC Implementing continuous KMC was difficult. Many facilities reported performing continuous KMC, but few actually practiced it Incomplete medical record

	Buy-in to kanga- roo mothercare method	Nurses more likely to use KMC after seeing positive effects and if they believed it works Support from more experienced nurses improved buy-in	Nurses believe KMC based on perception and not scientific fact Concerns on the stability of the infant Nurses fail to have strong belief in importance of KMC Inconsistent knowledge and application of KMC
Health-care workers	Social support and empower-ment	Management mobilization of resources Nurse involvement in care related decision making Multiple health worker support program—nutrition workers, CHWs and clinical workers Management promotion of kangaroo mothercare Role of parents and other health-care workers	Management did not prioritize KMC Felt newborn care was not a priority in the health system Parents could serve as a hindrance to health-care worker Lack of leadership and support from management
	Time necessary to provide care	KMC did not increase workload	Training mothers would take additional time out of health workers' schedules, increase their workload, and reduce time with other critical patients

	1	1	
	Medical concerns	Temperature stability Experienced nurses more comfortable with KMC lowered concerns Practicing securing catheters lowered nurses' concerns	Did not believe KMC was safe for LBW newborns Staff not trained in preterm care
	Access to care	Expanding training to other healthcare personnel besides nurses Virtual communication and training Integration of KMC into healthcare curriculum.	Difficulty finding time for training the parents KMC training not part of a broader healthcare training curriculum Poor training lead to ina- dequate knowledge
	Context, cultural norms	Some HCWs advised mothers to delay bathing so infant would not get cold	Bathing practices and wrapping infants soon after birth delayed initiation of method In warm climates staff did not believe hat and socks were necessary Nurse excluding father from infant care was a cultural norm
Mother, father and family perspective	Buy-in and bon- ding	Benefits for Newborns Slept longer, less anxious, happier, more willing to feed  Benefits for Caregivers KMC was calming, relaxing, comforting, natural, instinctive, secure, logical, healing Created a family bond, inspired caregiver confidence Sped emotional and physical recovery of mother Made caregivers feel useful	KMC felt forced Were unaware of the benefits of KMC Were expected to perform KMC with little or no instruction Could not see newborn during KMC Did not feel a bond with the infant Perceived newborn did not enjoy KMC Stigma Mothers reported shame of having a preterm infant Caregivers lied about carrying a newborn on their chest Others presumed the newborn was ill or deformed

Social support	Support from Society Societal acceptance of paternal involvement Support from HCW Less apprehensive mothers. Better results with continuous training and support  Support from Family Grandmothers, sisters, others helping with chores increased uptake and duration of KMC Paternal support crucial to success of KMC, they alleviate workload, support, encourage, increase mother's confidence More likely to understand and respond well if mother explained KMC	Support from Society Fear, guilt doing KMC publicly Felt KMC was role of mother Mothers did not want father to perform KMC  Support from HCWs Did not respect family privacy Unsupportive, loud, uncaring  Support from Family Mothers-in-law and grandmothers did not approve Bad attitudes and peer pressure negatively influenced desire to perform KMC
Time necessary to provide care	Parents preferred to practice KMC at home than at the facility to attend to other responsibilities Unlimited visita- tion hours at health facility	Caregivers unable to devote time Other responsibilities at home or work interfered Mothers lonely and depressed in KMC ward Time needed to commute from home to hospital was too much
Medical concerns	KMC helped mother's recover from post-partum depression KMC helped to relieve stress and promote emotional well-being	Mothers Fatigue Postpartum depression Pain hindered KMC, particularly after a C-section Discomfort sleeping upright

Access to care	Financing Belief that KMC cut down hospital bills due to early discharge Assumed to be a cheaper than incubator care Parents more likely to stay if services were free  Service Delivery Private, quiet spaces for KMC	Financing Cost associated with travel, food, lodging, parking, clinical fees Lack of transport and distance to facility  Service Delivery Lack of privacy Lack of necessary resources
Broad context, cultural norms	Gender Roles Normalization of paternal involved in child care Mother preferred the attention as a kangaroo mother to the incubator, the method inspires con- fidence Equality of gender roles	Traditional Newborn Care Infants traditionally carried on back, thus carrying on the front seemed odd Bathing practices interfered If breastfeeding not pursued KMC less likely to continue Considered unclean where diapers not used

## **ACKNOWLEDGMENTS**

Special thanks to GRADEpro GDT. We used their academic tool for the development of this updated version of the Kangaroo Evidence-Based Guideline.

# Clinical Question 5

In the preterm or low birth weight newborn, how effective is KMC in establishing a betterquality postnatal mother-infant relationship compared to usual incubator care?

Population	Intervention	Control	Principal outcome measures
Infants born prematurely or with low birth weight and their parents	Kangaroo Mothercare Method	Standard incubator care	(Mother-child bond; Mother-child attachment

### Response

## Moderate certainty of the evidence

## Strong recommendation in favor of the intervention

Health personnel should assist, favor and encourage parents to initiate KMC as early as possible to facilitate the development of the mother/father-child bond.

### Justification

Both qualitative and quantitative evidence converge on the high value of the intervention in favoring bonding, despite the methodological limitations, the main findings are related to the development of the mother/father's competence as the best caregivers of the baby. This is an intervention that is likely to be accepted by health professionals, especially if they have training or experience in the Kangaroo Mothercare Method.

### *Implementation*

The implementation of the recommendation fundamentally requires prior training of NICU staff in KMC, 24-hour opening of the neonatal units and a paradigm shift with the role of parents during the stay of the nuclear family in the neonatal unit: parents are not a visitor, they are part of the success of the infant's treatment, they are co-actors in the care of this fragile infant.

# GRADEpro recommendation

Should kangaroo mothercare method or conventional care be used for infants born prematurely or with low birth weight to encourage the adequate formation of a post-natal mother-child bond?

or a poor matar	motificial cities points.
Population:	Infants born prematurely or with low birth weight and their parents
Intervention:	Kangaroo mothercare method
Control:	Conventional care
Principal	Mother-child bond; Mother-child attachment
outcome	
measures:	

# **Strength of evidence**

What is the general certainty about the effects of the intervention?

FINDING	INTERVENTIONAL EVIDENCE			ADDITIONAL CONSIDERATIONS
<ul> <li>Very low</li> <li>Low</li> <li>Moderate</li> <li>High</li> <li>Not applicable</li> </ul>	Outcome measures	Importance	Strength of evidence (LEVEL)	For this question we found a great heterogeneity in the measurement of the measurement of outcome, as it is a complex behavioral construct. complex behavioral construct. For this reason, the results were not grouped and the results selected were the results that best represent the outcome.
	Mother-child bond (Gathwala 2008 study included in Conde-Agudelo 2016) Evaluated on: Total attachment score Follow up: 3 months	CRITICAL	⊕⊕⊕ MODERATE <sup>a</sup>	
	Mother-child bond (Roberts 2000 study included in Conde-Agudelo 2016) Evaluated on: Subscale relationship with the child	CRITICAL	⊕⊕⊕ MODERATE <sup>a,b</sup>	

FINDING	INTERVENTIONAL EVIDENCE			ADDITIONAL CONSIDERATIONS
	Outcome measures	Importance	STRENGTH OF EVIDENCE (GRADE)	Most of the evidence incorporated is from randomized clinical trials, which were at risk of bias
	Mother-child bond (Charpak 1997) Evaluated on: Feeling of competence 1 to 5 scale Follow up: 41 weeksc	CRITICAL	⊕⊕⊕⊖ MODERATEd	due to lack of clarity in the allocation concealment and one of the outcomes was taken from a quasi-experimental
	Mother-child bond (Charpak 1997) Evaluated on: Nursing Child Assessment Feeding Scale: Response of the mother toward the child Follow up: 41 weeks	CRITICAL	⊕⊕⊕ MODERATE <sup>d,e,f</sup>	study that evaluates the time in which the expected behaviors appear. In general, the quality of the evidence is moderate for the outcomes from the RCTs and very low for the observational study.
	Mother-child bond (Charpak 1997) Evaluated on: Nursing Child Assessment Feeding Scale: Response of the child toward the mother Follow up: 41 weeks	CRITICAL	⊕⊕⊕ MODERATE <sup>d,e,f</sup>	
	Mother-child bond (Neu 2010) Evaluated on: Symmetric coregulation Follow up: 6 months g,h,i	CRITICAL	⊕⊕⊕○ MODERATE <sup>j</sup>	
	Relationship mother-child - attachment behavior Evaluated on: Proportion of time that mothers provided typical maternal behavior. Follow up: range 3 to 6 months	CRITICAL	⊕○○○ VERY LOW <sup>k</sup>	
			,	

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
	a. Due to the nature of the intervention, blinding is not possible, concealment of the intervention assignment was not clear, and the outcome evaluation was not blinded.  b. The sample size is very small c. Mother's feeling of competence and confidence in her ability to care for her premature baby d. There is no clarity about concealment of intervention assignment, the study by its nature is not blind e. Outcome measurement was done by trained personnel who recorded observations of behaviors through videos of the interaction of mother and child at specific times f. The results are not conclusive, the results are both in favor and against the intervention, although the size of the effect in both directions is small g. Symmetric coregulations: The dyad shares a joint focus. Each member adds to the interaction. The smile, the laughter of the baby, raising the arms towards the mother or crying change the interaction. An example of symmetric coregulation is the game "peek-a-boo" h. To measure mother-child coregulation during the interaction, the Fogel score was used for the periods of pre-neutral face play and post-neutral face meeting in the observation of the face at rest. This system considers the dyad as a unit with interactive patterns that are continuously and jointly co-created, and innovative. A second to second score is awarded. The Fogel system has been used to demonstrate: (a) babies vocalize more during symmetric than unilateral interactions, (b) the characteristics of the stability of the form of the dyad and the transition of communication patterns of the dyad in early childhood, (c) symmetric coregulation is positively associated with the baby's development, (d) the significant relationship between coregulation codes and maternal efficacy, the baby's temperament and physiological regulation measures, and (e) maternal touch influences mother-child coregulation during face-to-face interaction i. The result is obtained from a MACOVA model, with covariates sex and depression score of the mother in the bas	

Value Is there significant uncertainty or variability in how people value the main outcomes?				
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS		
o Uncertainty o Significant variability o Likelihood of significant uncertainty or variability o Likelihood of no significant uncertainty or variability • No significant uncertainty or variability	Thanks to the close contact of the kangaroo position, parents recount becoming more and more familiar with their baby, easily establishing a relationship and a father-son, mother-child and family bond, which makes it easier for them to love their child, despite difficult experiences like the pain of having a child in these conditions. They consider that skin-to-skin contact is the best way to establish a bond, even more so than breastfeeding and any other form of contact (8). In the systematic review by Anderzen et al. (9) they found that the bonding experience was a central element in the qualitative studies of the parents' perception of the kangaroo mothercare method.  Among the descriptions about the effect of the use of the method are: the mutual feeling of having one another (mother-baby), establishing a relationship with their son or daughter, feeling close or creating a unique connection, loving their baby, mothers being fully concentrated on their baby during skin-to-skin contact, provides the best bonding experience, superior to breastfeeding or other kind of support, the baby can smell and touch their mother/father and therefore get to know them and finally parents report that, once skin-to-skin contact is established, mothers recognize that babies prefer to remain in skin-to-skin contact with their parents, rather than being left alone in the crib.	The postnatal mother-child relationship (or father-child) is the pillar that supports the physical and psychological development of the human being. Attachment guarantees the survival of the human species. In this sense, the main outcome measures correspond to an approximation of the measurement of the mother's behaviors and perceptions in the first weeks of life which will favor the development of an attachment to the baby.		

FINDING	INTERVENTIONAL	EVIDENCE				ADDITIONAL CONSIDERATIONS
<ul><li>Favors the control</li><li>Likely favors the</li></ul>	Outcome measures	Withconventional care	With kangaroo mothercare method	Difference	Efecto relativo (IC95%)	The kangaroo mothercare method favors the perception of the mother-child bond,
control  Favors neither the intervention nor the control  Likely favors the intervention Favors the intervention Varies	Mother-child bond (Gathwala 2008 study included in Conde-Agudelo 2016) Evaluated on: Total attachment score Follow up: 3 months	The mother-child bond (Gathwala 2008 study included in Conde- Agudelo 2016)	The mother-child bond (Gathwala 2008 study included in Conde-Agudelo 2016) in the intervention group was 3.61 standard deviations higher (2.96 to 4.25 higher)	Standardized mean difference of 3.61 standard deviations higher (2.96 to 4.25 higher)		the feeling of competence of the mother over the care of her baby, as well as the time dedicated to the behaviors that favor the bond.  It was also found that it favors symmetric coregulation and disfavors asymmetric or unilateral coregulation, which
o Inconclusive	Mother-child bond (Roberts 2000 study included in Conde-Agudelo 2016) Evaluated on: Subscale relationship with the child	The mother-child bond (Roberts 2000 study included in Conde- Agudelo 2016) was 0 standard deviations	The mother-child bond (Roberts 2000 study included in Conde-Agudelo 2016) in the intervention group was 1.13 standard deviations higher (0.35 to 1.65 higher)	Standardized mean difference of 1.13 standard deviations higher. (0.35 to 1.65 higher)		represents the favoring of a bond of better quality between the mother and the child.  Regarding the results of the observation of the behaviors during lactation, no differences were found between the two groups.

FINDING	INTERVENTIONAL EVIDENCE					ADDITIONAL CONSIDERATIONS
	Outcome measures	Con cuidado habitual	Con Kangaroo mothercare method	Difference	Efecto relativo (IC95%)	
	Mother-child bond (Charpak 1997) Evaluated on: Feeling of competence 1 to 5 scale Follow up: 41 weeksa		The mother-child bond (Charpak 1997) in the intervention group was 0.28 standard deviations higher (0.1 to 0.41 higher)	Standardized mean difference of <b>0.28 standard deviations</b> higher. (0.1 to 0.41 higher)	_	
	Mother-child bond (Charpak 1997) Evaluated on: Nursing Child Assessment Feeding Scale: Response of the mother toward the child Follow up: 41 weeks	The mother- child bond (Charpak 1997) was <b>0</b> standard deviations	The mother-child bond (Charpak 1997) in the intervention group was 0.12 standard deviations higher (0.06 to 0.29 higher)	Standardized mean difference of <b>0.12 standard deviations higher</b> . (0.06 to 0.29 higher)	-	

FINDING	INTERVENTIONAL	EVIDENCE				ADDITIONAL CONSIDERATIONS
	Outcome measures	Con cuidado habitual	Con Kangaroo mothercare method	Difference	Efecto relativo (IC95%)	
	Mother-child bond (Charpak 1997) Evaluated on: Nursing Child Assessment Feeding Scale: Response of the child toward the mother Follow up: 41 weeks	The mother- child bond (Charpak 1997) was <b>0</b> standard deviations	The mother-child bond (Charpak 1997) in the intervention group was 0.11 standard deviations higher (0.14 lower to 0.36 higher.)	Standardized mean difference of <b>0.11 standard deviations higher</b> . (0.14 to 0.36 higher)		
	Mother-child bond (Neu 2010) Evaluated on: Symmetric coregulation Follow up: 6 months b,c,d	The mother- child bond (Neu 2010) was <b>0</b> standard deviations	The mother-child bond (Neu 2010) in the intervention group was 3.4 standard deviations higher (2.46 to 4.33 higher)	Standardized mean difference of <b>3.4 standard deviations higher</b> . (2.46 to 4.33 higher)	-	

FINDING	INTERVENTIONAL	EVIDENCE				ADDITIONAL CONSIDERATIONS
	Outcome measures	Con cuidado habitual	Con Kangaroo mothercare method	Difference	Efecto relativo (IC95%)	
	Relationship mother-child - attachment behavior Evaluated on: Proportion of time that mothers provided typical maternal behavior. Follow up: range 3 to 6 months	Relationship mother-child - attachment behavior (Feldman 2014) was <b>0</b> SD	Relationship mother- child - attachment behavior (Feldman 2014) in the intervention group was 0.41 standard deviations higher (0.08 to 0.73 higher)	Standardized mean difference of <b>0.41 standard</b> <b>deviations</b> <b>higher</b> . (0.08 to 0.73 higher)		

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
	a. Mother's feeling of competence and confidence in her ability to care of her premature baby	
	b. Symmetric coregulation: The dyad shares a joint focus. Each member adds to the interaction. The smile, the laughter of the baby, raising the arms towards the mother or crying change the interaction. An example of symmetric coregulation is the game "peek-a-boo"	
	<ul> <li>c. To measure mother-child coregulation during the interaction, the Fogel score was used for the periods of pre-neutral face play and post-neutral face meeting in the observation of the face at rest. This system considers the dyad as a unit with interactive patterns that are continuously and jointly co-created, and innovative. A second to second score is awarded. The Fogel system has been used to demonstrate: (a) babies vocalize more during symmetric than unilateral interactions, (b) the characteristics of the stability of the form of the dyad and the transition of communication patterns of the dyad in early childhood, (c) symmetric coregulation is positively associated with the baby's development, (d) the significant relationship between coregulation codes and maternal efficacy, the baby's temperament and physiological regulation measures, and (e) maternal touch influences mother-child coregulation during face-to-face interaction</li> <li>d. The result is obtained from a MACOVA model, with covariates sex and depression score of the mother in the baseline.</li> </ul>	
	(4, 1, 2, 3, 6, 7)	

ACCEPTABILITY Is the intervention a FINDING	cceptable to the interested parties?  INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul> <li>No</li> <li>○Probablemente</li> <li>no</li> <li>◆ Likely yes</li> <li>○ Yes</li> <li>○ Varies</li> <li>○ Inconclusive</li> </ul>	In a phenomenological study conducted in the Scandinavian countries, the experiences of NICU nurses were evaluated as they promulgated skin-to-skin contact for preterm newborns and their parents. In the findings the nurses stated that they perceived signs that the babies were better and more comfortable in skin-to-skin contact, than alone in the incubator, and they focused on the parents as the most important caregivers who gave their children closeness and comfort through the kangaroo care method. When they observed that the parents were not ready, they motivated them to try the method. (10)  Specifically, the nurses manifested a change in perspective, from focus on the care of the child in the incubator where they should not be touched to avoid stress, to an approach of attachment with two key elements: the right of newborns to be in skin-to-skin with their parents to boost their development, and the need to support and prepare parents for the onset of skin-to-skin contact as early as possible, seeing themselves as the best caregivers of the baby. (10)  In question 4, additional considerations are presented regarding the acceptability of the kangaroo mother method by parents and healthcare professionals who focus on the method.	In this sense, the evidence from countries that have chosen the kangaroo mothercare method as a standard for the care of premature babies, shows a change in the paradigm of care for premature babies to one focused primarily on the rights of children and their families and on the promotion of the establishment of the bond that guarantees a better development of the baby.

VIABILITY Is it possible to imp	plement the intervention?	
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
o No oProbablemente no • Likely yes o Yes o Varies o Inconclusive	There are multiple reports on the implementation of the kangaroo mothercare method in different countries around the world. Chan et al. (11, 12, 13), conducted a systematic review of good quality studies in which they evaluated the implementation of the kangaroo mothercare method. Their analysis included 86 studies, 61% of which were published between 2010 and 2015, and most of which were carried out in American countries. The authors developed a matrix of barriers and enablers for the implementation of the kangaroo mothercare method. In their analysis they found three levels for implementation, these were parents, healthcare workers and health institutions; and six main aspects that facilitate or hinder implementation of the intervention: buy-in to the method and bonding, social support, time necessary to provide care, medical concerns, access to care and cultural norms. The main findings are described in the attached diagram. (see appendix 1)  Some examples of barriers and enablers of implementation are demonstrated in the following qualitative evidence findings:  Difficulties of the position.  - Parents report that they sometimes feel exposed during skin-to-skin contact and that it is an activity that may require a lot of energy. In low-resource countries, it may be difficult to find chairs with backrest to ensure comfort for the mother (14).  - At times, mothers may want a break from the position and appreciate if the staff allows for this, but at other times the parents feel that their wishes about the intensity of the contact with their child are ignored and they may become frustrated if they are not allowed contact when they desire it or when they are not permitted to rest (Seidman et al., 2015).	

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
	Related to the context of application of the method  - Parents say they rather make skin-to-skin contact in their homes than in the hospital, where they can feel uncomfortable exposing their body, where there is more noise, where they may be criticized by staff and where they are likely to have to sit around all day, unable to rest adequately. Even the practice of skin-to-skin contact in the home can have difficulties such as being unable to perform other activities including going to the bathroom, eating and having relationships with other people. Support is needed at home to carry a premature baby in the skin-to-skin position. ((9, 15, 16)  - In some communities where skin-to-skin contact is new, both healthcare professionals and mothers may consider it unlikely that the method will continue to be used after discharge, even if they report enthusiasm for the practice (14).  - For nurses there are some situations that can hinder the practice of skin-to-skin contact, such as the increase in workload, especially if there is not enough staff; when parents do not have confidence in the effectiveness of the method; and concerns about the baby's medical condition (16).	
	Enablers  To overcome all barriers, mothers rely heavily on the following: the positive attitude of the healthcare workers, the support of families, the feelings of trust and empowerment that they acquire and the evidence of the effectiveness of the method (16).	

SUMMARY OF FINDINGS	FINDING						
STRENGTH OF	Very low	Low	Moderate	High			Not applicable
EVIDENCE							
VALUE	Significant	Likelihood of	Likelihood of	No significant			
	uncertainty or	significant	no significant	uncertainty or			
	variability	uncertainty or	uncertainty or	variability			
		variability	variability				
BALANCE OF	Favors the	Likely favors the	Favors neither	Likely favors the	Favors the	Varies	Inconclusive
OUTCOME	control	control	the intervention	intervention	intervention		
MEASURES			nor the control				
ACCEPTABILITY	No	Likely not	Likely yes	Yes		Varies	Inconclusive
VIABILITY	No	Likely not	Likely yes	Yes		Varies	Inconclusive

# **RECOMMENDATION**

Strong	recommendation	Conditional recommendation	Conditional recommendation	Conditional recommendation	Strong recommendation in
against t	the intervention	against the intervention	in favor of the intervention or	in favor of the intervention	favor of the intervention
			the control		
0		0	0	0	•

# **A** Conclusion

Healthcare personnel should help, favor and encourage parents to initiate KMC as early as possible to facilitate the development of the mother/father-child bond.

### **Justification**

Both qualitative and quantitative evidence converge on the high value of the intervention in favoring bonding. Despite the methodological limitations, the main findings are related to the development of the mother/father's competence as the best caregivers for the baby. This is an intervention that is likely to be accepted by healthcare professionals, especially if they have training or experience in the Kangaroo Mothercare method.

### **Subgroup considerations**

Not applicable

### **Considerations for implementation**

For the implementation of the recommendation, the following are essential: the prior training of NICU staff in kangaroo mothercare method, the 24-hour opening of neonatal units and the paradigm change in the role of parents during their stay in the neonatal unit – parents are not visitors, they are part of the success of the child's treatment, they are co-actors in the care of this fragile child.

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providing skin-to-skin care to their newborn infant—Part 2: A qualitative metasynthesis. International Journal of Qualitative Studies on Health and Well-being; 2014.

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## Clinical Question 6

In the preterm or low birth weight newborn, how effective is the Kangaroo Mothercare method in promoting neurological and psychomotor development compared to usual care?

Population	Intervention	Control	Principal outcome measures
Preterm or low birth weight newborns	Kangaroo Mothercare method	Traditional incubator handling until discharge	Neuromotor development Psychomotor development Brain maturation Sleep quality

### Response

## Moderate certainty of evidence

The use of KMC is recommended in preterm and low birth weight infants with the longest skin to skin contact as possible and as much as tolerated by the infant and the parents.

## Strong recommendation in favor of the intervention

#### Justification

The results of the studies are consistent with the different outcomes related to neurodevelopment in preterm infants, the evidence found was especially in more fragile infants.

### Detailed justification

#### **Values**

The possibility that the intervention will favor neurodevelopment in preterm infants is highly valued in terms of long-term burdens when considering a possible decrease in disability in high-risk infants.

#### Balance of effects

The balance of benefits and risks is in favor of the intervention.

### *Implementation*

Prior to implementation, it is very important to verify that the following aspects are available and ready for the execution of the KMC in the NBU, the delivery room or in the joint accommodation:

1. Infrastructure preparation (chairs, Lycra bands, food for the mother, privacy screens, water and soap).

- 2. Care protocols including:
  - » Open Unit Protocol,
  - » Protocol for initiation of the KMC in the NICU,
  - » Protocol for initiation of the KMC in Intermediate Care,
  - » Kangaroo practice registration protocol,
  - » Protocol for parental participation and permanence in the unit,
  - » Protocol for family visits,
  - » Protocol for social work.

These must be accepted by all the staff members, applied at all times and in all types of units, from the auxiliary nurses to neonatologists, including administrative staff.

- 3. Previous training for the staff in the Kangaroo Mothercare method and in how to train and educate parents and/or caregivers.
- 4. Education and training materials adapted to the parents. Parents' education is basic, like initial position support, until they feel confident enough in their kangaroo knowledge to handle their baby on their own.
- 5. Follow-up of the impact on children, parents and staff.
- 6. Regular meetings to support staff in case of difficulties.

# GRADEpro recommendation

Should kangaroo m development?	Should kangaroo mothercare or traditional handling be used in the care of premature or low birth weight newborns to favor neurological and psychomotor development?				
Population:	Infants born prematurely or with low birth weight at birth, neurological and psychomotor development				
Intervention:	Kangaroo mothercare method				
Comparison:	Conventional traditional handling				
Principal outcome	Psychomotor maturation				
measures:					

# STRENGTH OF EVIDENCE

What is the general certainty about the effects of the intervention?

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS		
<ul><li>Very low</li><li>Low</li><li>Moderate</li><li>High</li><li>Not applicable</li></ul>	Outcome measures	Importance	Certainty of the evidence (GRADE)	The results of a clinical trial, whose patients were incorporated into a 15- and 20-year follow-up cohort, were included for the outcome measures of cerebral palsy and brain
	Psychomotor development in babies under 1800 grams (Charpak 1997, Tessier 2003) Evaluated on: Griffith quotient Follow up: 12 months	CRITICAL		development. The study provides results of maturation at 15 years and of neurodevelopment at 20 years.

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS		
	Outcome measures	Importance	Certainty of the evidence (GRADE)	A study evaluating the maturation process at 8 weeks was also included.
	Psychomotor development in babies under 1800 grams and whose Infanib score at 6 months was in the category of abnormality (fragile) (Charpak 1997, Tessier 2003) Evaluated on: Griffith quotient Follow up: 12 months	CRITICAL	⊕⊕⊕○ MODERATE <sup>b</sup>	Although there are multiple observational studies for the outcomes measured, with multiple forms of development, this was the
	Psychomotor development in babies under 1800 grams who were admitted to the NICU (Charpak 197, Tessier 2003) Evaluated on: Griffith quotient Follow up: 12 months	CRITICAL	⊕⊕⊕○ MODERATE <sup>b</sup>	best available evidence. The general quality of the evidence is low, some
	Psychomotor development in babies under 1800 grams who were admitted to the NICU (Charpak 197, Tessier 2003) Evaluated on: Griffith quotient Follow up: 12 months	CRITICAL	⊕⊕⊜ LOW <sup>b,c</sup>	outcome measures have moderate evidence, which gives us partial certainty of the evidence found.
	Brain maturation: REM sleep index (Scher 2009) Evaluated on: Polysomnogram Follow up: 8 weeks	CRITICAL	⊕⊕⊕○ MODERATE <sup>d</sup>	
	Brain maturation: percentage of deep sleep (Scher 2009) Evaluated on: Polysomnogram record of ratio of REM sleep to total sleep cycles in Follow up: 8 weeks	CRITICAL	⊕⊕○○ LOW	

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS		
	Outcome measures	Importance	Certainty of the evidence (GRADE)	
	Brain maturation: difference in the duration of the sleep cycle (Scher 2009) Evaluated on: Polysomnogram record of the duration in minutes Follow up: 8 weeks	CRITICAL	⊕○○○ VERY LOW <sup>a</sup>	
	Brain maturation: state of alertness (Scher 2009) Evaluated on: Register of events in polysomnogram Follow up: 8 weeks	CRITICAL	⊕⊕○○ LOW	
	Brain maturation (Charpak 1997, Schneider 2012) Evaluated on: Latency of potential motor skills evoked Follow up: range 14 to 15 years <sup>e</sup>	CRITICAL	⊕○○○ VERY LOW <sup>f</sup>	
	Brain maturation (Charpak 1997, Schneider 2012) Evaluated on: Latency of interhemispheric inhibition Follow up: range 14 to 15 years <sup>9</sup>	CRITICAL	⊕⊕○○ LOW	
	Brain maturation (Charpak 1997, Schneider 2012) Evaluated on: Duration of interhemispheric inhibition Follow up: range 14 to 15 years <sup>h</sup>	CRITICAL	⊕⊕○○ LOW	

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS		
	Outcome measures	Importance	Certainty of the evidence (GRADE)	
	Neurodevelopment results in children under 1800 grams whose Infanib score at 6 months was in the normal category (Charpak 1997, 2016) Evaluated on: IQ Follow up: 20 years	CRITICAL	⊕○○○ VERY LOW <sup>a</sup>	
	Neurodevelopment results in children under 1800 grams whose Infanib score at 6 months was in the category of abnormality (fragile) (Charpak 1997, 2016) Evaluated on: IQ at 20 years in subjects with transient or abnormal neurological examination at 6 months	CRITICAL	⊕⊕○○ LOW	
	a. Not conclusive, very broad confidence interval b. The evaluation of the outcome measure was not blind c. Small sample size and with a wide confidence interval that has t d. The size of the effect is large and the confidence intervals are in			

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
	e. The higher the latency, the slower the synchronization of the neurons of the primary motor cortex f. The range is broad, ranging from a small to a large effect size. Very small sample size g. The higher the latency, the lower the interhemispheric transmission speed h. Directly proportional to the control between the hemispheres (1, 2, 3, 4, 5).	

VALUE Is there significant	uncertainty or variability in how people value the main outcomes?	
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul> <li>Significant uncertainty or variability</li> <li>Likelihood of significant uncertainty or variability</li> <li>Likelihood of no significant uncertainty or variability</li> <li>No significant uncertainty or variability</li> <li>variability</li> </ul>	a validated and widely used scale; for brain maturation, neurophysiological processes are evaluated to determine the processes of brain myelination; and, as a result of neurodevelopment the intellectual coefficient was considered as an objective measurement once the process was completed. No evidence was found regarding the value parents or professionals give these outcomes	In the clinical setting, one of the main concerns for parents and health care providers is the negative effects of prematurity and low birth weight on the neurodevelopmental process. parents and health personnel are the negative effects of prematurity and low birth weight on the neurodevelopmental process. The neurological and developmental complications most frequently reported in the literature include: intraventricular hemorrhage, cerebral palsy, learning disorders, attention deficit, alterations in neurosensory integration, coordination disorders, etc Nosarti, C., Murray, R. M., & Hack, M. (Eds.). (2010).

FINDING	INTERVENTIONAL EVIDEN	CE				ADDITIONAL CONSIDERATIONS
						Neurodevelopmental outcomes of preterm birth from childhood to adult life. Cambridge University Press.) In this sense, we can affirm that the possibility of offering interventions that demonstrate a protective effect on the premature infant's nervous system or that favor a harmonious development to reduce the incidence of disabilities or associated disorders is highly desirable.
	FCOME MEASURES  between favorable and unfavor	able outcomes fav	vor the intervention	n or the control?		
FINDING	INTERVENTIONAL EVIDENCE	CE				ADDITIONAL CONSIDERATIONS
<ul><li>Favors the control</li><li>Likely favors the control</li></ul>	Outcome measures	With conventional handling	With Kangaroo Mothercare	Difference	Relative measure of effect (95% CI)	Kangaroo mothercare likely favors maturation and neurodevelopment, especially for the subgroup
	Cerebral palsy (Charpak 1997) Evaluated on: Number of cases Follow up: 12 months	25 per 1,000	<b>16 per 1,000</b> (5 to 51)	9 less per 1,000 (20 less to 26 more)	<b>RR 0.65</b> (0.21 to 2.02)	of babies who were at higher neurological risk,

FINDING	INTERVENTIONAL EVIDENCE					ADDITIONAL CONSIDERATIONS
o Favors neither the intervention nor the control • Likely favors the intervention o Favors the intervention o Varíes o Inconclusive	Outcome measures	With conventional handling	With Kangaroo Mothercare	Difference	Relative measure of effect (95% CI)	which was detected at 6 months, or which were admitted to NICU and whose weight at birth was less than 1800 grams; all these factors
	Psychomotor development in babies under 1800 grams (Charpak 1997, Tessier 2003) Evaluated on: Griffith quotient Follow up: 12 months	The average psychomotor development in babies under 1800 grams (Charpak 1997, Tessier 2003) was <b>0</b> standard deviation	The average psychomotor development in babies under 1800 grams (Charpak 1997, Tessier 2003) in the intervention group was 0.28 standard deviations higher (0.07 to 0.5 higher)	Standardized mean difference of 0.28 standard deviations higher. (0.07 to 0.5 higher)		are indicators of fragility. This indicates the potential of the intervention to protect the brain from the negative effects of prematurity. (2, 3, 4) In this sense, it is important to highlight that the study that contributed a large part of the results was characterized by the use
	Psychomotor development in babies under 1800 grams and whose Infanib score at 6 months was in the category of abnormality (fragile) (Charpak 1997, Tessier 2003) Evaluated on: Griffith quotient Follow up: 12 months	The average psychomotor development in babies under 1800 grams and whose Infanib score at 6 months was in the category of abnormality (fragile) (Charpak 1997, Tessier 2003) was <b>0</b> standard deviation	The average psychomotor development in babies under 1800 grams and whose Infanib score at 6 months was in the category of abnormality (fragile) (Charpak 1997, Tessier 2003) in the intervention group was 0.68 standard deviations higher (0.18 to 1.18 higher)			of the 24-hour kangaroo position as a central element of the method. (3)

FINDING	INTERVENTIONAL EVIDE	NCE				ADDITIONAL CONSIDERATIONS
	Outcome measures	With conventional handling	With Kangaroo Mothercare	Difference	Relative measure of effect (95% CI)	The results on the maturation process measured with the evaluation of sleep at 8 weeks and myelination at 15 years indicate that
	Psychomotor development in babies under 1800 grams who were admitted to the NICU (Charpak 197, Tessier 2003) Evaluated on: Griffith quotient Follow up: 12 months	The average psychomotor development in babies under 1800 grams who were admitted to the NICU (Charpak 197, Tessier 2003) was <b>0</b> standard deviation	The average psychomotor development in babies under 1800 grams who were admitted to the NICU (Charpak 197, Tessier 2003) in the intervention group was 0.61 standard deviations higher (0.11 to 1.11 higher)	Standardized mean difference of <b>0.61</b> standard deviations higher. (0.11 to 1.11 higher)	-	the intervention likely has favorable neurophysiological effects. (1), (Scher 2009) No significant differences were found in the subgroups without neurological risk at 6 months. (2, 4, 3) The existence of differences in the risk of presenting cerebral palsy at 12 months
	Brain maturation: REM sleep index (Scher 2009) Evaluated on: Polysomnogram Follow up: 8 weeks	The average brain maturation: REM sleep index (Scher 2009) was 0 standard deviation	The average brain maturation: REM sleep index (Scher 2009) in the intervention group was 1.48 standard deviations lower (2.24 to 0.71 lower)	Standardized mean difference of <b>1.48</b> standard deviations lower. (2.24 to 0.71 lower)	-	between the groups cannot be concluded (Charpak et al., 2016, Tessier et al., 2003, Charpak et al., 1997)

FINDING	INTERVENTIONAL EVIDER	ADDITIONAL CONSIDERATIONS				
	Outcome measures	With conventional handling	With Kangaroo Mothercare	Difference	Relative measure of effect (95% CI)	
	Brain maturation: percentage of deep sleep (Scher 2009) Evaluated on: Polysomnogram record of ratio of REM sleep to total sleep cycles in Follow up: 8 weeks	The average brain maturation: percentage of deep sleep (Scher 2009) was <b>36.2</b> %	The average brain maturation: percentage of deep sleep (Scher 2009) in the intervention group was 10.1 % higher. (3.62 to 16.58 higher)	Difference of averages of 10.1% higher. (3.62 to 16.58 higher)		
	Brain maturation: difference in the duration of the sleep cycle (Scher 2009) Evaluated on: Polysomnogram record of the duration in minutes Follow up: 8 weeks	The average brain maturation: difference in the duration of the sleep cycle (Scher 2009) was <b>70</b> min	The average brain maturation: difference in the duration of the sleep cycle (Scher 2009) in the intervention group was 1 min higher. (9.04 less to 11.04 higher)	Difference of averages of 1 min higher. (9.04 less to 11.04 higher)	-	

FINDING	INTERVENTIONAL EVIDE	NCE				ADDITIONAL CONSIDERATIONS
	Outcome measures	With conventional handling	With Kangaroo Mothercare	Difference	Relative measure of effect (95% CI)	
	Brain maturation: state of alertness (Scher 2009) Evaluated on: Register of events in polysomnogram Follow up: 8 weeks	The average brain maturation: state of alertness (Scher 2009) was <b>0</b> standard deviation	The average brain maturation: state of alertness (Scher 2009) in the intervention group was 1.36 standard deviations higher (0.6 to 2.12 higher)	The average brain maturation: state of alertness (Scher 2009) in the intervention group was 1.36 standard deviations higher (0.6 to 2.12 higher)		
	Brain maturation (Charpak 1997, Schneider 2012) Evaluated on: Latency of potential motor skills evoked Follow up: range 14 to 15 years	The average brain maturation (Charpak 1997, Schneider 2012) was <b>0</b> standard deviation	The average brain maturation (Charpak 1997, Schneider 2012) in the intervention group was 77 standard deviations lower (1.43 to 0.12 lower)	Standardi- zed mean difference of 77 standard deviations lower (1.43 to 0.12 lower)	-	

FINDING	INTERVENTIONAL EVIDE	ADDITIONAL CONSIDERATIONS				
	Outcome measures	With conventional handling	With Kangaroo Mothercare	Difference	Relative measure of effect (95% CI)	
	Brain maturation (Charpak 1997, Schneider 2012) Evaluated on: Latency of interhemispheric inhibition Follow up: range 14 to 15 years <sup>9</sup>	The average brain maturation (Charpak 1997, Schneider 2012) was <b>0</b> standard deviation	The average brain maturation (Charpak 1997, Schneider 2012) in the intervention group was 2.35 standard deviations lower (3.19 to 1.52 lower)	Standardized mean difference of <b>2.35</b> standard deviations lower (3.19 to 1.52 lower)	_	
	Brain maturation (Charpak 1997, Schneider 2012) Evaluated on: Duration of interhemispheric inhibition Follow up: range 14 to 15 yearsh	The average brain maturation (Charpak 1997, Schneider 2012) was <b>0</b> standard deviation	The average brain maturation (Charpak 1997, Schneider 2012) in the intervention group was 1.67 (0.93 to 2.41 higher)	Standardized mean diffe- rence of <b>1.67</b> <b>standard</b> <b>deviations</b> <b>higher</b> . (0.93 to 2.41 higher)	-	

FINDING	INTERVENTIONAL EVIDE	NCE				ADDITIONAL CONSIDERATIONS
	Outcome measures	With conventional handling	With Kangaroo Mothercare	Difference	Relative measure of effect (95% CI)	
	Neurodevelopment results in children under 1800 grams whose Infanib score at 6 months was in the normal category (Charpak 1997, 2016) Evaluated on: IQ Follow up: 20 years	The average neurodevelopment results in children under 1800 grams whose Infanib score at 6 months was in the normal category (Charpak 1997, 2016) was <b>0</b> standard deviation	The average neurodevelopment results in children under 1800 grams whose Infanib score at 6 months was in the normal category (Charpak 1997, 2016) in the intervention group was 0.11 standard deviations lower (0.4 lower to 0.18 higher)	Standardized mean difference of <b>0.11</b> standard deviations lower (0.4 lower to 0.18 higher)	_	
	Neurodevelopment results in children under 1800 grams whose Infanib score at 6 months was in the category of abnormality (fragile) (Charpak 1997, 2016) Evaluated on: IQ at 20 years in subjects with transient or abnormal neurological examination at 6 months	The average neurodevelopment results in children under 1800 grams whose Infanib score at 6 months was in the category of abnormality (fragile) (Charpak 1997, 2016) was <b>0</b> standard deviation	The average neurodevelopment results in children under 1800 grams whose Infanib score at 6 months was in the category of abnormality (fragile) (Charpak 1997, 2016) in the intervention group was 0.64 standard deviations higher (0.07 to 1.21 higher)	Standardized mean diffe- rence of <b>0.64</b> standard deviations higher. (0.07 to 1.21 higher)		

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
	Tessier, R, Cristo, M B., Velez, S, Giron, M, Nadeau, L, Figueroa de Calume, Z, Ruiz-Paláez, JG., Charpak, N. Kangaroo Mothercare: A method for protecting high-risk low-birth-weight and premature infants against developmental delay. Infant Behavior and Development; 2003.  Charpak, N, Ruiz-Peláez, JG, Figueroa, Z, Charpak, Y. Kangaroo mother versus traditional care for newborn infants  -2000 grams: a randomized, controlled trial. Pediatrics; 1997. Scher, MS, Ludington-Hoe, S, Kaffashi, F, Johnson, MW, Holditch-Davis, D, Loparo, KA. Neurophysiologic assessment of brain maturation after an 8-week trial of skin-to-skin contact on preterm infants. Clinical Neurophysiology; 2009. Schneider, C, Charpak, N, Ruiz-Peláez, JG, Tessier, R. Cerebral motor function in very premature-at-birth adolescents: a brain stimulation exploration of kangaroo mothercare effects. Acta Paediatrica; 2012. Charpak, N, Tessier, R, Ruiz, JG, Hernandez, JT, Uriza, F, Villegas, J, Nadeau, L, Mercier, C, Maheu, F, Marin, J, Cortes, D, Gallego, JM, Maldonado, D. Twenty-year Follow-up of Kangaroo Mothercare Versus Traditional Care. Pediatrics; 2016. The result is statistically significant in favor of the MMC, the confidence interval ranges from a low effect size to a medium effect size which is explained by a small sample size, however, it is decided not to go down due to imprecision considering that the results were statistically significant. a. The higher the latency, the slower the synchronization of the neurons of the primary motor cortex b. The higher the latency, the lower the interhemispheric transmission speed c. Directly proportional to the control between the hemispheres (1, 2, 3, 4)	

			ΤY

Is the intervention acceptable to the interested parties?

	<u> </u>	
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul><li>No</li><li>Likely not</li><li>Likely yes</li><li>Yes</li><li>Varies</li><li>Inconclusive</li></ul>	In question 4, considerations are presented regarding the acceptability of the kangaroo mothercare method by parents and health professionals.	

# **VIABILITY**

Is it possible to implement the intervention?

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
∘ No ∘Likely not	implementation of KMC in their analysis they included 86 studies, 61 % were published between 2010 and	Question 4 contains an appendix an appendix with the complete results.

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul><li>Likely yes</li><li>Yes</li><li>Varies</li><li>Inconclusive</li></ul>	In their analysis they found three levels for implementation, these are: parents, health professionals and health institutions. And six main aspects that facilitate or hinder the implementation of the intervention: acceptance of the method and attachment, social support, time for care, health or medical concerns, access to the health system and cultural aspects of the context. The main findings are described in the attached outline. (see appendix 1) question 5	
	Position Difficulties.	
	- Parents report that they sometimes feel exposed during skin-to-skin contact and that it is an activity that can require a lot of energy and intimacy. In low-resource countries, it may be difficult to have chairs with backs to ensure comfort for the mother (9).  - At times, mothers may want a break from positioning and appreciate it if staff allow it, but at other times fathers feel that their wishes regarding the intensity of contact are ignored and may become frustrated if they are not allowed to engage in contact when they want it or when they are not allowed to rest (Seidman et al., 2015).	

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
	Related to the context for the application of the method.	
	- Parents state that they prefer to perform skin-to-skin contact in their homes than, in the hospital, where they may feel uncomfortable exposing their body, with the noise, being criticized by the staff and sometimes having to remain seated all day, without being able to rest adequately. Even the practice of skin-to-skin contact at home can have difficulties such as hindering other activities such as toileting, eating and relationships with other people. Home support is required to skin-to-skin carry a premature infant. (10, 11, 12) - In some communities where skin-to-skin contact is new, both health professionals and mothers may find it unlikely that the method will continue to be used after discharge, even if they report enthusiasm for the practice (9) For nursing staff, there are some situations that may hinder the practice of skin-to-skin contact such as the increased workload involved in explaining the method to parents the first time and supporting them the following times, especially if there are not enough staff, and when parents are not confident in the effectiveness of the method and the concerns they have about the baby's medical condition (12).	
	Facilitators.	
	To overcome all barriers, mothers count as major facilitators a good attitude from health personnel, support from families, the very feelings of confidence and empowerment they acquire, and evidence of the method's efficacy (12))	

SUMMARY OF FINDINGS	FINDING						
STRENGTH OF	Very low	Low	Moderate	High			Ningún estudio
EVIDENCE							incluído
VALUE	Significant	Likelihood of	Likelihood of no	No significant			
	uncertainty or	significant	significant uncertainty	uncertainty or variability			
	variability	uncertainty or	or variability				
		variability					
BALANCE OF	Favors the	Likely favors the	Favors neither the	Likely favors the	Favors the	Varies	Inconclusive
OUTCOME	control	control	intervention nor the	intervention	intervention		
MEASURES			control				
ACCEPTABILITY	No	Likely not	Likely yes	Yes		Varies	Inconclusive
VIABILITY	No	Likely not	Likely yes	Yes		Varies	Inconclusive

# **RECOMMENDATION**

Strong	recommendation	Conditional recommendation	Conditional recommendation	Conditional recommendation	Strong recommendation in
against the	e intervention	against the intervention	in favor of the intervention or	in favor of the intervention	favor of the intervention
			the control		
0		0	0	0	•

Clinical practice guidelines for the optimal use of the Kangaroo Mothercare Method

# **A** Conclusion

#### Recommendation

It is recommended the use of the Kangaroo Mothercare method in premature and low birth weight babies with the longest possible duration on skin-to-skin contact and as much as the baby and the parents tolerate it.

### **Justification**

### **General justification**

Although the overall quality of the evidence is low, the results indicate a possible favoring of neurodevelopment, particularly in higher risk groups positive outcomes are highly desirable.

## **Detailed justification**

Values

The possibility that the intervention favors neurodevelopment in preterm infants is highly valued in terms of long-term burdens if a possible disability reduction in high-risk infants is considered.

Balance of effects

The balance of benefits and risks is in favor of the intervention

## **Subgroup considerations**

Not applicable

### **Considerations for implementation**

Prior to implementation, it is very important to verify that the following aspects are available and ready for the execution of the KMC in the NBU, the delivery room or in the joint accommodation:

- 1. Infrastructure preparation (chairs, Lycra bands, food for the mother, privacy screens, water and soap).
- 2. Care protocols including:
  - » Open unit protocol,
  - » Protocol for initiation of KMC in the NICU,
  - » Protocol for initiation of KMC in Intermediate Care.
  - » Kangaroo practice registration protocol,
  - » Protocol for parental participation and permanence in the unit,
  - » Protocol for family visits,
  - » Protocol for social work.

These must be accepted by all the staff members, applied at all times and in all types of units, from the auxiliary nurses to neonatologists, including administrative staff.

- 3. Previous training for the staff in the Kangaroo Mothercare method and in how to train and educate parents and/or caregivers.
- 4. Education and training materials adapted to the parents. Parents' education is basic, like initial position support, until they feel confident enough in their kangaroo knowledge to handle their baby on their own.
- 5. Follow-up of the impact on children, parents and staff.

6. Regular meetings to support staff in case of difficulties.

### **Investigational priorities**

The priority research topic is the time of initiation of the KMC, before or after physiological stability to decrease neurological sequelae.

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## Clinical Question 7

In the stable preterm or low birth weight newborn without respiratory distress, does the KMC performed at birth in a community without referral to a hospital and without supervision by trained personnel compared to standard KMC initiated in a hospital setting have similar outcomes in terms of mortality, neurological complications and somatic growth?

Population	Intervention	Control	Principal outcome measures
Premature or low birth weight newborns who are stable and have no difficulty breathing	Kangaroo Mothercare method (KMC) performed at birth in a community without being referred to a hospital and without supervision by trained personnel	Standard Kangaroo Mothercare (KMC) method initiated in a hospital setting	Mortality; Somatic growth; Neurological complications

# Response.

### Certainty of evidence very low

### Strong recommendation against intervention

It is not recommended the initiation of the Kangaroo Mothercare method in a preterm or low birth weight newborn in a community without a prior referral to the hospital for an initial examination to rule out pathologies and without clinical follow-up by trained personnel on an outpatient basis during the first year of life.

#### **Justification**

There is no evidence to support the use of the Kangaroo Mothercare method without the minimum quality standards in terms of survival and quality of survival of the preterm infant; the risk of harm in using KMC without these components may be much higher than the possible benefits it may present.

More research is needed on the establishment of a network for the management of preterm and/or low birth weight newborns. For example, which infants can be handled at a primary level in the community, which infants can be handled at the different health care levels, which should be referred, but can then return to the community and under what type of follow-up.

More research is also needed on KMC for transport in difficult terrain or in isolated

# GRADEpro recommendation

Should kangaroo mother	Should kangaroo mothercare performed at birth in the community without referral to a hospital and without supervision by trained personnel vs. standard				
kangaroo mothercare init	kangaroo mothercare initiated in a hospital setting be used for the preterm or stable low birth weight newborn without respiratory distress?				
Population:	Premature or low birth weight newborns who are stable and have no difficulty breathing				
Intervention:	Kangaroo mothercare method (KMC) performed at birth in the community without being referred to a hospital and without				
	supervision by trained personnel				
Comparison:	Standard Kangaroo Mothercare (KMC) Method initiated in hospital setting				
Principal Outcome	Mortality; Somatic growth; Neurological complications				
measures:					

	STRENGTH OF EVIDENCE What is the general certainty about the effects of the intervention?							
FINDING	INTERVENTIONAL EVIDENCE			ADDITIONAL CONSIDERATIONS				
<ul><li>Very low</li><li>Low</li><li>Moderate</li><li>High</li></ul>	Outcome measures	Importance	STRENGTH OF EVIDENCE (GRADE)	The evidence found corresponds only to one study comparing the use of KMC in the community versus traditional care in the community,				
∘Not applicable	Mortality (Sloan 2008) evaluated with: No. of deaths in the neonatal period follow-up: 30 days	CRITICAL	⊕○○○ VERY LOW <sup>a,b</sup>	in which 30-day neonatal mortality was the only measured outcome.				
	Somatic growth - not reported	CRITICAL	-	However, due to the characteristics of the study, there is a high risk of				
	Neurological complications - not reported	CRITICAL	-	bias and its use of indirect evidence				
				affects the confidence in the study results.				

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
	a. It is the only study that evaluates the application of KMC in the community (which was explained to parents, who were then encouraged to use skin-to-skin contact as long as possible), and their control is traditional community care without the KMC method (it makes no reference to standard hospital care), this may or may not include skin-to-skin contact. Very low rates of skin-to-skin contact were reported in the control group.  b. Measurement bias (the weight of a subgroup of participants was measured) and bias due to a significant loss of data on the weight of more than 60% of the neonates who died between the first day and the neonatal period; there is no way of predicting the weight of children who died, of which about 50% did so on the first day.	
VALUE Is there significant uncertainty or variability in how people value the main outcomes?		
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul> <li>Significant uncertainty or variability</li> <li>Likelihood of significant uncertainty or variability</li> <li>Likelihood of no significant uncertainty or variability</li> <li>No significant uncertainty or variability</li> </ul>		The decrease in mortality of premature infants is one of the most important outcomes of the intervention but it is not the ultimate goal. The value of the outcome may vary according to factors related to the social and anthropological context of the population.  From a public health point of view, in low-income countries the reduction of neonatal mortality is highly valued due to the impact on public health

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
		likewise in developed countries, despite having a lower general mortality rate, the intervention supports the maintenance of its statistics.
		Although outcomes related to growth and neurological complications are critical in evaluating the intervention over the control, no evidence on these was found in association with the intervention.

FINDING	INTERVENTION	AL EVIDENCE				ADDITIONAL CONSIDERATIONS
<ul> <li>Favors the control</li> <li>Likely favors the control</li> <li>Favors neither the intervention nor the control</li> <li>Likely favors the intervention</li> <li>Favorece la intervención</li> <li>Varies</li> <li>Inconclusive</li> </ul>	Outcome measures	With standard KMC initiated in hospital setting	With KMC performed at birth in the community without being referred to a hospital and without supervision of trained personnel	Difference	Relative measure of effect (95% CI)	It is the only study that evaluates the application of KMC in the community (which was explained to parents, who were then encouraged to use skin-to-skin contact as long as possible), and their control is traditional community care without the KMC method (it makes no reference to standard hospital care), this may or may not include skinto-skin contact, however, reported frequency of skin-to-skin contact was very low in the control group. It is a randomized clinical trial, in
	Mortality (Sloan 2008) Evaluated on: Number of deaths in neonatal period Follow up: 30 days		of trained personnel  6 (0.126 to 0.839) of the comparison of KMC he usual care in community does not equate			which the randomization unit were "unions" or population groups which correspond to the subdivision of districts in Bangladesh, which are composed of two or more villages. The researchers included 42 unions and 39,888 women between the ages of 12 and 50, 4,213 births, with

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
	a. It is the result of a model adjusted by: literacy; husband working as agricultural worker, farmer or professional or without occupation; age of the mother of the baby and if she worked outside the home; parity; number of people and children under 5 years old in the home; if Sylheti was spoken by family members; religion; if the birth occurred in a health care center and if it was attended by a qualified birth attendant; multiple pregnancies; gender of the infant; if the baby had a major or minor congenital anomaly; and if there was a previous neonatal death.	4,325 babies (112 twins) and 4,165 live births. There were 165 infants reported to weigh under 2,000 grams, with the caveat that 41% of the 2,125 exposed to the intervention and 46% of the 2,044 controls were not weighed.  Although the results indicate an effect in favor of KMC in the community with respect to the usual community care, due to the particularities of the study and the control, we do not have direct evidence to answer the question posed and there is a high risk of measurement bias due to a loss of significant weight data in more than 60% of infants who died between the first day and the end of the neonatal period. There is no way to predict the weight of the children who died on the first day, which corresponds to 50% of the cases, and the results could be contradicted by this missing data.

ACCEPTABILITY  Is the intervention a	acceptable to the interested parties?	
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul> <li>No</li> <li>Likely not</li> <li>Probablemente</li> <li>Sí</li> <li>Yes</li> <li>Varies</li> <li>Inconclusive</li> </ul>	There is no evidence on the acceptability of the use of KMC in the community without referral to a hospital or follow-up by trained personnel.  However, in a qualitative study, Bazzano et al. did a pilot test of a counseling protocol in which they investigated the acceptance of the practice of KMC for low-birth-weight newborns in the home in a population in Ghana. The women were recruited in delivery rooms, 48 hours after delivery, and followed up with at their home. The sites where they were selected did not practice skin-to-skin contact. They included a small sample of nine women who were asked to do skin-to-skin care themselves for as long as possible, four refused to do so but accepted the interview. The women who accepted trying the technique received counseling. The researchers also interviewed people who previously used KMC in a hospital setting and health service providers, as well as a group of traditional midwives.  The researchers found that for the group of health providers and women who previously used the method in a hospital setting, although they were enthusiastic about the use of the method in the home, they considered it unlikely that it would be done outside the hospital due to cultural and social practices, as well as the difficulties of applying the method at home compared to the hospital.	The use of KMC in the community without referral to a hospital and without receiving clinical follow-up by trained personnel is not acceptable in the current context. Developing countries struggle to develop and save the lives of their most fragile, small and sick babies.  It is not normal to have a birth before term or to give birth to a low-birth-weight infant, which is why these children have to be examined to rule out any pathology that could be treated, and they have to be followed up on to detect any deviation in the neuro-psychomotor and sensory development that would benefit from timely intervention to avoid sequelae requiring more difficult treatments.  At the same time, one could understand that the use of the method in the community context may be the only opportunity to avoid hypothermia

The mothers expressed the following as limitations to apply KMC: postpartum pain, fear of causing damage to the navel, the probability that carrying the baby caused pain in the chest as if they were carrying something very heavy, the tradition of placing the baby on the back, the lack of support for the back (they did not have chairs with backs), fear of the baby falling, fear of crushing the baby at night, handling of the baby during the time they bathe or do daily tasks, discomfort in the breasts, and the position to breastfeed. Most of these were addressed through counseling.

As for the midwives, they expressed interest as long as they receive appropriate training to help the mother and the baby (2). These findings indicate that the use of KMC in the community requires formal training and follow-up by trained personnel and it should be taken into account that the deliveries occurred in hospitals.

and/or hypoglycemia for a premature or low birth weight child in isolated regions without communication. But this should be transitory while the conditions of the country improve.

In this context, transportation while using Kangaroo Mother Method can also be considered. This modality in addition to the position includes kangaroo nutrition, which allows for long-term transport between an isolated community by either boat, motorcycle, on foot or by plane and a hospital with the capacity to take care of these fragile children. This requires training in the use of the kangaroo mother method for neonatal transport.

It should be noted that there is often a rejection by the community to care for the smallest children for fear of the sequelae and by the mothers worried they will find themselves alone with a child that will prove costly while they know that they will probably have another child the following year. This cultural aspect of the rejection of the KMC by the community must be understood and goes hand in hand with the reduction of mortality and the improvement of the economic situation of the country.

VIABILITY Is it possible to implement the intervention?							
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS					
<ul><li>Likely not</li><li>Likely yes</li><li>Yes</li></ul>	Although Sloan's study showed that the intervention can be viable, the results are not reliable because they lack the comparison to the "gold standard" scenario, which is the use of KMC in a hospital setting, and to community handling with high quality standards with regard to the clinical care of the newborn, consequently it is not feasible to implement the intervention without evidence to support it.						

SUMMARY OF FINDINGS	FINDING						
STRENGTH OF EVIDENCE	Very low	Low	Moderate	High			Not applicable
VALUE	Significant uncertainty or variability	Likelihood of significant uncertainty or variability	Likelihood of no significant uncertainty or variability	No significant uncertainty or variability			
BALANCE OF OUTCOME MEASURES	Favors the control	Likely favors the control	Favors neither the intervention nor the control	Likely favors the intervention	Favors the intervention	Varies	Inconclusive
ACCEPTABILITY	No	Likely not	Likely yes	Yes		Varies	Inconclusive
VIABILITY	No	Likely not	Likely yes	Yes		Varies	Inconclusive

# RECOMMENDATION

Strong recommendation	Conditional recommendation	Conditional recommendation	Conditional recommendation	Strong recommendation in
against the intervention	against the intervention	in favor of the intervention or	in favor of the intervention	favor of the intervention
		the control		
x	0	0	0	0

# **A** Conclusion

### Recommendation

It is not recommended the initiation of the Kangaroo Mothercare method in a preterm or low birth weight newborn in a community without a prior referral to the hospital for an initial examination to rule out pathologies and without clinical follow-up by trained personnel on an outpatient basis during the first year of life.

### **Justification**

There is no evidence to support the use of the Kangaroo Mothercare method without the minimum quality standards in terms of survival and quality of survival of the preterm infant. The risk of harm in using the KMC without these components can be much higher than the possible benefits it may present.

## **Subgroup considerations**

Not applicable

### **Considerations for implementation**

Not applicable

### **Research priorities**

More research is needed on the establishment of a network for the management of preterm and/or low birth weight newborns. For example, which infants can be handled at the primary level in the community, which infants should be handled at the different health care levels, which should be referred, but can then return to their community and under what type of follow-up.

More research about KMC is also needed for transportation in difficult terrains or in isolated communities.

### **Reference summary:**

- 1. Sloan, NL, Ahmed, S, Mitra, SN, Choudhury, N, Chowdhury, M, Rob, U, Winikoff, B. Community-Based Kangaroo Mothercare to Prevent Neonatal and Infant Mortality: A Randomized, Controlled Cluster Trial. Pediatrics; 2008.
- 2. Bazzano, A, Hill, Z, Tawiah-Agyemang, C, Manu, A, ten Asbroek, G, Kirkwood, B. Introducing home-based skin-to-skin care for low-birth-weight newborns: a pilot approach to education and counseling in Ghana. Global Health Promotion; 2012.

### **ACKNOWLEDGMENTS**

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# **Aspect 2: Kangaroo position**

## Clinical Question 8

Does the kangaroo position employed in the care of the preterm and low birth weight newborn produce any effect on the stability of vital signs compared to usual care?

Population	Intervention	Control	Principal outcome measures
Infants born prematurely or with low birth weight who are stable	Kangaroo position	Traditional care in an incubator	Stability of Vital Signs (Temperature- thermoregulation, HR, RR, oxygen saturation) - Thermal regulation, HR, FR, Oxygen Saturation)

# Response.

## Moderate certainty of the evidence

### Strong recommendation in favor of intervention

To maintain the physiological stability of the preterm and low birth weight newborn, the use of the kangaroo position is recommended.

### Justification

The evidence found indicates that the kangaroo position decreases the risk of hypothermia, and could improve oxygen saturation, without probable negative effects on heart rate and respiratory rate. As for parental values and preferences, although there is no evidence regarding outcomes, it must be considered that once the parents understand the implications of physiological instability in their babies, they are the ones who are more attentive to look for and maintain their baby's stability.

The use of the kangaroo position generates satisfaction in the parents even though there may be some difficulties for the acceptance of the position by the parents in some contexts. In the same way, healthcare personnel usually recognize the benefits of the position, but in some contexts this acceptability may vary.

### *Implementation*

Prior to implementation, it is very important to verify that the following aspects are available and ready for the execution of the KMC in the NBU, the delivery room or

#### in the KMC ward:

- 1. Infrastructure preparation (chairs, Lycra bands, food for the mother, privacy screens, water and soap).
- 2. Care protocols including:
  - » Open Unit Protocol,
  - » Protocol for initiation of the KMC in the NICU,
  - » Protocol for initiation of the KMC in Intermediate Care,
  - » Kangaroo practice registration protocol,
  - » Protocol for parental participation and permanence in the unit,
  - » Protocol for family visits,
  - » Protocol for social work.

These must be accepted by all the staff members, applied at all times and in all types of units, from the auxiliary nurses to neonatologists, including administrative staff.

- 3. Prior training for the staff in the Kangaroo Mothercare method and in how to train and educate parents and/or caregivers.
- 4. Education and training materials adapted to the parents. Parents' education is basic, like initial position support, until they feel confident enough in their kangaroo knowledge to handle their baby on their own.
- 5. Follow-up of the impact on children, parents and staff.
- 6. Regular meetings to support staff in case of difficulties

# GRADEpro recommendation

Should kangaroo	Should kangaroo position vs. usual incubator care be used for the preterm or low birth weight newborn who is stable to maintain stability in vital signs?						
Population:	Population: Infants born prematurely or with low birth weight						
Intervention:	Kangaroo position						
Comparison:	Traditional care in incubator						
Principal	Physiological stability						
outcome							
measures:							

# STRENGTH OF EVIDENCE

What is the general certainty about the effects of the intervention?

INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS		
Outcome measures	Importance	STRENGTH OF EVIDENCE (GRADE)	The quality of the evidence related to the outcome measures of hypothermia and heart rate is moderate, while for the other outcomes variability in respiratory
Hypothermia: Conde-Agudelo, 2016 evaluated on: Episodes of hypothermia after discharge or at 40-41 weeks of gestational age	CRITICAL	⊕⊕⊕ MODERATE <sup>a</sup>	rate and oxygen saturation is low.
Heart rate: Ali 2009, Legault 1995 (included in Boundy 2016), Deghani 2015 Evaluated on: average beats/minute	IMPORTANT	⊕⊕⊕ MODERATE <sup>b,c</sup>	
	Outcome measures  Hypothermia: Conde-Agudelo, 2016 evaluated on: Episodes of hypothermia after discharge or at 40-41 weeks of gestational age  Heart rate: Ali 2009, Legault 1995 (included in Boundy 2016), Deghani 2015	Outcome measures  Hypothermia: Conde-Agudelo, 2016 evaluated on: Episodes of hypothermia after discharge or at 40-41 weeks of gestational age  Heart rate: Ali 2009, Legault 1995 (included in Boundy 2016), Deghani 2015	Outcome measures  Importance    Importance   EVIDENCE (GRADE)

### STRENGTH OF EVIDENCE What is the general certainty about the effects of the intervention? INTERVENTIONAL EVIDENCE FINDING ADDITIONAL CONSIDERATIONS In general, an important variability STRENGTH OF was found that can be explained **Outcome measures Importance EVIDENCE** by the differences in the use of (GRADE) the kangaroo position and the populations studied. Respiratory rate: Ali 2009, Legault 1995 and, **IMPORTANT** $\oplus \oplus \bigcirc \bigcirc$ Kadam 2005 (included in Boundy 2016), I OWa,b,c,d Deghani 2015. Evaluated on: average breaths/minute Oxygen saturation: Ali 2009, Legault 1995, **IMPORTANT** $\oplus \oplus \bigcirc \bigcirc$ Kadam 2005, (included in Boundy 2016), I OWa,c,d Deghani 2015. Evaluated on: Blood-oxygen saturation (%SaO2) Follow up: 3 days a. Heterogeneity is substantial; I<sup>2</sup> greater than 50% b. The results do not conclusively find a difference; the CI is narrow and the CI values are not clinically relevant. For this reason, it was decided not to penalize for lack of preciseness despite having a suboptimal sample size. c. Evaluation of outcomes was not blinded in any of the studies. d. Risk of bias in randomization in the Kadam study (1, 2, 3, 4, 5, 6, 7).

VALUE Is there significant uncertainty or variability in how people value the main outcomes?								
FINDING	INTERVENTIONAL EVIDE		ADDITIONAL CONSIDERATIONS					
<ul> <li>Significant uncertainty or variability</li> <li>Likelihood of significant uncertainty or variability</li> <li>Likelihood of no significant uncertainty or variability</li> <li>No significant uncertainty uncertainty or variability</li> </ul>	There is no evidence on the included in this question.	asures	Once parents understand the implications of physiological instability in their children, it is they who are most attentive to establishing and maintaining the physiological stability of their baby.					
BALANCE OF OUTCOME	E MEASURES ¿Does the bala	nce between favora	able and unfavorabl	e outcomes fav	or the interventi	on or the control?		
FINDING	INTERVENTIONAL EVIDE	NCE				ADDITIONAL CONSIDERATIONS		
<ul><li>Favors the control</li><li>Likely favors the control</li><li>Favors neither the</li></ul>	Outcome measures	With traditional care in incubator	With kangaroo position	Difference	Relative effect (95% CI)	There is a great reduction in the risk of hypothermia in the premature or low birth weight newborn with the use of the		
intervention nor the control	Hypothermia: Conde- Agudelo, 2016 evaluated on: Episodes of hypothermia after discharge or at 40-41 weeks of gestational age	271 per 1000	<b>76 per 1000</b> (43 to 133)	195 fewer per 1000 (228 to 138 fewer)	<b>RR 0.28</b> (0.16 a 0.49)			

FINDING	INTERVENTIONAL EVIDER	NCE				ADDITIONAL CONSIDERATIONS
<ul><li>Likely favors the intervention</li><li>Favors the intervention</li><li>Varies</li></ul>	Outcome measures	With traditional care in incubator	With kangaroo position	Difference	Relative effect (95% CI)	The kangaroo position probably does not produce differences in heart rate. The kangaroo position may produce little or no difference
○ Inconclusive	Heart rate: Ali 2009, Legault 1995 (included in Boundy 2016), Deghani 2015 Evaluated on: average beats/minute		The average heart rate in the interventional group was 3.6 beats per minute higher (3.03 lower to 10.23 higher)	MD <b>3.6</b> beats/min higher. (3.03 lower to 10.23 higher)	-	in respiratory rate. Evidence suggests that the kangaroo position may increase oxygen saturation, this increase is clinically significant when the
	Respiratory rate: Ali 2009, Legault 1995 and, in the intervention g	The average respiratory rate in the intervention group was 4.99 lower (8.04 lower to 1.94 higher)	MD <b>4.99 lower</b> (8.04 lower to 1.94 higher)	-	saturation level is less than 90%.	

FINDING	INTERVENTIONAL EVIDE	NCE				ADDITIONAL CONSIDERATIONS
	Outcome measures	With traditional care in incubator	With kangaroo position	Difference	Relative effect (95% CI)	The kangaroo position probably does not produce differences in heart rate. The kangaroo position may produce little or no difference
	Oxygen saturation: Ali 2009, Legault 1995, Kadam 2005, (included in Boundy 2016), Deghani 2015. Evaluated on: Bloodoxygen saturation (%SaO2) Follow up: 3 days (8, 2) (1, 2, 3, 4, 5, 9)		The average oxygen saturation in the intervention group was 1.47 higher (0.83 to 2.11 higher)	MD <b>1.47 higher</b> . (0.83 to 2.11 higher	-	in respiratory rate. Evidence suggests that the kangaroo position may increase oxygen saturation, this increase is clinically significant when the saturation level is less than 90%.
ACCEPTABILITY						
	acceptable to the interested pa	rties?				
FINDING	INTERVENTIONAL EVIDE	NCE				ADDITIONAL CONSIDERATIONS
<ul><li>No</li><li>Likely not</li><li>Likely yes</li><li>Yes</li></ul>	In multiple studies, parent and immediate love at firs	Acceptability to the parents In multiple studies, parents mainly express good experiences with skin-to-skin contact, such as joy and immediate love at first contact in the kangaroo position and with first eye contact, some even described it as a gift from God, which in turn was				

Inconclusive

o Yes Varies

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
	accompanied by a decrease in the feeling of guilt, anguish, fear and rejection (11, 12). Even though some mothers experienced some initial discomfort feeling sweaty, they appreciated the experience. During the act of providing skin-to-skin contact, mothers describe that they experienced calm, peace and relaxation, as well as fascination with the movements of the baby and their efforts to look around. Findings show that parents were delighted to observe the growth of their baby and to feel their beating heart (12).  Additionally, skin-to-skin contact helped the mothers reflect on and manage their feelings about having given birth to a premature child and contributed to the mothers' need for affection after the birth experience. Seeing the child's growing strength helps alleviate feelings of guilt and fear, increasing the parents' hopes for their child's survival. Parents also consider that skin-to-skin contact is a natural instinct, related to the desire to protect their baby (12).	
	Mothers believe that providing skin-to-skin contact helped them with managing the baby with confidence and with breastfeeding, preparing them to take responsibility for the baby's care after discharge, as well as contributing to their need to feel that they have some responsibility related to the care of their child while hospitalized. The fathers, in turn, manifest wanting to be instructed on the method by their partners (12). Moreover, in many societies, the role of mother is of utmost importance in the construction of the social identity of women, and the method of skin-to-skin care helps many mothers in this process, as well as their partners to assume their role as the father. Likewise, the consequent increase in the parents' self-esteem helps in other aspects, such as the decrease in fear generated by the baby's monitoring equipment and an increase in the feeling of control (12, 13).  As for other positive practical effects, mothers learn to recognize the normal pattern of breathing, temperature, hunger and sleep of their baby, and can therefore recognize alterations easier and faster. This sense of security	

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
	and competence decreases their anxiety. Fathers recognize that skin-to-skin contact is an important intervention in the recovery of their premature baby and in the establishment of maternal breastfeeding, in addition to considering it a pleasant experience for the baby. Mothers feel that skin-to-skin contact conveys affection, security, courage and hope to their child (12). Some mothers who expressed fear of establishing a bond with their child, if he or she is very fragile, considered that skin-to-skin was necessary in this process (12, 14). Some fathers believe that skin-to-skin contact should preferably be carried out by the mother since the baby prefers her smell and the comfort of breastfeeding and some even state that they do not consider the male body appropriate to provide contact. Additionally, some mothers with older children may feel they are neglecting them by spending so much time caring for their premature baby in skin-to-skin contact, although in general their partners accepted responsibility for taking care of the older children (12). Some mothers reported other difficulties in making skin-to-skin contact, including having a lot of pain due to childbirth; fear of harming the baby, especially their navel; and some believe that the chest is not a comfortable place to carry their baby, as the back is stronger since there are communities accustomed to carrying their children in this way (10).	
	Acceptability to the healthcare personnel:  Qualitative evidence supports the notion that nursing staff view skin-to-skin contact positively for several reasons, such as: the possibility for parents to see their child earlier; the close contact that allows parents to learn to interpret their child's gestures; and their greater participation in the care of their newborn, which fosters greater confidence in the parents. The nurses also consider that the practice is beneficial for the babies themselves, including supporting their stability, growth, sleep, uptake of breastfeeding, and even report that there is a lower risk of infection by manipulation (15).	

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
	The staff is also aware of the importance of their participation and support of parents for the success of the kangaroo mothercare method and that it is important to listen to their preferences and decisions. They consider that an environment without a lot of noise or light is important for a better practice of the method (12). In some countries, especially Scandinavian countries, skin-to-skin contact has been fully incorporated into the role of the nursing staff, and the parental bond is seen as a priority in the care of the baby. The nurses consider it an essential part of their work to support the development of an empowered parenthood, and even consider that the importance of skin-to-skin contact is proportional to the fragility of the newborn and express positive personal emotions when implementing the method (16).  On the other hand, it has been described that the practice of kangaroo mothercare can be a cause of stress for nurses because of the feeling of not having control over the care of the baby and the difficulty of observing changes in the babies and in performing the necessary procedures (12). In certain communities, healthcare professionals feel that patience is needed to introduce the practice into the community, since most women adopt it enthusiastically in the hospital but not at home because of social pressure (10).	
VIABILITY		
Is it possible to imple	ment the intervention?	
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul><li>No</li><li>Likely not</li><li>Likely yes</li><li>Yes</li><li>Varies</li><li>Inconclusive</li></ul>	The viability of using the kangaroo position is directly related to the viability of the Kangaroo Mothercare Method.  *Position Difficulties** • Parents report that they sometimes feel exposed during skin-to-skin contact and that it is an activity that may require a lot of energy. In low-resource countries, it may be difficult to find chairs with backrest to ensure comfort for the mother (10)2).	

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
	<ul> <li>At times, mothers may want a break from the position and appreciate if the staff allows for this, but at other times the parents feel that their wishes about the intensity of the contact with their child are ignored and they may become frustrated if they are not allowed contact when they desire it or when they are not permitted to rest (14)</li> </ul>	
	<ul> <li>Related to the context for the application of the method.</li> <li>Parents say they rather perform skin-to-skin contact method in their homes than in the hospital, where they can feel uncomfortable exposing their body, where there is more noise, where they may be criticized by staff and where they are likely to have to sit all day, unable to rest adequately. Even the practice of skin-to-skin contact in the home can have difficulties such as being unable to perform other activities including going to the bathroom, eating and having relationships with other people. (12, 14)</li> <li>In some communities where skin-to-skin contact is new, both healthcare professionals and mothers may consider it unlikely that the method will continue to be used after discharge, even if they report enthusiasm for the practice (Bazzano et al., 2012).</li> <li>For the nursing staff, there are some situations that can hinder the practice of skin-to-skin contact, such as the increase in workload, especially if there is not enough staff; when parents do not have confidence in the effectiveness of the method; and concerns about the baby's medical condition (14)</li> </ul>	
	Facilitators. To overcome all barriers, mothers rely heavily on the following: the positive attitude of the healthcare workers, the support of families, the feelings of trust and empowerment that they acquire and the evidence of the effectiveness of the method (14)	

SUMMARY OF FINDINGS	FINDING						
STRENGTH OF EVIDENCE	Very low	Low	Moderate	High			Not applicable
VALUE	Significant uncertainty or variability	Likelihood of significant uncertainty or variability	Likelihood of no significant uncertainty or variability	No significant uncertainty or variability			
BALANCE OF OUTCOME MEASURES	Favors the control	Likely favors the control	Favors neither the intervention nor the control	Likely favors the intervention	Favors the intervention	Varies	Inconclusive
ACCEPTABILITY	No	Likely not	Likely yes	Yes		Varies	Inconclusive
VIABILITY	No	Likely not	Likely yes	Yes		Varies	Inconclusive

# **RECOMMENDATION**

Strong recomme	endation Conditional reco	mmendation Conditional	recommendation C	Conditional recommendation	Strong recommendation in
against the interventi	on against the inter	vention in favor of t	he intervention or ir	n favor of the intervention	favor of the intervention
		the control			
0	0	0	0	0	•

# **A** Conclusion

#### Recommendation

To maintain the physiological stability of premature and low birth weight newborns, the use of kangaroo position is recommended.

### **Justification**

The evidence found indicates that the kangaroo position decreases the risk of hypothermia, and could improve oxygen saturation, with no probable negative effects on heart rate and respiratory rate. Regarding the values and preferences of the parents, although there is no evidence regarding these outcome measures, it should be considered that once the parents understand the implications of physiological instability in their children, it is they who are most attentive to the establishment and maintenance of the baby's stability.

The use of the kangaroo position generates satisfaction in the parents, even though there may be some difficulties for the acceptance of the position by the parents in some contexts. Similarly, health personnel recognize the benefits of the position, but in some contexts acceptability may vary.

## **Subgroup considerations**

N/A

# **Considerations for implementation**

Prior to implementation, it is very important to verify that the necessary conditions, including the following aspects, are available and ready for the execution of Kangaroo Mothercare Method (KMC) in the newborn unit, the delivery room or in the joint accommodation:

- 1. nfrastructure preparation (chairs, support belts, food for the mother, privacy screen, water and soap).
- 2. Care protocols that include:
  - » Open Unit Protocol,
  - » KMC initiation protocol in the ICU,
  - » KMC initiation protocol in intermediates,
  - » Registration protocol for kangaroo practice,
  - » Protocol for parental involvement and stay in the unit,
  - » Protocol for family visits,
  - » Protocol for social work.

These must be accepted by all staff, from the nursing assistant to the neonatology specialists including administrative staff, and applied at all times and in all types of units,

- 3. Previous training of personnel in KMC and in parent education and training.
- 4. Education and training materials adapted for parents. Parent education is basic,

such as initial position support, until they feel confident enough in their kangaroo knowledge to handle their baby alone.

- 5. Systems for monitoring the impact on children, parents and staff.
- 6. Regular staff support meetings in case of difficulty.

## **Investigational priorities**

N/A

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- Skin-to-skin holding from the Caregiver's perspective. Advances in Neonatal Care; 2015.

## Clinical Question 9

In the preterm infants, how effective is the kangaroo position in preventing apnea of prematurity compared to usual incubator care?

Population	Intervention	Control	Principal outcome measures
Infants born prematurely	Kangaroo position	Traditional care in an incubator	Episodes of apnea of prematurity

# Response.

### Moderate certainty of evidence

## Strong recommendation in favor of the intervention

### Justification

All preterm or low birth weight infants should be kept in the kangaroo position for as long as possible and for as long as required to reduce the risk and number of apneas.

## *Implementation*

The evidence found demonstrates the beneficial effect of the kangaroo position to reduce the risk of apnea of prematurity, but it is of moderate quality due to the risk of bias in some studies. As an additional consideration, it has been described that reduction in apneas correlates with a better long-term neurological prognosis (Reference).

Moreover, this is considered to be an outcome of high value to parents. Although the variability in the acceptability and feasibility of the intervention may affect the recommendation, it is considered that in the implementation process, strategies should be used to reduce the described barriers

# GRADE pro recommendation

Should kangaroo position	Should kangaroo position be used vs. traditional care in an incubator for premature or low birth weight infants to prevent apnea of prematurity?					
Population:	Infants born prematurely or with low birth weight to prevent apnea of prematurity					
Intervention:	Kangaroo position					
Control:	Traditional care in incubator					
Principal outcome	pisodes of apnea of prematurity					
measures:						

STRENGTH OF EVID	STRENGTH OF EVIDENCE What is the general certainty about the effects of the intervention?								
FINDING	INTERVENTIONAL EVIDENCE			ADDITIONAL CONSIDERATIONS					
<ul> <li>Very low</li> <li>Low</li> <li>Moderate</li> <li>High</li> <li>Not applicable</li> </ul>	Outcome measures	Importance	STRENGTH OF EVIDENCE (GRADE)	The evidence found is of moderate quality; there are limitations in the designs of the studies that may affect the certainty of the					
	Episodes of apnea of prematurity (Kadam 2005; Acharya 2014; Sharma 2016: Swarnkar 2016)	CRITICAL	⊕⊕⊕ MODERATE <sup>a,b</sup>	evidence, however observational studies show similar results.					
	a. Although the confidence interval is wide, the results are conclusive in favor of intervention. The Swarnkar 2016 study assigned patients alternately, which corresponds to pseudo-randomization.  b. The studies were not blinded because of the characteristics of the intervention. They do not report how outcome was measured in most studies. (1, 2, 3, 4)			When meta-analyzing the results of the cohort studies Bonhorst 2001, Maastrupp 2010 and Collados Gómez 2011, we found that in the KMC group the RR was 0.38 with a 95% CI [0.18, 0.80] with a risk difference of 13.3% ((5, 6, 7)).					

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul> <li>Significant uncertainty or variability</li> <li>Likelihood of significant uncertainty or variability</li> <li>Likelihood of no significant uncertainty or variability</li> <li>No significant uncertainty or variability</li> <li>No significant uncertainty or variability</li> </ul>	N/A	We believe that the outcome measure of apnea episodes is of high value to parents because of the effects that the lack of oxygenation during the episodes may cause in their children. Expressions of anguish and horror when their babies stop breathing are the norm due to their association of this symptom with death.

BALANCE OF OUTCOME MEASURES  Does the balance between favorable and unfavorable outcomes favor the intervention or the control?  FINDING INTERVENTIONAL EVIDENCE ADDITIONAL CONSIDERATIONS							
<ul><li>Finding</li><li>Favors the control</li><li>Likely favors the control</li></ul>	Outcome measures	With traditional care in incubator	With kangaroo position	Difference	Relative effect (95% CI)	The kangaroo position significantly reduces the risk of apnea in premature babies compared to traditional care.	
<ul> <li>Favors neither the intervention nor the control</li> <li>Likely favors the intervention</li> <li>Favors the intervention</li> <li>Varies</li> <li>Inconclusive</li> </ul>	Episodes of apnea of prematurity (Kadam 2005; Acharya 2014; Sharma 2016: Swarnkar 2016)  Fixed effects mo Kadam et al., 200				<b>RR 0.41</b> (0.22 a 0.78) <sup>a</sup>	The decrease in episodes of apnea correlates with a better long-term neurological prognosis ((8)).	

ACCEPTABILITY  Is the intervention acceptable to the interested parties?				
DING INTE	ERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS		
For the baby's to recover anxies recover in additional stress.  On the to-ski incompose are ignot all rest ("  Nurse sleep handle stress.	the parents, the kangaroo position makes it easier for mothers to recognize their is normal patterns of breathing, temperature, hunger and sleep, making it easie is cognize variations. This sense of security and competence decreases their ety. Parents recognize that skin-to-skin contact is an important intervention in the very of their premature baby and in the establishment of maternal breastfeeding didition to considering it a pleasant experience for the baby. Mothers feel that eto-skin contact conveys affection, safety, courage and hope to their child (9). The other hand, parents report that they sometimes feel exposed during skin-kin contact and that it is an activity that may require a lot of energy. In low-me countries, it can be difficult to find chairs with backrest to ensure comfort the mother (10). Sometimes, mothers may want a break from the position and reciate if the staff allows it, but at other times the parents feel that their desires gnored as to the intensity of the contact and may become frustrated if they are allowed to perform the position when they want it or if they are not allowed to (11).  The sees also consider the practice to be beneficial for the child's stability, growth, possible provides the practice of KMC can be a cause of the staff allows and even report that there is a lower risk of infection from the diling. But it has also been noted that the practice of KMC can be a cause of the staff and the feeling of not having control over the baby's care and the			
For the baby's to recover anxies recover in additional stress.  On the to-ski incompose are ignot all rest ("  Nurse sleep handle stress.	the parents, the kangaroo position makes it easier for mothers to recognize their is normal patterns of breathing, temperature, hunger and sleep, making it easie recognize variations. This sense of security and competence decreases their ety. Parents recognize that skin-to-skin contact is an important intervention in the very of their premature baby and in the establishment of maternal breastfeeding didition to considering it a pleasant experience for the baby. Mothers feel that to-skin contact conveys affection, safety, courage and hope to their child (9). The other hand, parents report that they sometimes feel exposed during skin-kin contact and that it is an activity that may require a lot of energy. In low-me countries, it can be difficult to find chairs with backrest to ensure comfort the mother (10). Sometimes, mothers may want a break from the position and reciate if the staff allows it, but at other times the parents feel that their desires gnored as to the intensity of the contact and may become frustrated if they are allowed to perform the position when they want it or if they are not allowed to (11).  The sees also consider the practice to be beneficial for the child's stability, growth, possible processing, and even report that there is a lower risk of infection from dling. But it has also been noted that the practice of KMC can be a cause of			

VIABILITY  Is it possible to implement the intervention?				
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS		
<ul> <li>No</li> <li>Likely not</li> <li>Likely yes</li> <li>Yes</li> <li>Varies</li> <li>Inconclusive</li> </ul>	The feasibility of using the kangaroo position is directly related to the feasibility of the KMC.  There are multiple reports of the implementation of KMC in different countries around world, Chan et al. (13, 14, 15), conducted a good quality systematic review of studies in which they evaluated the implementation of KMC. In their analysis the authors included 86 studies, 61% were published between 2010 and 2015 and most of them in countries in America. The authors developed a matrix of barriers and enablers for the implementation of the KMC.  In their analysis they found three levels for implementation, these are: parents, healthcare workers and health facilities. And six main aspects that facilitate or hinder the implementation of the intervention: acceptance of the method and bonding, social support, time necessary to provide care, health or medical concerns, access to the healthcare system and contextual cultural aspects. The main findings are described in appendix 1 of question 4.			

SUMMARY OF FINDINGS	FINDING						
STRENGTH OF EVIDENCE	Very low	Low	Moderate	High			Not applicable
VALUE	Significant uncertainty or variability	Likelihood of significant uncertainty or variability	Likelihood of no significant uncertainty or variability	No significant uncertainty or variability			
BALANCE OF OUTCOME MEASURES	Favors the control	Likely favors the control	Favors neither the intervention nor the control	Likely favors the intervention	Favors the intervention	Varies	Inconclusive
ACCEPTABILITY VIABILITY	No No	Likely not Likely not	Likely yes Likely yes	Yes Yes		Varies Varies	Inconclusive Inconclusive

# **RECOMMENDATION**

Strong recommendation	Conditional recommendation	Conditional recommendation	Conditional recommendation	Strong recommendation in
against the intervention	against the intervention	in favor of the intervention or	in favor of the intervention	favor of the intervention
		the control		
0	0	0	0	•

# **A** Conclusion

#### Recommendation

All premature or low birth weight babies should be kept in the kangaroo position for as long as possible and during a required period to reduce the risk and number of apnea episodes.

### **Justification**

The evidence found demonstrates the beneficial effect of the position in reducing the risk of apnea of prematurity; the evidence is of moderate quality due to risk of bias in some studies. As an additional consideration, it has been described that reduction in apnea episodes correlates with a better long-term neurological prognosis (Reference).

This is considered a highly valuable outcome for parents. Although the variability in the acceptability and feasibility of the intervention may affect the recommendation, it is generally considered that strategies that reduce the barriers to implementation described should be used in the implementation process.

### **Subgroup considerations**

N/A

## **Considerations for implementation**

Prior to implementation, it is very important to verify that the necessary conditions, including the following aspects, are available and ready for the execution of KMC in the newborn unit, the delivery room or in the joint accommodation:

- 1. Infrastructure preparation (chairs, support belts, food for the mother, privacy screen, water and soap).
- 2. Remember that when a mother carries her baby in a kangaroo position, it is under the responsibility of the nurse or midwife or the delivery room doctor. Ideally, it is best to make sure that the mother is accompanied to ensure the proper position of the child if the mother falls asleep.
- 3. Care protocols that include:
  - » Open Unit Protocol,
  - » KMC initiation protocol in the ICU,
  - » KMC initiation protocol in intermediates,
  - » Registration protocol for kangaroo practice,
  - » Protocol for parental involvement and stay in the unit,
  - » Protocol for family visits
  - » Protocol for social work.

These must be accepted by all staff, applied at all times and in all types of units, from the nursing assistant to the neonatology specialists, including administrative staff.

- 4. Previous training of personnel in KMC and in parent education and training.
- 5. Education and training materials adapted for parents. Parent education is basic, such as initial position support, until they feel confident enough in their kangaroo knowledge to handle their baby alone.

### **Investigational priorities**

N/A

## **Reference summary:**

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- 6. Maastrup, R, Greisen, G. Extremely preterm infants tolerate skin-to-skin contact during the first weeks of life: Skin-to-skin contact in extremely preterm infants. Acta Paediatrica; 2010.
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- 12. Mörelius, E, Anderson, GC. Neonatal nurses' beliefs about almost continuous parent-infant skin-to-skin contact in neonatal intensive care. Journal of Clinical Nursing; 2015.
- 13. Chan, G, Bergelson, I, Smith, ER, Skotnes, T, T., Wall. Barriers and enablers of kangaroo mothercare implementation from a health systems perspective: a systematic review. Health policy and planning.; 2017.
- 14. Smith, ER, Bergelson, İ, Constantian, S, Valsangkar, B, GJ, Chan. Barriers and enablers of health system adoption of kangaroo mothercare: a systematic review of caregiver perspectives. BMC Pediatrics; 2017.
- 15. Chan, GJ, Labar, AS, Wall, S, Atun, R. Kangaroo mothercare: a systematic review of barriers and enablers. Bull World Health Organ; 2016.

# Clinical Question 10

In the preterm or low birth weight newborn, what is the effectiveness of the kangaroo position in preventing gastroesophageal reflux compared to the usual antireflux position?

Population	Intervention	Control	Principal outcome measures
Preterm or low birth weight new-borns.	Kangaroo position.	Anti-reflux position in an incubator during routine care until discharge.	Gastroesophageal reflux. Bronchoaspiration episodes.

### Response

# Certainty of evidence no evidence found on the subject

### Conditional recommendation in favor of intervention

Consider maintaining the kangaroo position to decrease the number of GER episodes.

GCPP: the kangaroo position should be maintained with adequate support using a band made of cotton Lycra or of similar characteristics.

#### Justification

There is a consensus that, due to their immaturity, premature infants have more GER episodes, and there is also a consensus that there is no pharmacological treatment for this condition. The prone kangaroo position on the mother's or father's chest using a lycra band to keep the infant in an adequate position has the potential to decrease the number of reflux episodes due to the physical effects of the posture. There are no reports of increased GER in this position.

## *Implementation*

The stability of the kangaroo position using a band made of cotton Lycra or similar characteristics is essential to prevent the premature infant - by definition hypotonic - from slipping and creating a risk of falling or being in a position that facilitates vomiting.

When removing the baby from the kangaroo position, they must be placed in the crib in supine position to prevent sudden infant death.

# GRADEpro recommendation

Should the kangaroo position vs. antireflux position of usual incubator care be used for the preterm or low birth weight infant to prevent gastroesophageal reflux and episodes of bronchoaspiration?		
Population:	The preterm or low birth weight newborn at risk of gastroesophageal reflux and episodes of bronchoaspiration	
Intervention:	kangaroo position	
Control:	anti-reflux position of standard incubator care	
Principal	Gastroesophageal reflux; bronchoaspiration episodes;	
outcome		
measures:		

STRENGTH OF EVIDENCE What is the general certainty about the effects of the intervention?			
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS	
<ul><li>Very low</li><li>Low</li><li>Moderate</li><li>High</li><li>Not applicable</li></ul>		There is no data from direct experimental studies that indicate that the kangaroo position protects against GER.	

VALUE Is there significant uncertainty or variability in how people value the main outcomes?			
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS	
<ul> <li>Significant uncertainty or variability</li> <li>Likelihood of significant uncertainty or variability</li> <li>Likelihood of no significant uncertainty or variability</li> <li>No significant uncertainty or variability</li> </ul>		GER is very frequent in premature babies due to their immaturity. Episodes of GER may be a major source of concern for parents for fear of leading to vomiting and choking or other major complications in premature babies.	

BALANCE OF OUTCOME MEASURES  Does the balance between favorable and unfavorable outcomes favor the intervention or the control?			
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS	
<ul> <li>Favors the control</li> <li>Likely favors the control</li> <li>Favors neither the intervention nor the</li> </ul>	No reports on relevant investigations	Premature infants held in the kangaroo position show less irritability, deeper and longer sleep, and physiological stability (see previous recommendations) that could indirectly be associated with decreased clinical manifestations of GER.	
control • Likely favors the intervention • Favorece la intervención • Varies		From a physiological point of view, it can be assumed that the kangaroo position (in vertical, sideways or prone positions) maintained by a sash may decrease GER episodes due to the effect of gravity. The position can also lead to a decrease in abdominal pressure. The prone position has empirically demonstrated fewer episodes of GER. (1)	
o Inconclusive		Additionally, a lower incidence of GER has been reported in newborns fed with breast milk, a practice favored by the kangaroo position and which makes part of the Kangaroo Mothercare Method.	
		There is no evidence that the kangaroo position can increase GER episodes.	
ACCEPTABILITY  Is the intervention acceptable to the interested parties?			
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS	
<ul><li>No</li><li>Likely not</li><li>Likely yes</li></ul>	For parents, the kangaroo position makes it easier for mothers to recognize changes in the baby. The feeling of security and competence decreases their anxiety.		

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
o Yes o Varies oNo lo sé	Parents recognize that skin-to-skin contact is an important intervention in the recovery of their premature baby and in establishing maternal breastfeeding, in addition to considering it to be a pleasant experience for the baby. Mothers feel that skin-to-skin contact transmits affection, security, courage and hope to their child. (2)  Nurses also consider that the practice of the kangaroo position is beneficial for the baby's stability, growth, sleep, uptake of breastfeeding, and even report that there is a lower risk of infection from handling. But it has also been noted that the practice of Kangaroo Mothercare Method can be a cause of stress for nurses due to the feeling of not having control over the baby's care and the difficulty of observing changes in stability and of performing needed procedures (3).	
VIABILITY Is it possible to implement	the intervention?	
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul> <li>No</li> <li>Likely not</li> <li>Likely yes</li> <li>Yes</li> <li>Varies</li> <li>Inconclusive</li> </ul>	The feasibility of using the kangaroo position is directly related to the feasibility of establishing the Kangaroo Mothercare Method (KMC). There are multiple reports of the implementation of KMC in different countries around world, Chan et al. (4, 5, 6), conducted a good quality systematic review of studies in which they evaluated the implementation of KMC. In their analysis the authors included 86 studies, 61% of which were published between 2010 and 2015 and most of them in countries in America. The authors developed a matrix of barriers and enablers for the implementation of the KMC.	

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
	In their analysis they found three levels for implementation, these are: parents, healthcare workers and health facilities. And six main aspects that facilitate or hinder the implementation of the intervention: acceptance of the method and bonding; social support; time necessary to provide care; health or medical concerns; access to the healthcare system; and contextual cultural aspects. The main findings are described in appendix 1 of question 4.	

SUMMARY OF FINDINGS	FINDING						
STRENGTH OF	Very low	Low	Moderate	High			Not applicable
EVIDENCE							
VALUE	Significant	Likelihood of	Likelihood of	No significant			
	uncertainty or	significant	no significant	uncertainty or			
	variability	uncertainty or	uncertainty or	variability			
		variability	variability				
<b>BALANCE OF</b>	Favors the	Likely favors the	Favors neither	Likely favors the	Favors the	Varies	Inconclusive
OUTCOME	control	control	the intervention	intervention	intervention		
MEASURES			nor the control				
ACCEPTABILITY	No	Likely not	Likely yes	Yes		Varies	Inconclusive
VIABILITY	No	Likely not	Likely yes	Yes		Varies	Inconclusive

# **RECOMMENDATION**

Strong	recommendation	Conditional recommendation	Conditional recommendation	Conditional recommendation	Strong recommendation in
against the	e intervention	against the intervention	in favor of the intervention or	in favor of the intervention	favor of the intervention
			the control		
0		0	0	•	0

# **A** Conclusion

#### Recommendation

Consider using the kangaroo position to decrease the number of GER episodes. Point of Good Clinical Practice: the kangaroo position must be maintained with adequate support, such as with a cotton Lycra strap or a sash with similar characteristics.

#### **Justification**

There is consensus that the premature baby has more episodes of GER because of immaturity. Likewise, there is consensus that there is no pharmacological treatment for this condition. The prone kangaroo position on the mother's or father's chest with a sash to keep the child in the appropriate position has the potential to decrease the number of reflux episodes due to the physical effects of the posture. There are no reports of increases in GER episodes while in this position.

# **Subgroup considerations**

N/A

# **Considerations for implementation**

Maintaining stability of the kangaroo position with a cotton Lycra or another equivalent type of support is essential to prevent the premature child, who is by definition hypotonic, from slipping and creating a risk of falling or resulting in a position that leads to vomiting. When the child is no longer in the kangaroo position, the positional recommendations for the prevention of sudden death must be maintained

# **Investigational priorities**

Require studies on kangaroo position and GER.

# Reference summary:

- 1. van Wijk MP, Benninga MA,Dent J,Lontis R,Goodchild L,McCall LM,Haslam R,Davidson GP,Omari T. Effect of body position changes on postprandial gastroesophageal reflux and gastric emptying in the healthy premature neonate.. J Pediatr.; 2007.
- 2. Anderzén-Carlsson, A, Lamy, ZC, Eriksson, M. Parental experiences of providing skinto-skin care to their newborn infant—Part 1: A qualitative systematic review. International Journal of Qualitative Studies on Health and Well-being; 2014.
- 3. Mörelius, E, Anderson, GC. Neonatal nurses' beliefs about almost continuous parent-infant skin-to-skin contact in neonatal intensive care. Journal of Clinical Nursing; 2015.
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# Clinical Question 11

Is the kangaroo position employed in the care of the preterm and low birth weight newborn effective in relieving pain and the noxious effects associated with painful procedures compared to usual care?

Population	Intervention	Control	Principal outcome measures
Preterm or low birth weight newborns.	Kangaroo position.	Standard incubator care until dis-charge.	Pain relief. Harmful effects associated with painful procedures (memory and threshold). Risk to the infant of the procedure in KP.

# Response.

# Moderate certainty of the evidence

# Strong recommendation in favor of intervention

The use of the kangaroo position is recommended during health care procedures required for the preterm or low birth weight infants.

## Good clinical practice points:

- » Minimize as much as possible all painful procedures, leaving only the necessary ones.
- » Group sampling.
- » Health personnel should clearly identify the painful procedures for preterm NBs.
- » Add to the kangaroo position other non-pharmacological pain control measures that are known to be effective (containment, breastfeeding and sucrose).

### Justification

The justification of the 2007 version of the guidelines is maintained.

The use of the kangaroo position during a painful procedure is a possibly effective and innocuous non-pharmacological measure for pain control. Furthermore, given its positive effects on the neurological organization of the premature infants, the routinary use of the KP, at moments other than when painful procedures are performed, could counteract the harmful effects that these procedures have on the behavior of these infants.

### Detailed justification

# Certainty of evidence

Moderate quality evidence. New studies were included.

### **Values**

Pain control is a high-value outcome.

### Balance of effects

Results in favor of intervention in immediate pain regulation.

# *Implementation*

An open unit with a written protocol for the use of the kangaroo position is required for parental participation during painful procedures. Staff training is required to perform painful procedures while in kangaroo position.

Should kangaroo procedures?	position vs. usual care be used for the preterm or low birth weight newborn to alleviate pain and the harmful effects associated with painful
Population:	premature or low birth weight newborns
Intervention:	kangaroo position
Comparison:	Usual care
Principal	Reactivity to pain; Regulation of pain-associated distress.
outcome	
measures:	

	STRENGTH OF	ADDITIONAL CONSIDERATIONS
Importance	(GRADE)	
re CRITICAL	⊕⊕⊕○ MODERATE <sup>a,b,c</sup>	
_	re	CRITICAL $\oplus \oplus \oplus \bigcirc$

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS		
	Outcome measures	Importance	STRENGTH OF EVIDENCE (GRADE)	
	Harmful effects associated with painful procedures: event memory or pain threshold - not reported	CRITICAL	-	
	Procedure risk for the baby in kangaroo position - not reported	CRITICAL	-	
	a. The regulation of distress associated with pain refers to the a recovery phase after the painful stimulus. The lower the score, to b. b. One of the studies is not clear about the method of rando the intervention in any of the studies. In one of the studies they participants with the scale.  c. I2 36% acceptable  (1, 2, 3, 4, 5, 6)	the better the re mization, it is no	gulation ot possible to mask	

VALUE Is there significant	uncertainty or variability in how people value the main outcomes?	
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul> <li>Significant uncertainty or variability</li> <li>Likelihood of significant uncertainty or variability</li> <li>Likelihood of no significant uncertainty or variability</li> <li>No significant uncertainty or variability</li> <li>variability</li> </ul>	Pain has been one of the most important clinical outcomes in newborn care since the 1980s. In premature or low birth weight babies, this is especially important due to the multiplicity of procedures to which they are subjected as part of care received for stabilization in newborn and intensive care units. For both parents and health professionals, the rapid relief of pain, and the reduction of negative effects that may occur as a result of painful experiences are important.	In the eighties, <b>Anand</b> y <b>Hickley (1987)</b> (7) citado en (8)) performed a study that shows that nociceptive messages can travel via the peripheral nervous system to the cortical level in the newborn including the newborn born prematurely. The authors use several arguments for their conclusion: anatomical (the main structures are present), neurochemical (pain-mediating molecules are present),

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
		physiological (hemodynamic and respiratory effects caused by nociceptive stimulation), metabolic (the catalysis of pain enzymes is present) and hormonal (the response to stress is perfectly identified especially in surgery without anesthesia) ( <b>Spicher, 2002</b> , (9) <b>citado en</b> (8)). Behavioral disorders, facial expressions and crying may be signs of perceived pain. (8) Pain in the newborn should be

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
		considered with great interest as it seems that the newborn is hypersensitive until the third month of life. More intense metabolic activity exists in the newborn in the areas of the cortex and the thalamus, which are the areas involved in pain mechanisms, as compared to the following months of life. The hypothesis of an accentuated experience of pain at birth could therefore be established (Spicher, 2002 cited in (8))

#### **BALANCE OF OUTCOME MEASURES** Does the balance between favorable and unfavorable outcomes favor the intervention or the control? **ADDITIONAL FINDING** INTERVENTIONAL EVIDENCE **CONSIDERATIONS** Favors the There are cognitive **Anticipated absolute effects \* (95%** arguments that show control CI) Relative **STRENGTH** that when a child Likely favors the **Outcome OF** effect What happens Without With memorizes painful control **EVIDENCE** measures Favors neither events, there is a risk (95% CI) (GRADE) Kangaroo Kangaroo Difference the intervention of disruption in the position position interaction between nor the control Pain relief-The The use of DSM **0.64** $\oplus \oplus \oplus \bigcirc$ the child and his Likely favors the MODERAimmediate the kangaroo average lower environment, until long intervention TFa,b,c pain relief -(0.88 to regulation position during after the painful event Favors the evaluated with: 0.39 lower) immediate the procedure intervention has concluded. (Anand PIPP after 30 likely produces regulation & Hickey, 1987 (7), cited Varies seconds of the without immediate Inconclusive **in** (8)). procedure regulation and kangaroo In a study conducted by monitoring range: position pain relief in Fitzgerald en 1994 (10), 30 seconds to 5 was **0** SD premature babies (cited in (8)) it is shown minutes that premature children Number of from 26 to 32 weeks of participants: 467 gestational age from (6 randomized whom controlled experiments [RCTs])

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
	a. The regulation of distress associated with pain refers to the alteration of the signs of distress in the recovery phase after the painful stimulus. The lower the score, the better the regulation b. One of the studies is not clear about the method of randomization, it is not possible to mask the intervention in any of the studies. In one of the studies they only report results of 40 of the 140 participants with the scale c. I2 36% acceptable (1, 2, 3, 4, 5, 6).	blood is drawn by repeated punctures to the foot had a threshold for lower limb flexion reflex in that foot in relation to the foot that had not been punctured. In the systematic review of observational studies on the effects of pain in premature infants, the authors included 13 studies that reported short-term and long-term effects on neurodevelopment, emotional regulation, growth, among others (11). Although this report has a high risk

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
		of bias, it is the only one that consolidates evidence on the harmful effects of pain without evaluating the effects of interventions to control it.
		These findings can give us an understanding of the phenomenon. There are no reports of studies indicating that the use of the kangaroo position causes harm to the child during medical procedures that can cause pain to the newborn.

ACCEPTABILITY  Is the intervention a	ACCEPTABILITY s the intervention acceptable to the interested parties?						
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS					
<ul> <li>No</li> <li>Likely not</li> <li>Likely yes</li> <li>Yes</li> <li>Varies</li> <li>Inconclusive</li> </ul>	When interviewing nurses, barriers to the use of kangaroo position as method for pain relief were identified, including the time it takes to adopt the position if the baby is in an incubator, the inability to count on the mother's presence at all times in certain cases and the difficulty of performing the procedure while the baby is in the position However, there is evidence that the practice of the kangaroo position is seen by some nurses as effective in the relief of pain in babies who require invasive procedures, even when compared to methods such as glucose administration. (12)  When taking blood tests, mothers recognize that skin-to-skin contact can be uncomfortable, but in general they recognize that it is necessary to make small sacrifices in cases like these and that discomfort does not reduce the positive effects of the method. The same applies to the time required that could otherwise be devoted to work. Fathers generally accept that it is necessary for their partners to dedicate more time to the premature baby than to their usual tasks and that it is natural to support them during the process. (13, 14)	TThere is also resistance by the mother due to the concern of being ob-served when a blood sample is taken, in case of difficulty in practicing the position. However, this resistance disappears with practice when they discover that parents accept that it is a difficult task and do not criticize but help in the physical and emotional stability of the baby. The expertise of health personnel in performing the procedures required by the baby while in the kangaroo posi-tion should be considered as a potential barrier.					

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
No Likely not Likely yes Yes Varies Inconclusive	In previous recommendations the barriers and enablers of the method were discussed. In particular for the use of the kangaroo position there are some barriers, described in qualitative studies, such as the following:  - Parents report that they sometimes feel exposed during skin-to-skin contact and that it is an activity that may require a lot of energy and intimacy. In low-income countries, it can be difficult to find chairs with backrest to ensure comfort for the mother. They also report fear of causing harm to the baby or fear of the baby slipping, however these concerns are relieved with training (15).  - Sometimes, mothers may want a break from the position and appreciate if the staff allows it, but at other times the parents feel that their wishes are ignored as to the intensity of the contact and they may become frustrated if they are not allowed to perform the position when they want it or if they are not allowed to rest (16).	

SUMMARY OF FINDINGS	FINDING						
STRENGTH OF EVIDENCE	Very low	Low	Moderate	High			Ningún estudio incluído
VALUE	Significant uncertainty or variability	Likelihood of significant uncertainty or variability	Likelihood of no significant uncertainty or variability	No significant uncertainty or variability			
BALANCE OF OUTCOME MEASURES	Favors the control	Likely favors the control	Favors neither the intervention nor the control	Likely favors the intervention	Favors the intervention	Varies	Inconclusive
ACCEPTABILITY	No	Likely not	Likely yes	Yes		Varies	Inconclusive
VIABILITY	No	Likely not	Likely yes	Yes		Varies	Inconclusive

# **RECOMMENDATION**

Strong	recommendation	Conditional recommendation	Conditional recommendation	Conditional recommendation	Strong recommendation in
against the	e intervention	against the intervention	in favor of the intervention or	in favor of the intervention	favor of the intervention
			the control		
0		0	0	0	•



#### Recommendation

The use of the kangaroo position is recommended during procedures required for the care of premature or low birth weight babies.

Good practice considerations:

- » Minimize all painful procedures, leaving only those strictly necessary.
- » Group procedures and drawing of samples.
- » Health personnel should clearly identify painful procedures for premature infants.
- » Add to the kangaroo position other non-pharmacological measures for pain control that are known to be effective (support, lactation and sucrose).

#### **Justification**

# General justification

The justification of the 2007 version of the practice guidelines stands.

The use of the kangaroo position during a painful procedure is a possibly effective and harmless non-pharmacological method for pain control. In addition, the routine use of the position at times outside of those when painful procedures are performed, given the position's positive effects on neurological development in the premature infant, could counteract the harmful effects that painful procedures have on the behavior of these children.

# Detailed Justification Strength of the evidence

Evidence of moderate quality. New studies were included.

#### **Value**

Pain control is a highly valuable outcome.

Balance of outcome measures

Results are in favor of the intervention in the immediate regulation of pain.

### **Subgroup considerations**

N/A

### **Considerations for implementation**

An open unit with a written protocol on the use of the kangaroo position is required for parental involvement during painful procedures.

Training of personnel is required for the execution of painful procedures while the baby is in kangaroo position.

# **Investigational priorities**

KMC as a non-pharmacological measure for pain management.

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# Clinical Question 12

Is the kangaroo position employed in the care of the preterm and low birth weight infants more effective or similar to the usual care in ensuring stable or accelerated somatic growth?

Population	Intervention	Control	Principal outcome measures
Preterm or low birth weight new-borns.	Kangaroo position.	Standard incubator care until dis-charge.	Stable or accelerated somatic growth (weight, height and CP), Per day or per week and g/day or g/kg/d.

# Response.

# Moderate certainty of evidence

Strong recommendation in favor of the intervention

The use of the kangaroo position is recommended for at least 6 hours daily. If the position is not used continuously, the infant should be in an incubator for thermal regulation.

The use of the kangaroo position two or less hours a day is not recommended for somatic growth.

The use of the kangaroo position alternating with cradle care is not recommended in preterm infants less than 1500 grams or less than 30 weeks.

#### Justification

The evidence found shows a dose-response relationship between the duration of position and growth (weight, height and head circumference). Growth is a crucial indicator to assess the infant's developmental process.

#### *Implementation*

In addition to the considerations raised for the other recommendations related to the position, monitoring of growth curves should be carried out.

# GRADE pro recommendation

Should the moth	Should the mother kangaroo method vs. usual care be used for the preterm or low birth weight newborn to ensure stable or accelerated somatic growth?				
Population:	Preterm or low birth weight newborn to ensure stable or accelerated somatic growth				
Intervention:	Kangaroo mothercare method				
Comparison:	Usual care				
Principal	Somatic growth				
outcome					
measures:					

# STRENGTH OF EVIDENCE

What is the general certainty about the effects of the intervention?

FINDING	INTERVENTIONAL EVIDENCE			ADDITIONAL CONSIDERATIONS
Outcome measures Importance OF EVID	STRENGTH OF EVIDENCE (GRADE)	For the analysis of the outcome measures, subgroups were established according to the duration of the intervention.  The evidence for the outcome of weight		
oNot applicable	Weight gain with continuously held kangaroo position (Cattaneo 1998) Evaluated on: Weight gain in grams/day Follow up: 10 days	CRITICAL	⊕⊕⊕ MODERATEª	gain related to holding the kangaroo position with durations greater than two hours per day is moderate, while for durations of two hours or less the quality of the evidence was rated as low.

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS		
	Outcome measures	Importance	STRENGTH OFEVIDENCE (GRADE)	Likewise, an analysis was made in a subgroup of babies weighing under 1500 grams and babies under 30
	Weight gain with kangaroo position held for 6 or more hours per day (Suman 2008, Alí 2009, Acharya 2014, Swarnkar 2016). Evaluated on: grams/day Follow up: 40 weeks	CRITICAL	⊕⊕⊕ MODERATE b,c	weeks of age in which duration of the kangaroo position was at least 8 hours but who remained clothed for the rest of the time. In this case the quality of the evidence was equally low.
	Weight gain with kangaroo position held between 2 and 6 hours per day (Lumbanraja 2016, Ramanathan 2001) Evaluated on: grams/day Follow up: range of 40 weeks to 'last follow up'	CRITICAL	⊕⊕⊕ MODERATE b,d,e	Regarding growth in size and head circumference related to holding the kangaroo position over 6 hours per day, the quality of the evidence was
	Weight gain with kangaroo position held for less than 2 hours per day (Blaymore 1996, Roberts 2000, Rojas 2003, Boo 2007) Evaluated on: grams/day Follow up: range of 40 weeks to 'last follow up'	CRITICAL	DOW b,f	moderate, while for shorter duration exposures the quality was low.
	Weight gain in newborns from 1500 to 1750 g (c) (Mwendwa 2012) (evaluated with: weight gain in g/kg/d) follow-up: at discharge.	CRITICAL	⊕⊕⊕○ MODERATE <sup>k,l</sup>	

FINDING	INTERVENTIONAL EVIDENCE			ADDITIONAL CONSIDERATIONS
	Outcome measures	Importance	STRENGTH OFEVIDENCE (GRADE)	
	Weight gain in NB from 1000 to 1499 g (c) (Mwendwa 2012) (evaluated with: weight gain in g/kg/d) follow-up: at discharge.	CRITICAL	⊕⊕⊕○ MODERATE <sup>k</sup>	
	Weight gain with kangaroo position held for at least 8 hours in infants less than 1500 grams and 30 weeks (Ghavane 2012) evaluated with: weight gain in g/kg/d follow-up: range 40 weeks	CRITICAL	LOW f,g	
	Growth in size with kangaroo position held for more than 6 hours (Suman 2008, Swarnkar 2016) Evaluated on: Weekly height gain in cm Follow up: range of 40 weeks to 'last follow up'	IMPORTANT	⊕⊕⊕○ MODERATE <sup>b</sup>	
	Growth in size with kangaroo position held for 6 hours or less (Acharya 2014, Rojas 2003) Evaluated on: Weekly height gain in cm Follow up: range of 40 weeks to 'last follow up'	IMPORTANT	LOW b,f	
	Growth in cephalic perimeter with kangaroo position held for more than 6 hours (Suman 2008, Swarnkar 2016) Evaluated on: centimeters/week	IMPORTANT	⊕⊕⊕⊖ MODERATE <sup>b</sup>	

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS		
	Outcome measures	Importance	STRENGTH OFEVIDENCE (GRADE)	
	Growth in cephalic perimeter with kangaroo position held for 6 hours or less (Acharya 2014, Boo 2007, Rojas 2003) Evaluated on: centimeters/week Follow up: range of 40 weeks to 'last follow up'	IMPORTANT	⊕○○○ VERY LOW b,f,g	
	a. This was an open multicenter study, it was not feasi intervention, and there is no report of concealment of a evaluation. There was variability between the control in not report the number of losses to follow up. b. In the studies included there may be selection bias a masking is unclear, there is no blinding of the intervent of the evaluator c. Acharya's study used crib care as a control, which do care	assignment or ntervention cer as the informat ion and there v	blinding of nters. They did tion regarding was no blinding	

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
	d. The Lumbanraja study includes crib care as a complementary intervention. In addition, 70% of the babies were more than 37 weeks of gestational age and average weight was 1900 grams, which indicates that the study was carried out on babies with low birth weight; this explains the attenuated increase in average weight gain compared to other studies in which predominantly premature babies were included, but does not represent indirect evidence.  e. Although the size of the population is small, it was a subgroup analysis that aimed to assess the differences between the different ranges of exposure to the intervention.  f. The results were not conclusive, neither in favor nor against the intervention.  g. Open study whose complementary intervention to the studied intervention was care in a dressed crib and not in an incubator, which is the usual standard of care for this population.  h. Considerable heterogeneity between studies  (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12)	

VALUE Is there significant uncertainty or variability in how people value the main outcomes?					
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS			
<ul> <li>Significant uncertainty or variability</li> <li>Likelihood of significant uncertainty or variability</li> <li>Likelihood of no significant uncertainty or variability</li> <li>No significant uncertainty uncertainty or variability</li> </ul>	No publications were found on how much parents value somatic growth rate.	For parents and clinicians, the somatic growth process of a baby is a fundamental indicator of good development. When there is no adequate weight gain or growth, this can cause concern for the parents. In the program's consultations, it has been observed that parents comment on the growth process of their children and compare growth progress among each other.			

CE OE OUT	/FASHRES
	MEASURES

Does the balance between favorable and unfavorable outcomes favor the intervention or the control?						
FINDING	INTERVENTIONAL	EVIDENCE				ADDITIONAL CONSIDERATIONS
o Favors neither the intervention nor the control o Likely favors the intervention o Varies o Inconclusive  We con kar (Ca Eva We gran Fol We kar helihou (Su 200 207 207 207 207 207 207 207 207 207	Outcome measures	With traditional care	With kangaroo position	Difference	Relative measure of effect (95% CI)	When performing the subgroup analysis, it was found that the duration of the kangaroo position probably produces an increase in weight proportional to the daily duration of the
	Weight gain with continuously held kangaroo position (Cattaneo 1998) Evaluated on: Weight gain in grams/day Follow up: 10 days	The average weight gain (Cattaneo 1998) was <b>17,7</b> g/day	Average weight gain with continuously held kangaroo position in the intervention group was 3.6 grams/day higher (0.78 to 6.42 higher)	MD <b>3,6 g/ day higher</b> (0,78 to 6,42 higher)	-	The evidence found does not indicate that durations of two hours or less per day lead to weight increases. Likewise, in premature infants weighing under 1500 grams or aged less than 30 weeks of gestational age, in which the position
	Weight gain with kangaroo position held for 6 or more hours per day (Suman 2008, Alí 2009, Acharya 2014, Swarnkar 2016). Evaluated on: grams/day Follow up: 40 weeks	The average weight gain (Suman 2008, Ali 2009, Acharya 2014, Swarnkar 2016), ranged from <b>3,29 to 15,84</b> g/day	Average weight gain with kangaroo position during 6 or more hours per day in the intervention group was 8.99 gram/day higher (8.14 to 9.84 higher)	MD <b>8,99 gr/ day higher</b> , (8,14 to 9,84 higher)	-	is interspersed with care in cribs (meaning not using standard care), there is no benefit when compared with 24-hour care in an incubator. On the contrary, it can be counterproductive, and the benefit of the kangaroo position is lost.  The greatest increases in size and head circumference probably occurred when the position was maintained for longer than 6 hours per day. It is not possible to conclude that changes occur if the position is held for a shorter duration.

FINDING	INTERVENTIONAL	EVIDENCE	ADDITIONAL CONSIDERATIONS			
	Outcome measures	Con cuidado habitual	Con Kangaroo mothercare method	Difference	Efecto relativo (IC95%)	
	Weight gain with kangaroo position held for 2 and 6 hours per day (Lumbanraja 2016, Ramanathan 2001) Evaluated on: grams/day Follow up: range of 40 weeks to 'last follow up'	Average weight gain (Lumbanraja 2016, Ramanathan 2001) ranged from <b>1,7 to 10,4</b> g/day		MD <b>3,67 gr/ día higher</b> (2.37 to 4.97 higher)	-	
	Weight gain with kangaroo position held for less than 2 hours per day (Blaymore 1996, Roberts 2000, Rojas 2003, Boo 2007) Evaluated on: grams/day Follow up: range of 40 weeks to 'last follow up'	Average weight gain (Blaymore 1996, Roberts 2000, Rojas 2003, Boo 2007) ranged from <b>14 to 30</b> g/day (Blaymore 1996, Roberts 2000, Rojas 2003, Boo 2007).	Average weight gain with kangaroo position during less than 2 hours per day in the intervention group was 1.16 grams/ day higher (0.19 lower to 2.51 higher)	MD <b>1,16 gr/ día higher</b> (0.19 lower to 2.51 higher)		

FINDING	INTERVENTIONAL EVIDE	NCE				ADDITIONAL CONSIDERATIONS
	Outcome measures	With traditional care	Con Kangaroo mothercare method	Difference	Relative measure of effect (95% CI)	
	Weight gain with kangaroo position held for at least 8 hours in infants less than 1500 grams and 30 weeks (Ghavane 2012)	The average weight gain with kangaroo position held for at least 8 hours in infants less than 1500 grams and 30 weeks was 17.6 grams/day	The average weight gain with kangaroo position held for at least 8 hours in infants less than 1500 grams and 30 weeks in the intervention group was 2.06 grams/day higher (0.28 lower to 5.48 higher)	MD <b>2.06</b> gr/day higher (0.28 lower to 5.48 higher)		
	Growth in size with kangaroo position held for more than 6 hours (Suman 2008, Swarnkar 2016) Evaluated on: Weekly height gain in cm Follow up: range of 40 weeks to 'last follow up'	Average growth in size with kangaroo position held for more than 6 hours was <b>0.7</b> cm/week	Average growth in size with kangaroo position held for more than 6 hours in the intervention group was 0.29 cm/week more (0.15 to 0.43 more)	MD <b>0.29</b> cm/week more (0.15 to 0.43 more)		

FINDING	INTERVENTIONAL I	EVIDENCE				ADDITIONAL CONSIDERATIONS
	Outcome measures	Con cuidado habitual	Con Kangaroo mothercare method	Difference	Efecto relativo (IC95%)	
	Growth in size with kangaroo position held for 6 hours or less (Acharya 2014, Rojas 2003) Evaluated on: Weekly height gain in cm Follow up: range of 40 weeks to 'last follow up'	growth in size with kangaroo position held for 6 hours or less oscillated	Average growth in size with kangaroo position held for 6 hours or less in the intervention group was 0.01 cm/week more (0.02 less to 0.02 more)	week more (0.02 less to	-	
	Growth in cephalic perimeter with kangaroo position held for more than 6 hours (Suman 2008, Swarnkar 2016) Evaluated on: centimeters/week	Average growth in cephalic perimeter with kangaroo position held for more than 6 hours oscillated between <b>0.46 to 0.49</b> cm/ week	Average growth in cephalic perimeter with kangaroo position held for more than 6 hours in the intervention group was 0.26 cm/week more (0.23 to 0.29 more)	0.26 cm/week more (0.23 to 0.29 more)	-	

FINDING	INTERVENTIONAL EV	INTERVENTIONAL EVIDENCE					
	Outcome measures	Con cuidado habitual	Con Kangaroo mothercare method	Difference	Efecto relativo (IC95%)		
	Growth in cephalic perimeter with kangaroo position held for 6 hours or less (Acharya 2014, Boo 2007, Rojas 2003) Evaluated on: centimeters/week Follow up: range of 40 weeks to 'last follow up'	Average growth in cephalic perimeter with kangaroo position held for 6 hours or less oscillated between <b>0.02 to 0.2</b> cm/ week	Average growth in cephalic perimeter with kangaroo position held for 6 hours or less in the intervention group was 0.07 cm/week more (0.03 less to 0.17 more)	MD <b>0.07 cm/</b> week more (0.03 less to 0.17 more)	-		
	(1, 2, 3, 4, 5, 6, 7, 8, 9, 1	0, 11, 12).					

ACCEPTABILITY  Is the intervention ac	cceptable to the interested parties?	
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul> <li>No</li> <li>Likely not</li> <li>Likely yes</li> <li>Yes</li> <li>Varies</li> <li>Inconclusive</li> </ul>	Acceptability to the parents:  In multiple studies, parents mainly express good experiences with skin-to-skin contact, such as joy and immediate love at first contact in the kangaroo position and with first eye contact, some even described it as a gift from God, which in turn was accompanied by a decrease in the feeling of guilt, anguish, fear and rejection (16, 14).  Even though some mothers experienced some initial discomfort feeling sweaty, they appreciated the experience. During the act of providing skin-to-skin contact, mothers describe that they felt calm, peaceful and relaxed, as well as fascination with the movements of the baby and their efforts to look around. Findings show that parents were delighted to observe the growth of their baby and to feel their beating heart (14).  Additionally, skin-to-skin contact helped the mothers reflect on and manage their feelings about having given birth to a premature child and contributed to the mothers' need for affection after the birth experience. Seeing the child's growing strength helps alleviate feelings of guilt and fear, increasing the parents' hopes for their child's survival. Parents also consider that skin-to-skin contact is a natural instinct, related to the desire to protect their baby (14).  Mothers believe that providing skin-to-skin contact helped them with managing the baby with confidence and with breastfeeding, preparing them to take responsibility for the baby's care after discharge,	

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
	as well as contributing to their need to feel that they have some responsibility related to the care of their child while hospitalized. The fathers, in turn, manifest wanting to be instructed on the method by their partners (14). Moreover, in many societies, the role of mother is of utmost importance in the construction of the social identity of women, and the method of skin-to-skin care helps many mothers in this process, as well as their partners to assume their role as the father. Likewise, the consequent increase in the parents' self-esteem helps in other aspects, such as the decrease in fear generated by the baby's monitoring equipment and an increase in the feeling of control (14, 17). As for other positive practical effects, mothers learn to recognize the normal pattern of breathing, temperature, hunger and sleep of their baby, and can therefore recognize alterations easier and faster. This sense of security and competence decreases their anxiety. Fathers recognize that skin-to-skin contact is an important intervention in the recovery of their premature baby and in the establishment of maternal breastfeeding, in addition to considering it a pleasant experience for the baby. Mothers feel that skin-to-skin contact conveys affection, security, courage and hope to their child (14)  Some mothers who expressed fear of establishing a bond with their child, if he or she is very fragile, considered that skin-to-skin contact should preferably be carried out by the mother since the baby prefers her smell and the comfort of breastfeeding and some even state that they do not consider the male body appropriate to provide contact.	

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
	Additionally, some mothers with older children may feel they are neglecting them by spending so much time caring for their premature baby in skin-to-skin contact, although in general their partners accepted having to take care of the older children (14). Some mothers reported other difficulties in making skin-to-skin contact, including having a lot of pain due to childbirth; fear of harming the baby, especially their navel; and some believe that the chest is not a comfortable place to carry their baby, as the back is stronger since there are communities accustomed to carrying their children in this way (15).	
	Acceptability to the healthcare personnel	
	Qualitative evidence supports the notion that nursing staff view skin-to-skin contact positively for several reasons, such as: the possibility for parents to see their child earlier; the close contact that allows parents to learn to interpret their child's gestures; and their greater participation in the care of their newborn, which fosters greater confidence in the parents. The nurses also consider that the practice is beneficial for the babies themselves, including supporting their stability, growth, sleep, lactation, and even indicate that there is a lower risk of infection by manipulation (18)  The staff is also aware of the importance of their participation and support of parents for the success of the kangaroo mothercare method and that it is important to listen to their preferences and decisions. They consider that an environment without a lot of noise or light is important for a better practice of the method (14). In some countries, especially Scandinavian countries, skin-to-skin contact has been fully incorporated into the role of the nursing staff, so the parental bond is seen as a priority in the care of the baby. The nurses consider it an essential part of their work to support the development of an empowered parenthood, and even consider that the importance of skin-to-skin contact is proportional to the fragility of the newborn and express positive personal emotions when implementing the method (13).	

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
	On the other hand, it has been described that the practice of kangaroo mothercare can be a cause of stress for nurses because of the feeling of not having control over the care of the baby and the difficulty of observing changes in the babies and in performing the necessary procedures (14). In certain communities, healthcare professionals feel that patience is needed to introduce the practice into the community, since most women adopt it enthusiastically in the hospital but not at home because of social pressure (15).	
VIABILITY Is it possible to implement th	ne intervention?	
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul> <li>No</li> <li>Likely not</li> <li>Likely yes</li> <li>Yes</li> <li>Varies</li> <li>Inconclusive</li> </ul>	<ul> <li>The viability of using the kangaroo position is directly related to the viability of implementing the Kangaroo Mothercare Method.</li> <li>Position Difficulties.</li> <li>Parents report that they sometimes feel exposed during skin-to-skin contact and that it is an activity that may require a lot of energy. In low-resource countries, it may be difficult to find chairs with backrest to ensure comfort for the mother (15).</li> <li>At times, mothers may want a break from the position and appreciate if the staff allows for this, but at other times the parents feel that their wishes about the intensity of the contact with their child are ignored and they may become frustrated</li> </ul>	

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
	if they are not allowed contact when they desire it or when they are not permitted to rest (17)	
	Related to the context for the application of the method	
	<ul> <li>Parents say they rather perform skin-to-skin contact method in their homes than in the hospital, where they can feel uncomfortable exposing their body, where there is more noise, where they may be criticized by staff and where they are likely to have to sit all day, unable to rest adequately. Even the practice of skin-to-skin contact in the home can have difficulties such as being unable to perform other activities including going to the bathroom, eating and having relationships with other people. (14, 17)</li> <li>In some communities where skin-to-skin contact is new, both healthcare professionals and mothers may consider it unlikely that the method will continue to be used after discharge, even if they report enthusiasm for the practice (15).</li> <li>For the nursing staff, there are some situations that can hinder the practice of skin-to-skin contact, such as the increase in workload, especially if there is not enough staff; when parents do not have confidence in the effectiveness of the method; and concerns about the baby's medical condition (17)</li> </ul>	
	Facilitators. To overcome all barriers, mothers rely heavily on the following: the positive attitude of the healthcare workers, the support of families, the feelings of trust and empowerment that they acquire and the evidence of the effectiveness of the method (17).	

S U M M A R Y OF FINDINGS	FINDING						
STRENGTH OF EVIDENCE	Very low	Low	Moderate	High			Ningún estudio incluído
VALUE	Significant uncertainty or variability	Likelihood of significant uncertainty or variability	Likelihood of no significant uncertainty or variability	No significant uncertainty or variability			
BALANCE OF OUTCOME MEASURES	Favors the control	Likely favors the control	Favors neither the intervention nor the control	Likely favors the intervention	Favors the intervention	Varies	Inconclusive
ACCEPTABILITY	No	Likely not	Likely yes	Yes		Varies	Inconclusive
VIABILITY	No	Likely not	Likely yes	Yes		Varies	Inconclusive

## **RECOMMENDATION**

Strong	recommendation	Conditional recommendation	Conditional recommendation	Conditional recommendation	Strong recommendation in
against the	e intervention	against the intervention	in favor of the intervention or	in favor of the intervention	favor of the intervention
			the control		
0		0	0	0	•

Clinical practice guidelines for the optimal use of the Kangaroo Mothercare Method

### **A** Conclusion

#### Recommendation

The use of the kangaroo position is recommended for a minimum of 6 hours per day. If the position is not used continuously, the baby must be in an incubator for thermal regulation.

#### **Justification**

The evidence found shows a dose-response relationship between the duration of the position and growth (weight, height and head circumference). Growth is a crucial indicator to assess the baby's development process.

### **Subgroup considerations**

The use of the kangaroo position held for only two or less hours per day is not recommended for somatic growth.

The use of the kangaroo position interspersed with care in a crib is not recommended in premature infants weighing less than 1500 grams or less than 30 weeks of gestational age.

### **Considerations for implementation**

In addition to the considerations raised for the other recommendations related to kangaroo position, monitoring of growth curves should be carried out.

#### **Investigational priorities**

The priority is the study of CMM and effects on growth.

#### **Reference summary:**

1. Choudhary, Mukesh, Dogiyal, Hemaram, Sharma, Deepak, Datt Gupta, Brahma, Madabhavi, Irappa, Choudhary, Jagveer Singh, Choudhary, Sushil Kumar. To study the effect of Kangaroo Mothercare on pain response in preterm neonates and to determine the behavioral and physiological responses to painful stimuli in preterm neonates: A study from western Rajasthan. Journal of Maternal-Fetal and Neonatal Medicine; 2016. 2. Cong, X, Ludington-Hoe, SM, Walsh, S. Randomized Crossover Trial of Kangaroo Care to Reduce Biobehavioral Pain Responses in Preterm Infants: A Pilot Study. Biological Research for Nursing; 2011.

- 3. Johnston CC, Stevens B, Pinelli J, Gibbins S, Filion F, Jack A, Steele S, Boyer K, Veilleux A.. Kangaroo care is effective in diminishing pain response in preterm neonates. Arch Pediatr Adolesc Med; 2003.
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- 8. Trespalacios-Prieto A, Piot-Ziegler C, Castelao E.. Douleur et naissance prematuree. Les bebes kangourous de Colombie. Laussane, Université de Lausanne ; 2005.
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- 14. Anderzén-Carlsson, A, Lamy, ZC, Eriksson, M. Parental experiences of providing skin-to-skin care to their newborn infant—Part 1: A qualitative systematic review. International Journal of Qualitative Studies on Health and Well-being; 2014.
- 15. Bazzano, A, Hill, Z, Tawiah-Agyemang, C, Manu, A, ten Asbroek, G, Kirkwood, B. Introducing home-based skin-to-skin care for low-birth-weight newborns: a pilot approach to education and counseling in Ghana. Global Health Promotion; 2012.
- 16. Seidman, G, Unnikrishnan, S, Kenny, E, Myslinski E, Cairns-Smith,S, Mulligan, B, C., Engmann. Barriers and enablers of kangaroo mothercare practice: a systematic review. PLoS One.; 2015.
- 17. Seidman, G, Unnikrishnan, S, Kenny, E, Myslinski E, Cairns-Smith, S, Mulligan, B, C., Engmann. Barriers and enablers of kangaroo mothercare practice: a systematic review. PLoS One.; 2015.
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### Clinical Question 13

In the preterm or low birth weight newborns, is holding a dying infant in the kangaroo position effective for the mother in managing the painful situation and to better process the grief compared to the usual caregiving position?

Population	Intervention	Control	Principal outcome measures
Preterm or low birth weight newborns	Kangaroo position	Position in usual care	Grief processing

## Response.

Certainty of the evidence: No experimental or observational studies were found that evaluated the effect of the kangaroo position on parental grief processing.

#### Conditional recommendation in favor of intervention

The use of the kangaroo position is suggested for the premature infants who are in palliative care or who are going to die, as long as the parents accept the contact in the kangaroo position.

#### Justification

While there is no empirical evidence to support the use of the position, the importance and desirability of the expected outcomes for the family (baby: less suffering, and parents: process the grief of their baby) using skin-to-skin contact in the process of illness and death are enough to encourage the intervention.

#### *Implementation*

Good Clinical Practice Point: Healthcare personnel should encourage parents to hold their baby.

Training of healthcare personnel is required, as well as psychological support to offer palliative care in the newborn unit.

### Reference summary

Should the kangaroo position vs. usual care position for the critically ill preterm or low birth weight newborn be used in palliative care for parental management of the painful situation?					
Population:	the critically ill preterm or critically ill low birth weight newborn in palliative care for the management of the painful situation by the parents				
Intervention:	Kangaroo position				
Comparison:	usual position of care				
Principal	Elaboration of grief				
outcome					
measures:					

## STRENGTH OF EVIDENCE

What is the general certainty about the effects of the intervention?

, and the second of the second					
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS			
<ul><li>Very low</li><li>Low</li><li>Moderate</li><li>High</li><li>Not applicable</li></ul>	No experimental or observational studies were found that evaluated the effect of the kangaroo position on the development of grief in the parents.				

VALUE Is there significant uncerta	VALUE Is there significant uncertainty or variability in how people value the main outcomes?						
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS					
	In the Kymre 2012 study, a group of nurses in Norway reported the desirability of generating calmness and decreasing fear in the baby who is critically ill and in the process of dying. (1)	The maternal-paternal mourning process linked to perinatal death is based on a fabricated relationship with the baby built on the hopes and fantasy the parents had about the baby who passes away. This can feel unreal. Additionally, mental conflicts may arise around the mother's ability to have a healthy and living child. The possibility of developing a physical relationship with the baby that gives a sense of existence and reality facilitates the development of grief by the parents. (2) It is not of minor importance to consider among the outcome measures the baby's experience in the death process.					

#### **BALANCE OF OUTCOME MEASURES** Does the balance between favorable and unfavorable outcomes favor the intervention or the control? **FINDING** INTERVENTIONAL EVIDENCE **ADDITIONAL CONSIDERATIONS** oFavors the control In the study by Kymre et al. (1) the authors propose, from the perspective of the nursing oLikely favors the team, the suitability of the use of the kangaroo control position in the baby who is dying. They point out as desirable effects the diminution of suffering oFavors neither the intervention nor the and comfort of the premature baby when held in control skin-to-skin contact with the mother. oLikely favors the From the parents' perspective, establishing skinintervention oFavors the intervention to-skin contact with the baby who is dying would facilitate the establishment of a real relationship Varies Inconclusive and as a consequence the development of a normal grieving process.

## **ACCEPTABILITY**

Is the intervention acceptable to the interested parties?

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul> <li>No</li> <li>Likely not</li> <li>Likely yes</li> <li>Yes</li> <li>Varies</li> <li>Inconclusive</li> </ul>		Depending on the cultural context, of both of the parents and health personnel, the use of the kangaroo position may be restricted or favored according to the beliefs and expectations surrounding the death process.

## **VIABILITY**

Is it possible to implement the intervention?

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul> <li>No</li> <li>Likely not</li> <li>Likely yes</li> <li>Yes</li> <li>Varies</li> <li>Inconclusive</li> </ul>		Considerations on staff training are required to stimulate parents to use the kangaroo position during the death process of their baby with the goal of reducing pain and giving comfort through the development of an intimate relationship between the parents and their baby. Minimizing the sources of stress in the incubator transfer process and looking for parents to carry their son / daughter as long as possible under the supervision of health personnel. (3)

SUMMARY OF FINDINGS	FINDING						
STRENGTH OF EVIDENCE	Very low	Low	Moderate	High			Not applicable
VALUE	Significant uncertainty or variability	Likelihood of significant uncertainty or variability	Likelihood of no significant uncertainty or variability	No significant uncertainty or variability			
BALANCE OF OUTCOME MEASURES	Favors the control	Likely favors the control	Favors neither the intervention nor the control	Likely favors the intervention	Favors the intervention	Varies	Inconclusive
ACCEPTABILITY	No	Likely not	Likely yes	Yes		Varies	Inconclusive
VIABILITY	No	Likely not	Likely yes	Yes		Varies	Inconclusive

## **RECOMMENDATION**

Strong re	commendation	Conditional recommendation	Conditional recommendation	Conditional recommendation	Strong recommendation in
against the int	tervention	against the intervention	in favor of the intervention or	in favor of the intervention	favor of the intervention
			the control		
0		0	0	•	0

## **A** Conclusion

#### Recommendation

The use of the kangaroo position is suggested for the premature baby who is in palliative care or who is in the process of dying, as long as the parents accept the skin-to-skin contact.

#### **Justification**

Although there is no empirical evidence to support the use of the position, the importance and desirability of the expected outcomes for the family (for the baby / less suffering for the parents / development of grief through a real connection) from skin-to-skin contact in the sickness and death process are sufficient to encourage intervention.

### **Subgroup considerations**

N/A

#### **Considerations for implementation**

Point of Good Clinical Practice: Health personnel should encourage parents to hold their baby.

Training of health personnel as well as psychological support is required to offer palliative care in the newborn care unit.

#### **Investigational priorities**

Studies are required to evaluate the kangaroo position as an alternative to end-of-life care.

#### **Reference summary:**

- 1. Kymre, Ingjerd G., Bondas, Terese. Skin-to-skin care for dying preterm newborns and their parents A phenomenological study from the perspective of NICU nurses. Scandinavian Journal of Caring Sciences; 2013.
- 2. Oviedo-Soto S, Urdaneta-Carruyo E, Parra-Falcón F, Marquina-Volcanes M. Duelo materno por muerte perinatal. Revista Mexicana de Pediatría; 2009.
- 3. Walden M, Sudia-Robinson T, Turnage Carrier C. Comfort care for infants in the neonatal intensive care unit at end of life. Newborn and Infant Nursing Reviews; 2001.

### Clinical Question 14

In the preterm or low birth weight newborn is it safe and favourable to transport in kangaroo position newborns requiring transfer to other healthcare institutions compared to transfer by ambulance with or without incubator?

Population:	Intervention:	Control:	Principal outcome measures:
Preterm or low birth weight infants requir-ing to be transferred to other health care institutions.	Transport in kangaroo position.	Transport in the usual care.	Complications of the baby during the transfer. Satisfaction of the parents. Anxiety of the parents. Satisfaction of those receiving the mother-baby dyad.

## Responses.

#### Very low certainty of evidence

The two studies found (1, 2), as best available evidence, are case reports that included both term and preterm infants.

There is an abstract of a paper from a Swedish group in which they used a control group and included only preterm infants, but the full report is not available.

### Conditional recommendation in favor of intervention

Consider the use of the kangaroo position for the transfer and transport of physiologically stable preterm or low birth weight infants in any situation where transfer is required. The unstable infant should be stabilized prior to transport in the kangaroo position.

#### Justification

The included reports show an apparently beneficial effect. Based on the favorable evidence of the kangaroo position on other outcomes under non-mobility conditions, the results are extrapolated and a favorable recommendation is given under the discussed considerations of values and preferences, acceptability and feasibility of the implementation.

#### *Implementation*

- 1. A detailed protocol of the kangaroo transport process is required to ensure the safety of the dyad according to the duration and conditions of the transport.
- 2. Sensitize health personnel that KMC is as good as an incubator when the incubator is not available and its use should be preferred when conventional management is not an option.

### **GRADEpro** recommendation

Should kangaroo transport vs. incubator transfer be used for the preterm or low birth weight newborn to another hospital care facility to reduce transfer complications and parental anxiety and to promote parent and staff satisfaction? preterm or low birth weight newborns requiring transfer to another hospital care center, to reduce complications during transfer and **Population:** parental anxiety, and to promote parent and staff satisfaction. reduce complications during transfer and parental anxiety, and promote parent and staff satisfaction transport in the kangaroo position Intervention: the transfer in incubator **Comparison:** 

Parental anxiety (Hennequin 2017); Satisfaction of those receiving the mother-child dyad (Hennequin 2017);

Complications during transfer (Sontheimer 2004, Hennequin 2017); Parental satisfaction (Sontheimer 2004, Hennequin 2017);

#### STRENGTH OF EVIDENCE

**Principal outcome** 

measures:

What is the general certainty about the effects of the intervention?						
FINDING	INTERVENTIONAL EVIC	DENCE		ADDITIONAL CONSIDERATIONS		
<ul><li>Very low</li><li>Low</li><li>Moderate</li><li>High</li><li>Not applicable</li></ul>	Outcome measures	Importance	STRENGTH OF EVIDENCE (GRADE)	The two studies found (1, 2) as the best available evidence are case reports that included both term and preterm babies.		
	Complications during the transfer (Sontheimer 2004, Hennequin 2017)	CRITICAL	MUY LOW <sup>a,b</sup>	There is a summary of a paper by a Swedish group in which they used a control group and included only premature infants, but the full report is not available.		
	Parental satisfaction (Sontheimer 2004, Hennequin 2017) Evaluated through: parental reporting	CRITICAL	⊕○○ MUY LOW <sup>a,b</sup>			

FINDING	INTERVENTIONAL EVIDENCE			ADDITIONAL CONSIDERATIONS
	Outcome measures	Importance	STRENGTH OF EVIDENCE (GRADE)	
	Parental anxiety (Hennequin 2017)	CRITICAL	⊕○○○ VERY LOW <sup>a,b</sup>	
	Satisfaction of those who receive the mother-child dyad (Hennequin 2017)	CRITICAL	⊕○○○ VERY LOW <sup>a,b</sup>	
	a. There is no control group b. Included full-term babies who were not analyzed independently			

### **VALUE**

Is there significant uncertainty or variability in how people value the main outcomes?

io unoi o organicamo anto orta	anty of variability in now people value the main outcomes.	
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul> <li>Significant uncertainty or variability</li> <li>Likelihood of significant uncertainty or variability</li> <li>Likelihood of no significant uncertainty or variability</li> <li>No significant uncertainty or variability</li> </ul>		Concerns about complications of babies during transfers are of fundamental importance to parents and the health team. For this reason, we consider there is an important gap in the development of research into this topic. In the same way as it has been evaluated in other questions, the satisfaction of both parents and staff are relevant aspects for the implementation of an intervention.

	BALANCE OF OUTCOME MEASURES  Does the balance between favorable and unfavorable outcomes favor the intervention or the control?					
FINDING	INTERVENTIONAL E	EVIDENCE	ADDITIONAL CONSIDERATIONS			
<ul><li>Favors the control</li><li>Likely favors the control</li></ul>	Outcome measures	Impact	There is no control/comparison group in the studies, and this generates uncertainty. However, the kangaroo position has been shown			
control     Favors neither the intervention nor the control     Likely favors the intervention     Favors the intervention     Varies     Inconclusive	Complications during the transfer (Sontheimer 2004, Hennequin 2017)	In one of the studies that included 94 preterm and full-term babies including 4 pairs of twins, they did not detect significant changes in physiological parameters and no adverse effects were reported. In another study, 31 neonates (term and preterm) were included, in whom heart rate, respiratory rate and oxygen saturation during transfer remained stable and there was an increase in temperature in three cases. They did not observe crying or agitated behavior. During the transfer, the shaking movements caused by the vehicle seem to have been minimized for the infant through the kangaroo position.	to be beneficial in the basic management of the premature or low birth weight baby.			
	Parental satisfaction (Sontheimer 2004, Hennequin 2017) Evaluated through: parental reporting	In the study of 31 neonates, mothers rated the satisfaction experienced as an average score of 9.2/10. In the study with 94 babies, all the parents appreciated the possibility of being with their children during the transport; they reported that they felt comfortable, safe and happy to provide personal transport to their baby.				

FINDING	INTERVENTIONAL E	VIDENCE	ADDITIONAL CONSIDERATIONS
	Outcome measures	Impacto	
	Parental anxiety (Hennequin 2017)	In the study of 94 neonates, mothers reported that transport by skin-to-skin contact helped reduce stress.	
	Satisfaction of those who receive the mother-child dyad (Hennequin 2017)	The satisfaction rating given by staff members upon receiving the neonate at the hospital was 8.9 / 10 on average in the study with 94 neonates.	

## ACCEPTABILITY

Is the intervention acceptable to the interested parties?

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul> <li>No</li> <li>Likely not</li> <li>Likely yes</li> <li>Yes</li> <li>Varies</li> <li>Inconclusive</li> </ul>	No evidence found	If the acceptability of the use of the kangaroo position is extrapolated from the outcome measures evaluated in the preceding questions and considering the benefits of the position demonstrated in previous evaluations, the question then arises whether the acceptability of the intervention would be different when
		transporting the baby in skin-to-skin contact with the mother or father. We believe there would be no difference.

## **VIABILITY**

Is it possible to implement the intervention?

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul> <li>No</li> <li>Likely not</li> <li>Likely yes</li> <li>Yes</li> <li>Varies</li> <li>Inconclusive</li> </ul>	No evidence found	The studies included were conducted in countries that have all the necessary technology to carry out conventional neonatal transport with specialized personnel and show that the kangaroo transfers that were carried out at the request of the parents occurred without any complications, in physiologically stable babies. Knowing the positive impact of the kangaroo position on physiological stability, especially thermal stability and on the regulation

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
		of stress and pain, we could anticipate results at least as good as traditional handling when the kangaroo position is used for neonatal transport in the absence or malfunction of a transport incubator, or on roads with poor condition. In-hospital transportation makes part of the early use of the kangaroo method including transport from the delivery room to the newborn unit or joint accommodation. Given the satisfaction reported in the studies included, this indicates that kangaroo position is an option that can be proposed to parents in any situation with good acceptability.

SUMMARY OF FINDINGS	FINDING						
STRENGTH OF	Very low	Low	Moderate	High			Not applicable
EVIDENCE							
VALUE	Significant uncertainty or variability	Likelihood of significant uncertainty or variability	Likelihood of no significant uncertainty or variability	No significant uncertainty or variability			
BALANCE OF OUTCOME MEASURES	Favors the control	Likely favors the control	Favors neither the intervention nor the control	Likely favors the intervention	Favors the intervention	Varies	Inconclusive
ACCEPTABILITY	No	Likely not	Likely yes	Yes		Varies	Inconclusive
VIABILITY	No	Likely not	Likely yes	Yes		Varies	Inconclusive

## **RECOMMENDATION**

Strong	recommendation	Conditional recommendation	Conditional recommendation	Conditional recommendation	Strong recommendation in
against the	e intervention	against the intervention	in favor of the intervention or	in favor of the intervention	favor of the intervention
			the control		
0		0	0	•	0

## **A** Conclusion

#### Recommendation

Consider using the kangaroo position for the transfer and transport of the premature or low birth weight baby, who is physiologically stable, in any situation where displacement is needed.

#### **Justification**

The reports included show an apparently beneficial effect. Based on the favorable evidence of the kangaroo position in other outcome measures of interest under non-mobility conditions, these results are extrapolated, and a favorable recommendation is given under the considerations of values and preferences, acceptability and feasibility of the implementation discussed.

### **Subgroup considerations**

The unstable child must be stabilized before transportation in the kangaroo position.

#### **Considerations for implementation**

- 1. A detailed protocol of the transport process in a kangaroo position according to duration and conditions is required to guarantee the safety of the dyad.
- 2. Need to raise awareness in health personnel that the kangaroo position is as good as an incubator when the latter is not available, and its use should be preferred when there is no conventional management option.

#### **Investigational priorities**

More studies are required to evaluate the outcomes of transporting infants in an incubator compared to transporting in the kangaroo position.

#### **Reference summary:**

- 1. Sontheimer, D., Fischer, C. B., Buch, K. E. Kangaroo Transport Instead of Incubator Transport. Pediatrics; 2004.
- 2. Hennequin, Yves, Grevesse, Laurence, Gylbert, Delphine, Albertyn, Valérie, Hermans, Sebastian, Van Overmeire, Bart. Skin-to-skin back transfers provide a feasible, safe and low-stress alternative to conventional neonatal transport. Acta Paediatrica, International Journal of Paediatrics; 2018.

### Clinical Question 15

In the stable preterm or low birth weight newborn who tolerates manipulation, is NIDCAP+ kangaroo position compared to NIDCAP alone, equally effective in terms of: reducing neonatal mortality, reducing morbidity, promoting psychomotor development, reducing neurological complications, promoting breastfeeding, maintaining physiological stability, reducing hospital stay, promoting parental bonding, parental satisfaction and health care team satisfaction?

Population	Intervention	Control	Principal outcome measures
Stable preterm or low birth weight infants tolerant to manipulation	NIDCAP+ the kangaroo position	NIDCAP alone	Neonatal mortality, morbidity, promote development, decrease neurological complications, breastfeeding, physiological stability, hospital stay, promote parental bonding, parental satisfaction and staff satisfaction

## Response.

#### Certainty of evidence

There are no studies evaluating the impact of including the kangaroo position (one of the components of the Kangaroo Mothercare method) in the NIDCAP method of care

The kangaroo position has been incorporated into the NIDCAP method since 2002.

In the CPG on prematurity, the intervention was evaluated and the authors reported that: "Systematic reviews on the effectiveness of the program of care focused on the Newborn Individualized Developmental Care and Assessment Program (NIDCAP) show no clear improvement in critical outcomes (mortality, morbidity, growth and development in the medium and long term, neurological complications such as intraventricular hemorrhage).

Systematic reviews and individual comparative studies of NIDCAP versus no intervention only detect improvement in some of the outcomes from the incorporation of the kangaroo position as one of the components of the NIDCAP intervention, suggesting that significant beneficial effects can be obtained by only using the Kangaroo Mothercare Method.

These studies showed a low quality of evidence.

#### Conditional recommendation in favor of intervention

#### In the preterm guideline

- » It was recommended NOT to do a formal Newborn Individualized Developmental Care and Assessment Program (NIDCAP), as it is a very costly strategy with no proven effectiveness. The recommendation was strong against the intervention.
- » It was recommended to adopt three of the components of NIDCAP as currently defined in relation to the preterm and/or LBW macroenvironment:
- 1) The containment position in the incubator,
- 2) the control of light and noise levels in the neonatal unit; and
- 3) the use of the KMC..

The recommendation for adopting these interventions is strong, with a quality of evidence rated as Moderate  $\bigoplus \bigoplus \bigoplus$  for environmental measures (Expert consensus informed by comparative studies (before and after) on the physiologic effects of light, noise, and handling levels on physiologic variables and critical outcomes) and strong recommendation for the KMC intervention.

## GRADE pro recommendation

Should NIDCAP in	Should NIDCAP including the kangaroo position vs. NIDCAP only be used for the preterm or low birth weight stable and manipulation tolerant newborn?			
Population:	Infants born prematurely or with low birth weight (LBW) who are stable and tolerate handling			
Intervention:	Newborn Individualized Developmental Care and Assessment Program (NIDCAP) with the Kangaroo position			
Comparison:	NIDCAP alone			
Principal	Neonatal mortality; Morbidity; Development; Neurological complications; Maternal breastfeeding; Physiological stability; Hospital stay;			
outcome	Parental bond; Parental satisfaction; Staff satisfaction			
measures:				

## STRENGTH OF EVIDENCE

What is the general certainty about the effects of the intervention?

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul> <li>Very low</li> <li>Low</li> <li>Moderate</li> <li>High</li> <li>Not applicable</li> </ul>		There are no studies that evaluate the impact of the inclusion of the kangaroo position (one of the components of the Kangaroo Mother Method) in the NIDCAP method of care.  The Kangaroo position has been incorporated into the NIDCAP method since 2002.  The intervention was evaluated in the clinical practice guideline for premature babies and the authors reported that: "Systematic reviews on the effectiveness of the care program focused on the development and maturation of the premature newborn (NIDCAP), do not show clear improvement in critical outcomes (mortality, morbidity, growth and development in the medium and long term, neurological complications

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
		such as intraventricular hemorrhage). Systematic reviews and individual comparative studies of NIDCAP versus no intervention detect improvement in only some of the outcomes following the incorporation of the kangaroo position as one of the components of the NIDCAP intervention, suggesting that significant beneficial effects can be obtained using only the Kangaroo Mother Method." These studies showed low quality of evidence

### VALUE

Is there significant uncertainty or variability in how people value the main outcomes?

FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul> <li>Significant uncertainty or variability</li> <li>Likelihood of significant uncertainty or variability</li> <li>Likelihood of no significant uncertainty or variability</li> <li>No significant uncertainty or variability</li> </ul>		

## BALANCE OF OUTCOME MEASURES

Does the balance between favorable and unfavorable outcomes favor the intervention or the control?

	oes the balance between lavorable and annavorable outcomes lavor the intervention of the control.				
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS			
<ul> <li>Favors the control</li> <li>Likely favors the control</li> <li>Favors neither the intervention nor the control</li> <li>Likely favors the intervention</li> <li>Favors the intervention</li> <li>Varies</li> <li>Inconclusive</li> </ul>		According to the clinical practice guidelines for premature babies, the KMC can contribute to NIDCAP especially in the transfer of responsibility of caring for the fragile child to the parents, in empowering parents as primary caregivers, in organizing the breastfeeding of the premature child in a logical and effective way and in organizing outings at home.  The NIDCAP can contribute to the KMC by providing the knowledge of how to interpret the baby's different dream states so that the mother can learn when it is best to wake up the baby for feedings every 2 hours, an important aspect of the KMC.			

ACCEPTABILITY  Is the intervention acceptable to the interested parties?					
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS			
<ul> <li>No</li> <li>Likely not</li> <li>Likely yes</li> <li>Yes</li> <li>Varies</li> <li>Inconclusive</li> </ul>		The KMC can be considered an individual development care intervention similar to the NIDCAP. Both interventions have the same goal of improving the health of the premature and/or LBW child, however the KMC needs only a few therapeutic interventions and these are taught to parents who understand them very well. KMC is an intervention where the knowledge of care is transmitted to the parents while the NIDCAP is a medicalized intervention where the child remains in the incubator while not in the kangaroo position and it is the health personnel who indicate to the parents when their baby is ready to eat and be held. In NIDCAP parents follow as passive actors and health personnel are the ones who hold the knowledge of care, while in KMC parents are responsible for the care of their child and learn the needs of their baby very quickly.			
VIABILITY  Is it possible to impleme	ont the intervention?				
FINDING	INTERVENTIONAL EVIDENCE	ADDITIONAL CONSIDERATIONS			
<ul><li>No</li><li>Likely not</li><li>Likely yes</li><li>Yes</li><li>Varies</li><li>Inconclusive</li></ul>		NIDCAP requires expensive training, which is oftentimes out of reach for many neonatal units around the world.			

SUMMARY OF FINDINGS	FINDING						
STRENGTH OF EVIDENCE	Very low	Low	Moderate	High			Not applicable
VALUE	Significant uncertainty or variability	Likelihood of significant uncertainty or variability	Likelihood of no significant uncertainty or variability	No significant uncertainty or variability			
BALANCE OF OUTCOME MEASURES	Favors the control	Likely favors the control	Favors neither the intervention nor the control	Likely favors the intervention	Favors the intervention	Varies	Inconclusive
ACCEPTABILITY	No	Likely not	Likely yes	Yes		Varies	Inconclusive
VIABILITY	No	Likely not	Likely yes	Yes		Varies	Inconclusive

## **RECOMMENDATION**

Strong recommendat	ion   Conditional recommendation	Conditional recommendation	Conditional recommendation	Strong recommendation in
against the intervention	against the intervention	in favor of the intervention or	in favor of the intervention	favor of the intervention
		the control		
0	0	•	0	0

## **A** Conclusion

#### Recommendation

In the Clinical Practice Guidelines for premature infants:

- It was recommended NOT to do a formal care program focused on the development and maturation of the premature newborn (NIDCAP), since it is a very expensive strategy and without proven effectiveness. The recommendation was strong against the intervention.
- It was recommended to adopt three of the components of the NIDCAP as currently defined in relation to the macroenvironment of premature and/or low birth weight newborn:
  - 1. The supportive containment position in the incubator,
  - 2. control of light and noise levels in the newborn unit and
  - 3. the use of the KMC.

The recommendation is strong to adopt these components of the intervention with evidence classified as Moderate  $\bigoplus \bigoplus \bigoplus$  for environmental measures (Expert consensus reported by comparative studies (before and after) on the physiological effects of light, noise and handling levels in physiological variables and critical outcomes) and strong recommendation for KMC intervention.

## **Aspect 3: Food (for future development)**

### **OClinical Question 16**

In preterm or low birth weight infants, is exclusive breastfeeding effective for proper development (growth, neurodevelopment, psychodevelopment), decreases mortality and protects against osteopenia of prematurity, lower respiratory infections and NEC compared to other milk?

Population	Intervention	Comparison	Outcome
Preterm or low birth weight newborns	Exclusive breast milk	Other milk	Growt neurode-velopment, psy-chodevelopment, decreases mortality, and protects against osteopenia of prematurity, lower respiratory infections and NEC.

### Clinical Question 17

In preterm or low birth weight infants, does the use of fortified breastfeeding compared to preterm formula allow equal weight gain during the stable growth stage?

Population	Intervention	Comparison	Outcome
Newborn preterm or low birth weigh.	Fortified breastfeeding	Preterm formula.	Weight gain

### Clinical Question 18

In preterm or low birth weight infants, is the initiation of sucking stimulation (including non-nutritive sucking) before 32 weeks compared to initiation after 32 weeks, associated with greater success of exclusive breastfeeding and shorter hospital stay?

Population Intervention		Comparison	Outcome
Preterm or low birth	initiation of sucking	initiation of sucking	Hospital stay,
weight Newborn.	stimulation prior to	stimulation after	Successful direct
	32 weeks.	week 32.	breastfeeding
			(exclusive)

### Clinical Question 19

In preterm or low birth weight infants, is the initiation of feeding by suction before 34 weeks compared with the initiation after 34 weeks, associated with greater success of exclusive breastfeeding and shorter hospital stay?

Population	Intervention	Comparison	Outcome
Preterm or low birth weight newborn.	Feeding before week 34	Feeding after week 34	Hospital stays. Successful direct breastfeeding (exclusive).

### Clinical Question 20

In preterm infants receiving direct breastfeeding or supplemental breastfeeding, is the use of other means than a bottle nipple versus feeding using a bottle nipple, effective in terms of the success of exclusive or partial breastfeeding at discharge and during the first 6 months of chronological age?

Population	Intervention	Comparison	Outcome
Preterm or low birth weight infants.	Direct or partial maternal feeding.	Administration of milk using a bottle nipple.	Successful direct breastfeeding (exclusive) Hospital stay.

## **Aspect 4. Early exit**

### Clinical Question 21

In preterm or LBW infants, is early discharge of the baby in a KMC ward, more effective and safer compared with staying in the NCU in terms of hypothermia episodes, weight gain, mortality, neurological complications, rehospitalization and infections?

Population	Intervention	Comparison	Outcome
Preterm or low birth weight infants	Baby discharge to joint accomodation	NBU	Hypothermia. Weight gain. Mortality. Neurological complications. Rehospitalization. Infections.

### Clinical Question 22

In preterm infants or LBW, is early discharge home in KMC more effective and safer than a KMC ward in terms of hypothermia episodes, weight gain, mortality, neurological complications, rehospitalization and infections?

Population	Intervention	Comparison	Outcome
Preterm or low birth weight infants.	Early discharge home in KMC.	KMC ward.	Hypothermia. Weight gain. Mortality. Neurological complications. Rehospitalization. Infections.

## **OClinical Question 23**

In preterm infants or LBW, is early discharge home in KMC more effective and safer than staying in the NCU in terms of hypothermia episodes, weight gain, mortality, neurological complications, rehospitalization and infections?

Population	Intervention	Comparison	Outcome
Preterm or low birth weight infants.	Early discharge home in KMC.	NCU	Hypothermia. Weight gain. Mortality. Neurological complications Rehospitalization. Infections

## **General Recommendations**

Practical recommendations on the implementation of the Kangaroo Mothercare method. Good clinical practice points (3,21,29,30).

#### PRACTICAL RECOMMENDATIONS ON THE KANGAROO POSITIONING STRATEGY

In accordance with the evidence-based responses from the 2007 guideline and the recommendations from the 2018 update regarding the attributes, advantages, and limitations of the kangaroo position, the group resolves to recommend the use of a standardized protocol for adapting and maintaining the kangaroo position in a way that it maximizes the advantages for infants and their parents and limits the disadvantages and risks. The following protocol for the application of the kangaroo position is proposed.

### **Target population**

These recommendations are intended for all preterm infants less than 37 weeks at birth and/or low birth weight newborns less than 2500g who are likely to benefit from the kangaroo position. These recommendations do not include offering skinto-skin contact to healthy term infants, in whom the kangaroo position, immediately after delivery, could help them overcome birth trauma, facilitate thermoregulation, and promote healthy bonding and successful breastfeeding.

A preterm or LBW infant is eligible to initiate the kangaroo position if he or she meets the following criteria:

The infant is stable, i.e., vital signs and other physiologic parameters (except temperature) are maintained in a normal range during the necessary handling to place and keep the infant in the kangaroo position. When the infant is placed in the kangaroo position for the first time, these physiologic parameters should be monitored, at least clinically. Each institution should develop and use a kangaroo initiation protocol that defines eligibility and what is meant by physiologic stability. The acceptance and follow-up of such protocol by the health care team involved, should be ensured.

An ongoing experimental study in Norway and Sweden, is seeking to evaluate the impact of immediate kangaroo positioning at birth on stabilization of the preterm infants between 28 and 32 weeks "Immediate parent-infant skin-to-skin study (IPISTOSS): study protocol of a randomized controlled trial on very preterm infants cared for in skin-to-skin contact immediately after birth and potential physiological, epigenetic, psychological and neurodevelopmental consequences". The protocol is registered at Clinicaltrials.gov, and it is available at BMJ open (Linnér A, et al. BMJ Open 2020;10: e038938. doi:10.1136/bmjopen-2020-038938). Results will be available in 2021.

1.1.2 The parents, but in particular the mother or the person designated as the main kangaroo position provider should freely express their desire to practice the kangaroo position once they have been adequately informed, and their doubts and

concerns resolved. It is necessary to reaffirm this desire after the mother has already experienced the kangaroo position. If necessary, the support of the NCU psychologist must be requested when a mother does not want to hold her baby in the kangaroo position.

Kangaroo position providers should have no contraindications:

- » Contagious exanthem
- » Hyperthermia
- » Hypothermia
- » Skin wounds
- » Unstabilized epilepsy
- » Uncontrolled mental illnesses

#### **Neonatal Unit Prerequisites**

There should be preparation and motivation to the administrative and healthcare staff. Mother-child separation time should be minimized and appropriate physical interaction of parents with their child should be allowed (gradual, safe and supervised contact according to the child's clinical condition, maturity and physiological stability). It is necessary to have an easy and fast access for the parents to the hospitalized infant and to have explicitly formulated openness policies: no restriction to parental visits in time and duration, locative facilities for parents, and before initiating kangaroo adaptation there should be access to appropriate furniture (comfortable reclining chairs or equivalent), food, bathing, entertainment, etc. In a few words, the neonatal unit should be open and friendly. It is desirable to have adequate breastfeeding policies supported by appropriate infrastructure and adequate training to the healthcare staff.

#### Place, time and form of initiation

A primary condition before starting the KP is the preparation of the parents and especially the mother, to whom the benefits of the KP for her baby should be explained and encouraged to be present as much as possible. It has to be explained, as well, the practical aspects of permanent or prolonged visitation with her hospitalized infant (including hygiene standards). This allows a gradual and logical transition to touching, caressing and then holding the infant in the kangaroo position.

A nurse trained in the Kangaroo Mothercare method, is the one who identifies candidates for the early kangaroo positioning, either in the delivery room, in the mother's room (when mother-child joint accommodation is available) or among infants admitted to the neonatal unit. This member of the "kangaroo healthcare team" has to come in contact with the mothers and start sensitizing the family on the Kangaroo Mothercare method. The ideal primary provider of the kangaroo position is the mother. In cases where the mother's health status makes her at least temporarily unavailable, the father may initiate the kangaroo position. Depending on the workload, the same nurse or a second member of the nursing group of the kangaroo team must be responsible for initiating (after consultation with the attending physician) the process of adaptation to the kangaroo position.

Once the mother-child dyad candidate for the kangaroo position is identified and the motivation and sensitization phase is completed, the situation of both the infant and the mother should be evaluated to define when it is appropriate to start the adaptation process to the kangaroo position. The idea is to initiate the position as early as possible, to increase benefits I and minimize risks. This may occur in the delivery room on a preterm infant close to term with an awake and motivated mother or it may be delayed in immature or sick infants, like the ones receiving intensive care. However, the kangaroo position can be initiated in the NICU with specially trained professionals in the transfer of the infant from the incubator to the kangaroo position.

It is not appropriate to recommend a specific date for initiation; it should be tailored to the characteristics of each mother-infant dyad. During the adaptation process, it must be continuously evaluated how well the infant and mother tolerate the kangaroo position and whether a gradual process is necessary (intermittent kangaroo position, returning to a neutral thermal environment) or whether the position can be maintained consistently and prolonged from the beginning. The adaptation must be done in a hospital environment and has a variable duration according to the response of the mother-infant binomial to the kangaroo position. The stability of the infant's vital signs, regularity of breathing, alertness, color, general appearance, posture and appearance of comfort or discomfort, the presence of periods of sleep and wakefulness and in general the infant's well-being during the position are evaluated. The mother's attitude, her tolerance, her emotional state (is she calm, is she stressed, etc.) are also observed. According to these observations, we proceed with more frequent and prolonged holding episodes until we can see if the mother manages to adequately hold the infant indefinitely, develops confidence and security, the child tolerates the position well, and an appropriate general condition of the infant.

In 2020, two new meta-analyses were published showing that the kangaroo position protects against apneas and that apneas cannot be a contraindication to placing the infant in the kangaroo position. It was also shown that somatic growth, weight, height and CP are better in the kangaroo position and vary with length: more time in kangaroo position equals better somatic growth. Everything should be in place in the NICU and the NCU to promote the kangaroo position for as long as possible, hopefully 24 hours a day and initiated as early as possible, hopefully from birth. The ultimate goal would be to avoid mother-infant separation to prevent generating stress in this fragile child which can only destabilize him.

When the mother is going to place her baby in the kangaroo position for the first time, she should be appropriately dressed (easy front access to the chest, for example, a hospital gown tied at the front). She should have short, clean nails with no nail polish, proper body grooming, especially the torso that will be in direct contact with the child's skin, her hair should be tied back and she should not wear jewelry or rings, cosmetics and perfumes. In order to comfortably support the child, a support system should be provided as described below, for example, the lycra band.

### Description of positioning and maintenance of the infant in kangaroo position

While holding the infant against the mother's chest, the infant should not be laid sideways, as this position often causes obstructive apneas, especially in the most hypotonic premature infants. The kangaroo baby should be in a strict upright position, in ventral decubitus with his body and cheek against his mother's chest ("frog" position). The position of the head must be rotated after each feeding (e.g., if the right cheek was resting on the chest, the head is rotated so that the left cheek is now resting on the chest) and great care must be taken to keep the airway free and permeable.

Although the mother can hold the child in position with her arms, it is unreal to expect her to hold the child in her arms indefinitely. It is necessary to help keep the infant in position using some device that is firm enough to maintain the infant attached to the chest with minimal or no support from the mother's arms, and flexible enough to allow adequate respiratory movements and other movements. In many kangaroo programs, a simple cotton lycra band or sling is successfully employed to be worn by both the mother and the father or other position provider. It has the advantage of being able to be pulled down at any time to breastfeed, change diapers or clean the infant. At the same time, it allows the mother to have freedom of movement to take care of routine activities related to comfort, hygiene, feeding, etc., without permanent dependence on third parties. Lycra® blouses or closed shirts are commercially available, which in many places are called "lycra® bodies", and are usually more comfortable in hot weather. The support system or "kangaroo carrier" (the band, girdle, "bodysuit", or whatever device is most appropriate and locally accessible) should be an aid to make the mother feel more secure but should not replace the vigilance that the mother should give to her child.

Kangaroo positioning, particularly the first few times it is performed, is a process that requires care. It is necessary for the appropriately trained healthcare professionals (usually nurses) to assist the mother or the position provider until they feel safe and comfortable enough to perform the maneuver on their own. In Intensive Care Units, positioning should always be performed under the supervision of a trained nurse who follows an explicit and detailed protocol.

positioning should always be performed under the supervision of a trained nurse who follows an explicit and detailed protocol.

The mother should be instructed on how to hold the baby, allowing easy and safe mobility, by supporting the baby with one of the hands placed on the back of the neck and back, allowing her fingers to reach the lower segment of the jaw to prevent the head from slipping and blocking the airway while the baby is in the upright position. The other hand should be placed under the buttocks.

If the infant is receiving oxygen by tube, cannula, and/or intravenous fluids, it is advisable to have another trained person (e.g., father) assisting the mother until she is confident enough to do it alone.

# Protocol to transfer the infant from the incubator to the kangaroo position in the neonatal ICU

Promoting the kangaroo position (KP) from the NICU helps to avoid separation of parents due to the fragility of their baby.

Kangaroo care of preterm and low birth weight infants initiated from the delivery room and continued in the NICU regardless of their gestational age, is based on the philosophy of integrated family care, in which parents are encouraged to participate in every aspect of their baby's care, including providing KP for as long as they can, even if the infant requires respiratory support.

Early-initiated KMC has multiple benefits, including:

#### Benefits for infants::

- » Improves brain maturation and could be said to be a "brain surfactant," due to the continuous stimulation of the skin-to-skin contact.
- » Stabilization of vital signs.
- » Decreases pain during procedures such as venous catheterizations, blood samplings, injections.
- » Decreases the stress from the aggression of being in a different environment than the intrauterine one, as evidenced by lower cortisol levels.
- » Prevention of hypothermia.
- » Improves the time it takes to initiate breastfeeding, duration of breastfeeding and probability of exclusive breastfeeding.

#### Benefits for parents:

- » Increases uterine involution and reduces the risk of postpartum hemorrhage.
- » Decreases postpartum depression.
- » Improves attachment
- » Reduces stress and anxiety.
- » Improves the duration and proportion of each breastfeeding intake (31).

Despite these multiple benefits, there is still resistance in the health care team to incorporate the Kangaroo Mothercare in fragile patients with ventilatory support. The most frequent reasons are (32,33):

- » Fear of arterial or venous line displacement.
- » Fear of accidental extubation
- » Safety issues in very low weight infants such as instability of vital signs and hypothermia.
- » Inconsistency in the practice of KMC due to lack of established protocols.
- » Nurses' feelings that KMC generates work overload.
- » Nurses' rejection of the method because they do not consider it useful.
- » Physicians' rejection of the method because they do not consider it useful.
- » Difficulty in providing infant care during KMC.

Clinical practice guidelines for the optimal use of the Kangaroo Mothercare Method

- » Concern of the medical team about the parents' privacy, especially in relation to mothers' breastfeeding.
- » Lack of experience in KMC.
- » Insufficient time for family care during KMC.
- » Belief that technology is better than KMC.

All these barriers can be overcomed by coordinating and integrating the health care team and parents to transfer the baby from the incubator to the kangaroo position in a safe way, enabling the benefits of this method.

The first reports of a transfer to KP in intubated infants date back to 1993 by Drosten-Brooks, Gale, Franck and Lund. Since then, two types of procedures have been identified (31,34):

- 1. Mother/father standing to the side of the incubator while the infant lays in supine and is then positioned in skin-to-skin contact against the thorax. The infant has only a cap and socks and is supported by the kangaroo lycra band. In the transfer to the standing parent, the baby moves from a supine position to an upright position.
- 2. Mother/father seated and the nurse does the transfer from the incubator. This is also called "nurse transfer". In the nurse transfer the babies move laterally.

There are differences of opinion regarding the safety of these two types of transfer. Ludington-Hoe et al. established that the transfer with the father standing up generated fewer physiological alterations in the babies, especially for those who were intubated. Other authors such as Nyqvist and Heinemann (2011) prefer the nurse transfer, especially for the most fragile infants.

In general, standing transfer can be performed by the trained parents and is preferred for children with CPAP or high-flow cannula. Nurse transfer is preferred for children who require mechanical ventilation for safety. This procedure can be performed even for children on high-frequency ventilation.

Regardless of the type of transfer chosen, standardization of transfer techniques at each institution is critical to reduce physiological instability. The transfer process from the closed or open incubator to the parent in KP and from the parent in KP to the incubator must have an established, safe, consistent, step-by-step protocol. If the transfer is not done smoothly, the infant will not tolerate the KP and may show signs of stress such as apnea, bradycardia or desaturations. So, the way how the transfer is conducted appears to have more impact on the time it takes for the infant to return to physiological stability than who performs the transfer.

#### Preliminary preparation for transfer

- » Education for the medical team is essential.
- » Step-by-step parent education on the transfer should be done, with verbal instructions. Emotional and clinical education should be offered as well.

- » The change of position should be slow, not abrupt.
- » If the infant is on mechanical ventilation, another nurse or the respiratory therapist (RT) should be available for transfer procedures to keep the orotracheal tube (OTT) in position.
- » The physician must be present and available in case reintubation is necessary.
- » The following is a description of the transfer process described by Schultz et al. and adapted for Colombia.

#### **Nurse Transfer**

## Step 1:

- 1. A second nurse or the respiratory therapist must be involved in all transfers of intubated infants.
- 2. The infant may be in a prone or supine position in the closed or open incubator. Some institutions prefer to do the transfer in the prone position, other institutions do the transfer in the supine position.
- 3. Secure the direction of the infant's head, to ensure that the infant's face is facing the ventilator, once in KP..

#### Step 2:

- 4. Place the first hand and forearm under the baby.
- 5. Maintain stability by placing the second hand and forearm on top of the baby holding the baby's head and neck, creating a "sandwich."
- 6. This technique allows a good control of the entire baby's body.

#### Step 3:

- 7. Lift the baby while keeping him/her in a prone or supine position.
- 8. Move the baby laterally toward the mother or father.
- 9. The movements must be slow and controlled.
- 10. If the infant has intravenous catheters, a second nurse should keep these lines.
- 11. If the infant is intubated, the RT or a second nurse should secure the OTT position and manage the ventilator circuit.

#### Step 4:

- 12. Maintain the "sandwich" technique.
- 13. Place the infant prone on the parent's bare chest (between the breasts).
- 14. The parent places both hands on the nurse's upper hand.
- 15. The nurse carefully removes the hands from the infant.

## Step 5:

- 16. If the infant is intubated, the RT continues to monitor the position of the OTT and handles the ventilator circuit until the parent is reclined and the chair is secured.
- 17. Once the parent is in the chair, the RT secures the OTT position and ventilator circuit.

## Step 6:

- 18. The chair is reclined to 30-45 degrees and secured in this position.
- 19. Ensure that the parent is comfortable: offer pillows for arm support and offer warm sheets.
- 20. Monitor the infant's vital signs and the parent's state of comfort.

Transfer of a stable infant with continuous positive pressure or high-flow cannula by the parent to the kangaroo position.

## Step 1:

- 1. Place the infant in supine position in the open or closed incubator.
- 2. The incubator should be at the level of the parent's waist.
- 3. Move the infant to the edge of the incubator allowing the parent to approach very close.
- 4. Be sure to move the infant's head so that the face is facing the ventilator, when on KP (usually in this transfer the infant is on CPAP or high flow cannula).

#### Step 2:

5. The parent places one hand under the infant's head and the other supporting the infant's body.

## Step 3:

- 6. The parent places his/her bare chest in contact with the infant before lifting the baby.
- 7. The parent maintains control of the head, neck and body.
- 8. Movements should be slow and controlled.

#### Step 4:

- 9. The parent turns in an upright position.
- 10. The parent maintains control of the baby's head, neck and body.
- 11. Movements should be slow and controlled.
- 12. The nurse must ensure the position of the infant: in a strapped position, airway in a sniffing position.
- 13. The nurse keeps the organization of all tubes, cables and IV lines.

## Step 5:

- 14. Assist the parent to maintain sitting position.
- 15. Nurse continues to monitor the infant.
- 16. Nurse ensures organization of tubes, wires and IV lines during the change of position.

#### Step 6:

- 17. The chair is reclined 30-45 degrees and secured in that position.
- 18. Ensure parent's comfort: provide pillows for arm support. Provide warm sheets.
- 19. Monitor vital signs and parent's comfort.

Multiple studies have shown how KP in ventilated infants enables stability in vital signs,

parental satisfaction in 95% of the cases, and even more physiological heart rate and saturation levels compared to incubator care (35-38).

The infant can be prepared for extubation in KP. Several studies in extreme preterm infants have shown how elective extubation in KP allows greater stabilization of cardiorespiratory parameters after the procedure. In this regard, a study carried out in Spain by Camba et al. in extreme preterm infants aged 23-27 weeks between 2008 and 2012, showed how extubation while in KP was effective and generated a high level of parental satisfaction (39).

## The Kangaroo outfit

The cap, made of cotton or wool depending on the climate, is essential to avoid hypothermia episodes. Because of its large surface area in relation to the child's body, and because it is not protected by the lycra band, the head has to be covered by a cap to prevent heat loss.

It is recommended that the baby wears a sleeveless cotton shirt or open T-shirt at the front. This protects the child's back from heat dissipation and the chest must be in direct skin-to-skin contact with the mother's torso. A shirt may not be necessary in very hot weather, especially if the back is always covered by the lycra band.

In hot, humid weather, a cotton cloth can be placed between the infant's face and the mother's skin going around the mother's neck, to absorb sweating and allowing the mother to feel more comfortable.

The diaper is absolutely necessary to protect the mother and child from the baby's stool. It has to be airtight to keep out urine that could evaporate and chill the infant, as well as being uncomfortable for the provider and irritating for the skin of both.

## The kangaroo carrier

The mother is the preferable kangaroo carrier because of the effects that the kangaroo position has on milk production and the establishment of a good mother-infant relationship. However, the father should be involved to support her, especially at times when she needs to take care of herself, and to also establish the father-child bonding, which is equally vital for the baby's future. Other family members can help to be kangaroo caregivers as all healthy human beings have adequate thermal regulation to maintain the baby's temperature. The important thing is to keep the child in skin-to-skin contact 24 hours a day.

The position of the carrier during the night is demanding and may be experienced by some carriers as extreme and difficult to comply with. The carrier should remain reclined with an inclination of at least 30°. The chairs in the neonatal unit should be designed for this purpose. Then, at home, bricks can be placed under the bed legs and the use of a lycra band can help the parents to keep the infant's head straight and still be able to fall asleep.

## Kangaroo baby care

The kangaroo baby should be permanently kept in the kangaroo position, except during diaper changes and breastfeeding. The lateral position is recommended for breastfeeding, as it allows skin-to-skin contact to be maintained even during lactation. This is an important consideration, as breastfeeding periods can be very long, especially in the early stages of kangaroo care and especially in more immature infants who get tired easily when feeding directly from the breast.

As long as the infant requires the kangaroo position to regulate temperature, he/ she should not be bathed by immersion because it generates a large undesirable dissipation of heat (in fact, they should not be bathed while in incubators either). The child should be wiped, whenever necessary, with wet absorbent cottons in the soiled areas, particularly the genitals and body folds.

## The duration of the kangaroo position

Premature and/or low birth weight infants are not "discharged" from the kangaroo position by external criteria but are carefully observed when they themselves "request" to be discharged, i.e., exhibit behaviors that show that the position is no longer necessary for thermal regulation and may even be hindering adequate heat dissipation. First of all, these are children who, as evidence of adequate thermal regulation, are developing adequately. When they are already regulating temperature without the need for heat transfer from the position provider, it is apparent that keeping them in skin-to-skin contact makes them uncomfortable. They become agitated and try to leave the position initially when they are awake and then both in wakefulness and during sleep. It is common for them to cry and resist when the mother tries to return them to the kangaroo position after a diaper change, scratch the skin of the position provider, reject the position, and try to get out on their own.

Adaptation to the kangaroo position begins during the infant's hospitalization, usually when the infant is stable and has overcomed most of the serious problems of their transition to extrauterine life. These are infants who basically remain in the neonatal unit because they require a thermal neutral environment (growth or "fattening" phase in the incubator) and possibly some additional monitoring. If such a thermal neutral environment and adequate attention to their feeding needs and detection of changes and alarm signs could be assured, it would be appropriate for these infants to leave the hospital and be managed on an outpatient care.

This is precisely what can be achieved in mother-child binomials properly adapted to the kangaroo position, in which the mother feels secure, manages to feed well and take good care of her child, and is attentive and recognizes signs of alarm in her child. For its part, the infant regulates temperature while in the kangaroo position, remains stable and comfortable, and gains weight at least as well as it would in a suitable incubator.

At that point it is appropriate to consider discharging the infant from the Neonatal Unit while he/she continues to receive the kangaroo position. "Early" (in fact timely) discharge in the kangaroo position is appropriate and safe as long as the adaptation is successfully completed. The infant is stable and the mother or position provider feels safe and can adequately monitor the infant. Close medical monitoring can be done, and if required, the infant can receive timely and appropriate emergency care.

The requirements for the kangaroo positioning at home are the same as in the hospital; the infant should be kept in the kangaroo position 24 hours a day, and the provider should sleep semi-sitting with elevation of at least 30°. It is requested for the family to avoid visits from ill people, particularly with infectious problems. The earlier arrival of the infant to his/her family environment, will enable to offer him/her an ambulatory neutral thermal environment (the provider assumes the role of an ambulatory incubator) and at the same time allows an earlier integration of the infant to his natural environment with his/her family which is one of the objectives sought by the Kangaroo Mothercare method.

**PRACTICAL RECOMMENDATIONS ON KANGAROO NUTRITION STRATEGY** (based on previous guidance, good clinical practice points based on expert opinion, pending 2017 update).

## **Target Population**

Preterm or low birth weight infants

Kangaroo feeding recommendations are addressed to all preterm and/or low birth weight infants (less than 2500g) hospitalized or at home, but who have initiated adaptation to the kangaroo position.

Kangaroo Mothercare is offered to preterm and/or low birth weight term infants as soon and safely as possible and if the infant is able to tolerate it and meets certain criteria such as: stabilization of vital signs, no bradycardia or desaturation when handled.

The recommendations are primarily aimed at children during their period of stable growth, but oral feeding with expressed breast milk can (and usually is) initiated at some point during the transition phase, as part of the initiation and establishment process of the oral route in these children.

Feeding strategies during the transitional period are not part of the focus for the present recommendations.

Although kangaroo positioning (gradual, intermittent or continuous) can be initiated during the transitional period, within the kangaroo feeding and nutrition strategies, these feeding processes would be included during the late transitional period. In the time of stable growth of these children, who already exhibit reasonable clinical stability and tolerate enteral and preferably oral feeding, the main goals of feeding are: a) recovery of growth to age-corrected body sizes and b) normalization of body composition.

A kangaroo feeding schedule is recommended during the hospitalization period, prior to the discharge home, which typically occurs in preterm infants reaching 33-34 weeks gestational age, followed by a feeding schedule for the outpatient kangaroo follow-up period in a Kangaroo Mothercare Program until the infant reaches the age of 40 weeks gestational age.

#### **Feeding ways**

#### Gavage

In immature infants who do not have a sucking reflex and adequate sucking-swallowing coordination due to prematurity or neurological problems or malformations, but who can use the intestine as a route of nutrient absorption, breast milk can be administered by intermittent gastroclysis (gavage). Sucking stimulation is initiated at the same time as the infant is being fed by gavage (non-nutritive sucking, an important step to stimulate sucking maturation). This sucking stimulation can be done directly at the mother's breast when she holds her baby in the kangaroo position. It can be initiated as early as 29 weeks. The child sucks, but stops when he gets tired. This stimulation is not only a

source of pleasure for the mother, allowing the production of breast milk, but also allows a physiological and sensory stimulation of the sucking (smell of the mother and milk, contact with the nipple).

#### Oral suction

In the 20th week the fetus can pucker the lips; the sucking reflex is present from the 24th week and becomes vigorous from week 32. All of the activity above is a basic preparation for the weeks 32-33, when the child can synchronize sucking with swallowing and can be orally fed directly by sucking. It can be started from week 29 when the child is held in the kangaroo position by the mother.

#### Mixed Paths

The daily weight gain of the preterm infant who receives tube feeding and who is given periods of non-nutritive suction stimulation must be monitored. When the weight remains stable or increases for more than two days and the oral administration of 50%-70% of the total daily volume is achieved, despite the suction work and the caloric expenditure involved, the infant should be placed on the breast for longer periods of time, with the support of the mother and the kangaroo clinical team.

Once the infant is able to suck adequately at the mother's breast, wait, until there is a good coordination between the regular increase in weight and the volume received by gavage for a few days, about 100 ml /Kg/day, before removing the tube and leave the infant exclusively on direct breast milk.

Oral drinking or dropper

Oral feeding is administered by drink or by dropper in case the mother is absent and if the infant becomes tired after the tube has been removed. The use of a pacifier or bottle teats should be avoided because it can cause confusion with the mother's nipple. When using a pacifier or bottle teats, the quality of maternal nipple sucking becomes inadequate and the volume of breast milk may decrease due to poor sucking efficiency. There is evidence that shows that feeding can be administered with a cup, not taking longer when performed by trained personnel.

However, feeding with a cup should not be too prolonged without appropriate sucking stimulation because it can delay the maturation between sucking and swallowing coordination.

#### Suction stimulation

There is controversy about the timing of initiating suction stimulation and the way that the administration by suction should be.

The recommended process in these guidelines for sucking stimulation is described below:

When the mother is with her infant in the kangaroo position and the baby is alert, these opportunities can be seized to perform the so-called non-nutritive sucking. Usually the child has a nasogastric tube. Non-nutritive sucking seeks to stimulate the sucking process in a physiological way and seeks to establish sucking-breathing-

Clinical practice guidelines for the optimal use of the Kangaroo Mothercare Method

swallowing coordination. Early training may aid in faster maturation of sucking skills in the most immature preterm infants (29-32 weeks).

In conjunction with the gavage process, the nipple is introduced in the infant's mouth, still in the kangaroo position, and every three to four suctions the nipple is removed to allow a respiratory pause. It starts with a minimum number of suctions so that the baby does not get too tired. Little by little the baby reaches a pattern of eight to ten suctions and a spontaneous respiratory pause. This way, the quality and maturity of sucking is evaluated: sucking-breathing-swallowing coordination, oral motor system, breathing pattern, absence of fatigue or signs of stress.

It is best to perform this sucking training with the mother's nipples, since besides adapting the baby to them, it is often comforting to both the mother and the baby.

Daily weight gain should be monitored. A too fast training is not useful, in spite of having excellent sucking and sucking-swallowing coordination. Infants are seen to lose weight with only the activity of sucking.

Once the child is able to suck adequately at the breast with good coordination, when the volume received by gavage meets around 100 ml/Kg/day for a few days and when the infant maintains or gains weight, the tube can be removed and the child is left with exclusive breast milk by direct suction.

The transition from the tube to the nipple is difficult for the healthcare staff, especially in the absence of the mother.

#### Suction mode of delivery

The absence of the mother in neonatal units along with the need to feed the baby by suction promoted the use of bottles with nipples or teats. This type of sucking is very different from direct suction at the breast, and interferes with the proper sucking stimuli that the infant makes when sucking adequately at the nipple, which favors proper milk production. The absence of the mother for prolonged periods together with the use of pacifiers or bottle teats are the major culprits in the failure of breastfeeding in these fragile infants who need more of their mother's milk.

Experiments of milk administration by cup, glass or syringe show that, with good training, these techniques do not take longer and allow a better adaptation from feeding tube to direct sucking at the breast. However, prolonged cup feeding without appropriate suction stimulation can also be disadvantageous since it delays the maturation of suckswallow coordination.

The ideal administration way is to move from the enteral feeding tube directly to maternal feeding by direct sucking and with interspersed cup or glass feedings in the absence of the mother.

#### Source of nutrition

#### Colostrum

If the premature infant is hospitalized and does not have oral feeding, the mother's own colostrum will be administered as soon as possible, by gavage, as a mean of trophic stimulation of the intestine, which has the function of stimulating maturation and immunological protection, instead of a nutritional contribution.

#### Mother's own exclusive breast milk

In infants less than 1500g, enteral feeding should preferably be initiated with exclusive breast milk associated with parenteral nutrition. It is started with small doses of 10 ml/kg/day and then increased according to tolerance from 10 to 20 ml/kg/day. When around 100 ml/kg/day are reached (according to the protocols of each neonatal unit) or one week has passed, fortification should be started, if the child's condition allows it, for a higher calcium, phosphorus and protein intake.

For newborn infants over 1500g who are able to suckle their mother's breast, exclusive breastfeeding is the best food while weight gain is carefully monitored, either during hospitalization or during kangaroo follow-up. If they are able to gain weight when receiving milk by direct suction, they are by definition at least 32 weeks gestational age and exhibit a mature sucking pattern. When adequate growth is not achieved after respecting the normal period of physiological weight loss, (growth of 15g per kg per day in weight; 0.7 cm in length per week and 0.5 cm per week in CP), before thinking about supplementing breast milk, the first step is to use the mother's own hindmilk to provide the supplementary caloric intake. Only in case of failure of the hindmilk, in addition to intense psychological support, will it be decided to supplement or fortify breastfeeding.

#### Breast milk from the own mother, fortified

Fortified breast milk is the most indicated for infants less than 1500g at birth. There is no consensus on the exact moment to start fortification, but it is suggested to fortify when the infant already receives a volume of about 100ml/kg/day to be sure of the tolerance level of the intestine. However, if the baby is more than one week old and does not achieve this volume, the fortifier is added anyway.

Although there is also no consensus on the date of withdrawal of the fortifier, it is applicable when an immature infant is able to move from the tube through which he/she receives fortified breast milk to a feeding based exclusively on direct sucking from the mother's breast, which usually occurs after week 32 and weighing at least 1500g. At this point fortification is discontinued so as not to interfere with breastfeeding and daily weight gain is monitored. The use of breast milk fortifiers in the outpatient setting is under study in Colombia.

#### Breast milk from the own mother, supplemented

In the hospitalized infant, when the mother is not present or the amount of milk she left is not sufficient, breast milk is supplemented to meet the infant's needs.

Clinical practice guidelines for the optimal use of the Kangaroo Mothercare Method

For most nutrients, it doesn't seem to be any difference when breast milk is supplemented with fortified donor milk or preterm formula, except with respect to Ca absorption which is more complete in fortified human milk than in artificial preterm milk.

In contrast, there are differences when supplemented with unfortified donor milk than with formula milk.

## Human donor milk, fortified

In order to be able to collect donor milk and fortify it, a lactation center with trained personnel is needed for milk collection and storage, as well as for freezing the mother's own milk and pasteurizing the donor's milk, in order to eliminate the risk of contamination or transmission of infectious agents.

If these conditions exist, fortified and properly administered donor milk (not using a bottle with nipple or teats) is the most appropriate after fresh milk from the mother.

#### Preterm formula milk

Preterm formula is used when there is not enough milk from the mother or when there is no donor milk bank and the infant is less than 1500g.

It is also used experimentally in the outpatient Kangaroo Mothercare program when a kangaroo infant does not grow adequately with exclusive breastfeeding or with hindmilk and the intense psychological support suggested in these cases has already been performed. Fortified breast milk is an alternative, but it needs to be handled, which makes it difficult and risky to use at home when there is no guarantee of hygiene (it could generate an infectious risk). For this reason, it is recommended to use the preterm formula in outpatient settings. To avoid contamination, preparation errors and abuse in its use, the liquid presentation is preferred, packaged by the manufacturer in bottles with adequate doses. Initially, breastfeeding is supplemented with a volume of formula milk that corresponds to less than 30% of the estimated daily ration for the infant. This supplementation is started with a minimum that is spread over the 24 hours of the day and administered by appropriate means (no bottle with nipple or teat) before each feeding. If this does not work, the amount is increased, which should always be less than 30% of the daily ration. Once the child achieves adequate growth, this supplement is progressively decreased until it is discontinued when the child reaches full term.

#### Vitamins, minerals and trace elements

Calcium and phosphorus should be administered to children under 1500g, ideally, in the form of fortification of their mother's own milk. Urinary excretion of calcium should be less than 6mg/Kg/day and phosphorus greater than 4mg/Kg/day.

The physiological reserves of vitamins are made during the last trimester of pregnancy and the mother's milk is insufficient to provide an adequate supply, especially of fat-soluble vitamins. Vitamin supplementation is administered in the hospital and then in the outpatient program until the child reaches term.

Vitamin D intake is advised to be around 400-600 IU per day; however, it depends on the amount of Vitamin D contained in the mother's milk. In the case of a mother with little exposure to the sun for long periods (winter of several months) it is advisable to give a

higher dose to avoid the appearance of rickets..

Vitamin A is supplemented at a dose of 1500-2500 IU per day and Vitamin E at 25 IU per day.

The administration of Vitamin K is more controversial, not so much with respect to the administration of the first dose at birth but in the repetition of doses especially in the child with exclusive breastfeeding or with hepatic immaturity. In Nordic countries, Vitamin K is administered weekly until the child starts the complementary diet. The recommended conduct in the Kangaroo Mothercare Program is to administer 2 mg of Vitamin K weekly and orally until the child reaches 40 weeks of gestational age. In case of navel bleeding, 1 mg is administered via IM.

## Summary of important practical aspects

In order to achieve successful maternal feeding, the non-separation of the infant and mother should be the rule. In case of hospitalization in the neonatal unit, schedules should be open day and night making it easy and comfortable for the mother to stay with her baby 24 hours a day.

The preterm baby of 32 weeks or more, who was born stable, should be placed on the mother's breast in the first half hour postpartum to stimulate the mother's milk production and suckling.

If the preterm infant is hospitalized and does not have oral feeding, the mother's own colostrum should be administered as soon as possible, by gavage, as a means of trophic stimulation of the intestine.

Breast milk remains the ideal food for the preterm infant, but it may not have the necessary caloric and mineral intake in infants of lower weight (<1500g). In this case, fortified breast milk is the most suitable and tolerated food to be administered by tube to the premature infant when he/she is already receiving oral feeding. Non-nutritive sucking is initiated in preparation for direct sucking at the breast and sucking-swallowing coordination. When these are acquired with a volume of fortified human milk greater than 100 ml/kg/day and with an increasing weight, the tube is removed and the infant is left to suck directly to the mother's breast.

If fortification is not possible (no fortifiers on the market or no lactation center where the mother's milk can be fortified), the technique of fortification with liquid milk for premature infants is an alternative, but it should be given in a minimum amount and distributed over 24 hours to avoid interfering with breastfeeding and to improve tolerance.

The kangaroo position stimulates breast milk production and should be initiated as soon as the infant is stabilized and for the longest periods tolerated by the infant and mother.

It is necessary for each neonatal unit to have a lactation room where the mother can manually express her milk.

# PRACTICAL RECOMMENDATIONS ON HOME DISCHARGE OF THE INFANT IN KANGAROO POSITION AND OUTPATIENT FOLLOW UP

#### An overview

Kangaroo follow-up with early discharge from the Neonatal Unit in the kangaroo position is one of the basic components of the Kangaroo Mothercare Method and it is similar to home neonatology until the child reaches term and 2500g in the case of the hypotrophic child, when, in theory, the first stage of kangaroo follow-up ends.

In Colombia, the kangaroo follow-up has two stages: an early, strict follow-up from the time the child leaves the kangaroo position until the child reaches 40 weeks of gestational age and a follow-up from 40 weeks until at least one year of corrected age. Kangaroo infants belong to the category of high biological risk for inadequate somatic growth and for presenting problems in neuropsychomotor and sensory development. Although it is not the direct subject of this guideline, it is considered essential for the high-risk infant to be followed up appropriately after the completion of the kangaroo follow-up period (40 weeks gestational age and a weight of 2500g, whichever happens first), and therefore the minimum activities to be performed during this high-risk follow-up are briefly mentioned at the end of the guideline.

The kangaroo technical guidelines of the Colombian Ministry of Health consider a high-risk follow-up in the Kangaroo Mothercare Programs until the child reaches at least 2 years of corrected age. This follow-up makes it possible to comply with the WHO and UN sustainable development goals (SG3). There are at least 53 Kangaroo Mothercare Programs in Colombia and some of them have achieved this follow-up until the child is 2 years old. The challenge for 2021 is to give access to a 100% of the preterm or LBW infants with a unified follow-up until the age of 2 years of corrected age.

When the infant is discharged home in the kangaroo position, the process of providing kangaroo care is continuous. Kangaroo positioning and feeding are initiated sometime during the hospitalization. This is the beginning of the kangaroo adaptation and continues as long as the child needs it, regardless of whether or not the child remains in the hospital. In fact, when successful adaptation of the mother and child to the kangaroo position and feeding is completed, the evidence shows that there is little that the hospital can offer that can't be already assured to the mother and child in an outpatient setting. Why seeking the earliest possible discharge of the premature infant?

The separation of mother and child is a painful phase, but often indispensable in the first stage in order to be able to take care of the sick premature and/or LBW infant. The altered physiology of this immature preemie, born too early, requires special care administered by expert healthcare professionals who are available at any time of the day or night. Parents feel like guests, spectators of a drama that concerns them but which they do not understand and in which they feel unable to intervene or help, despite their role as parents. At a given moment, most of these children adapt to extrauterine life and at this point they have to be returned to the care of their parents, first in the hospital and then at home.

When is an infant ready to leave home from the neonatal unit? When is his family ready to receive him/her? How is it possible to measure and balance the risk of prolonged separation from the parents against the risk of being at home away from electronic and clinical surveillance and possible emergency intervention? How to train the parents and stimulate their aptitude to adequately manage the new family member when he/she returns home?

Most institutions have developed rules and protocols for the discharge home, based mainly on biological data such as reaching a certain weight or gestational age, and many already recognize the need to properly train parents and provide them with long-term support and follow-up at home. But these rules are not standardized, they vary from countries, and within a country from institutions. Sometimes they are arbitrary, unrelated to the family or the reality.

Intuitively, it is attractive to take a baby to his/her house as early as possible, but this is not the goal. The meaning of the word "possible" needs to be defined. Neonatologists tend to be conservative about the appropriate time to take the decision. The potential risks and the large investment made to save these fragile infants cause them to overestimate the risks in relation to the benefits of discharging the infants as early as possible under the care of the parents when they are trained.

In KMC, the kangaroo follow-up with early discharge home from the neonatal unit is a core component. It recognizes the benefit of returning to the parents the right to be the best caregivers for their fragile infant, once a successful kangaroo adaptation is completed.

#### **The Kangaroo Adaptation**

Is an indispensable step for the success of the KMC, the early discharge in kangaroo position and the kangaroo follow-up? It can be defined as a process of social, emotional and physical adjustment of the mother and family of the preterm and/or low birth weight infant to the kangaroo methodology. This is accomplished through an objective and a clear education process, with training and social and emotional support.

As soon as a low birth weight infant is adequately stabilized, gaining weight in a thermal neutral environment and tolerating manipulations (being hospitalized in the Intensive Care Unit or in basic or minimal care), he/she is eligible for KMC. Each neonatal unit should define their criteria for the mother and infant to start the kangaroo neonatal adaptation and as the staff becomes more trained, the criteria for initiating KMC can be modified with a consensus of the NCU staff. If the family agrees, a member of the kangaroo team (usually a nurse) initiates the adjustment with the mother-infant dyad. This work is done next to the incubator or in the kangaroo adaptation room of the NICU if available. If the infant is ventilated, on CPAP or an IV drip, kangaroo adaptation is initiated at the side of the incubator. If the infant has a KT and nasal cannula oxygen, the infant can be brought to the kangaroo adaptation room. Ideally this collective kangaroo room should be in the

Clinical practice guidelines for the optimal use of the Kangaroo Mothercare Method

Neonatal Unit and must have oxygen connections. If there is no kangaroo room, this can be done next to the incubator. The performance of the infant's adaptive functions, such as thermal regulation when in the kangaroo position, as well as the ability to coordinate breathing, sucking and swallowing, should be carefully observed. The mother's ability to carry and breastfeed her baby is also encouraged.

Mothers are encouraged to spend as much time as possible with their babies. Ideally, mothers who are in kangaroo adaptation, stay with their babies 24 hours a day, but the facility to do so is not always real. If being together is not possible, kangaroo adaptation must be done by observing the mother's job with her baby for as much time as possible during each day.

## What are the objectives of the in-hospital kangaroo adaptation?

- » To help the mother accept the image of the little baby she has gestated by enabling continuous encounters, that led to recognition of his/her characteristics and learning how to care for her baby.
- To alleviate maternal stress caused by having to care for a fragile premature baby.
- » To alleviate fears and worries by allowing mothers to share them in a group and resolving many of them with information.
- » To collectively educate about the Kangaroo Mothercare method and the characteristics that differentiate a premature baby from a full-term baby, the precautions and alarm signals of the baby during the kangaroo position at home.
- To train the mother in the process of feeding the premature infant: direct feeding at the breast, expression and storage of breast milk and appropriate administration (without a bottle, with a cup, dropper, syringe, etc.) of expressed milk and other nutrients.
- » To decrease fatigue through physical and relaxation exercises with the baby in the kangaroo position.
- » To reduce fears about the kangaroo method with testimonials from mothers who have previously participated in the program.
- » To promote physical recognition and a stimulating mother-infant relationship by massaging the baby while in skin-to-skin contact, encouraging physical recognition and a stimulating mother-infant relationship.
- » To make the mother capable of caring for her baby at home, using the Kangaroo Mothercare method, training her on how to hold the baby 24 hours a day.
- » To decrease fears and apprehensions that arise while providing the KMC.
- » To promote and strengthen the development of the mother-child emotional bond.
- » To assess infants who are ready and able to receive KMC in the outpatient setting.

What does it mean to have a successful in-hospital kangaroo adaptation?

- The infant is gaining weight every day in the Neonatal Unit.
- The infant has a mother or a family member who knows how to hold him/her in the kangaroo position and how to feed him/her.
- » The infant has a mother or family member who feels able to follow the steps

- and procedures of the kangaroo intervention at home and who has shown interest in participating in the in-hospital kangaroo adaptation.
- » There is a commitment of the mother and family members to continue with the outpatient kangaroo follow-up.

What are the criteria to be discharged home in the kangaroo position?

The infant is considered ELIGIBLE for discharge, regardless of weight or gestational age, when:

- » Regulates his/her temperature in the kangaroo position.
- » Has adequate weight gain in the Neonatal Unit with kangaroo position and incubator.
- » Has finished his/her treatment, if any.
- » If the infant is receiving oxygen through a nasal cannula, it should be less than ½ l/min.
- » Has had a successful in-hospital kangaroo adaptation:
- » Has appropriate breastfeeding techniques (direct sucking at the breast) and expression of milk.
- » Acceptance and education in the Kangaroo Mothercare method.
- » Has family and social support.
- » Has adequate suction-swallow-breathing coordination.
- » There is a Kangaroo Mothercare Program capable of providing a kangaroo follow-up.

#### The mother is considered eligible when:

- » She feels capable of managing her baby with kangaroo methodology (positioning and nutrition) at home.
- There is a family commitment to attend to the kangaroo follow-up (mother, father and grandmothers).
- » There are no physical contraindications for the kangaroo position (see chapter "Position").
- » For cases of high social risk, a multidisciplinary team concept is needed for discharge: prostitute mother, single mother with twins, single mother with a child on ambulatory oxygen, etc.

## How is the kangaroo follow-up until 40 weeks gestational age and 2500g?

It is a follow-up performed in a physical structure called the Kangaroo Mothercare Program, where a multidisciplinary team trained in KMC, works. There are young infants in the kangaroo position and older infants who assist for their neurological or psychomotor developmental screening or growth controls. Only healthy infants are accepted in the consultation group, to avoid sick infants to start crossed contamination between each other. These collective meetings are important for the management of the anxiety of these parents who are always wondering about the future that awaits for their fragile and different baby.

The KMCP must be located in a hospital structure, ideally in a place where there are professionals who know how to handle a sick newborn:

- » Because it is neonatology at home.
- » Because a kangaroo emergency affects a neonate and has to be treated in a neonatal unit or at least by someone adequately trained.
- » Because the follow-up is initially done daily, weighing the infant on an electronic scale and being checked by a pediatrician able to detect any alteration in this fragile child who does not speak.
- » Because the outpatient kangaroo adaptation can last all morning or all day or several days if the baby has not gained weight or there are breastfeeding problems.

Physical structure: It must have a large room for consultation and collective waiting. In addition, it should have several individual places where outpatient kangaroo adaptation can be performed in one of them and others for psychology interconsultations, workshops for new parents and psychomotor development exams, ophthalmology screening, audiology screening, vaccinations, optometry and eventually outpatient phototherapy (BiliBlanket and BiliCheck).

A multidisciplinary team must be available: pediatrician, nurse, psychologist, social worker, nutritionist, physical therapist, ophthalmologist, optometrist, speech therapist; each contributing from their own discipline. The permanent core is formed by the pediatrician, the nurse and the psychologist.

## It is intentionally a consultation with a collective wait

- » Because education is daily and collective, which allows reinforcing knowledge when the mothers listen to the same lectures several times.
- » Because the mother who waits her turn listens to the problems of others and exchanges with other mothers her experiences and difficulties.
- » Because anxiety is better managed: by seeing smaller babies than their own, mothers realize that their baby is doing better; on the other hand, by seeing older babies it gives them a goal to reach.
- » Because of the psychologist's availability in case of depression, feelings of loneliness or insecurity.
- » Because this commitment to come daily to the consultation is somehow the same commitment you have when the child is hospitalized and every day you have to go to the hospital to be with him/her. You have to remind parents that it is a very intense job for a short time, until the child is 40 weeks old, but it will pay off for the rest of his/her life.
- » It stimulates solidarity in the family, especially when the child is oxygendependent, since the mother will need a companion to help carry the oxygen cylinder in order to travel to the consultation.

## **Ambulatory kangaroo adaptation**

It can last from one day in a well-trained mother to one week in a mother who has difficulty feeding her baby or if the child has inadequate growth problems. It is done under the supervision of a trained nurse in maternal feeding techniques and may receive support from psychology and social work.

- » It begins on the first day of entry into the Kangaroo Mothercare Program.
- » It requires professionals with dedication, patience, persistence and human warmth, capable of generating in the mother confidence in her own abilities, and who are available to resolve any concerns, or repeat explanations.
- » It requires being aware of the risk of hypoglycemia.
- » It requires close supervision on how the mother is carrying out the care of the child at home with the kangaroo methodology.
- » It needs supervision on the use and management of nutritional supplementation in children with prolonged hospitalization while eventual exclusive breastfeeding is achieved.
- » Must reinforce what was learned in the in-hospital adaptation.
- » Must teach "sunbathing" for physiologic jaundice.
- » Must reinforce the massage technique in the kangaroo position.
- » Must continually offer emotional support to the mother and family.

## Organization of kangaroo follow up until 40 weeks of gestational age

Initially, the follow-up must be daily: the nutrition and quality of the food the child receives is evaluated and a weight gain of about 15g/kg/day is expected until week 37 of age (intrauterine growth velocity). Then, it is expected to be 8-11g/kg/day until the week 40 of post-conceptional age. Height should increase by an average of 0.8 cm per week, and head circumference by 0.5-0.8 cm until term.

The follow-up becomes weekly when the child reaches adequate growth, which shows that there is already a harmony and balance between the parents and the child. In case of living far away, we try to help the parents to go to the consultation despite the difficulties, in the same way as we insist them to come as they would do it, if they have to visit their baby daily, in case of hospitalization.

In case of impossibility for the parents to attend the daily consultation, due to absolute poverty or lack of transportation, or because they live too far away, early discharge can be given in a KMC ward (for example, in a hospital wing) until they can be definitively discharged, with the guarantee that the parents will return for a weekly follow-up.

It must be checked how the parents are doing with the kangaroo methodology. Usually the first nights are very heavy and the parents who quickly learn to rest with their baby in the kangaroo position and show their satisfaction

- when the baby starts to grow properly must be encouraged and congratulated. They feel proud to know that this is the fruit of their efforts.
- All infants undergo a first session of kangaroo adaptation on the first day of the outpatient visit and then during the following days if the mother requests it or if somatic growth is inadequate. The decision to supplement breastfeeding with preterm formula and the timing of initiation of this supplementation is a multidisciplinary decision. The technique was described in the chapter on kangaroo nutrition. In case of initiation, it should be verified that the mother knows the necessary hygiene rules to use this type of food, as well as the techniques of dropper, cup or syringe administration to try to interfere as little as possible with breastfeeding. The objective is to always achieve term with exclusive breastfeeding.

#### Medication

Caffeine or Xanthines: PTNB with gestational age ≤ 34 wk. at PMC entry and continue to be administered until term.

Vitamins A, D, E, K are administered until term.

Ferrous sulfate from 30 days and up to 1 year of corrected age.

## Screening up to 40 weeks

- » Ophthalmologic: from 34 weeks or 28 days of life.
- » Audiometric: at 40 weeks of gestational age (otoacoustic emissions and AEP))
- » Evaluation of neurological tone with brain ultrasound. It is important to have a first brain imaging of this high-risk infant before term. In children who show normal tone and neuro-psychomotor development, no complementary examination is repeated. The child with normal and/or abnormal brain ultrasound showing abnormal neuro-psychomotor development during the year is complemented with a brain CT and/or brain MRI if necessary.

#### **Educational sessions**

Each day the nurse conducts morning and afternoon educational sessions on childcare, home care and a home resuscitation workshop for parents is held once a week at the KMCP.

## Organization of kangaroo follow-up until 1-year corrected age

#### Screening

- » Neurological: Complete neurological evaluation during the corrected follow-up year. It can be performed when the child reaches 40 weeks, then at 3, 6, 9 and 12 months. This allows timely referral to physical therapy, in case of children with developmental disorders, assessing the impact on subsequent neurological examinations. Parents are encouraged to learn the therapy exercises to be performed at home to reinforce the treatment.
- » Psychomotor development: minimum 2 times a year. The test applied should consider all developmental aspects: not only psychomotor but also social. It can

- be complemented with a series of exercises to be performed at home and taught to the parents during the evaluation session.
- » Systematic hip X-ray is not performed: it is the pediatrician's clinical examination at 3 months of corrected age who will decide whether to perform it or not.
- » By optometry: from 3 months of corrected age.

## Somatic growth during follow-up until one year of corrected age

The controls are spread out during the year trying to make them coincide with vaccination or screening dates to save trips to the parents.

The zero point of the growth curves corresponds to the 40 weeks of age, ideally one should use somatic growth curves before and after term on the same graph for weight, length and CP. We use the Fenton curves before 40 weeks and then the WHO curves at ED as requested by the Colombian Ministry of Health.

#### Educational sessions

These are conducted on a daily basis in the collective consultation about topics that concern both the youngest and the oldest people present. A mother with a baby in kangaroo position who comes to the consultation every day must have listened to the complementary feeding talk several times before her baby reaches the age where he/she will start complementary feeding. Psychologists and nurses, nutritionists and pediatricians share the educational sessions which are repeated and short.

#### **Vaccines**

They can be applied in the Kangaroo Mothercare Program. It is necessary to meet the requirements of the health authorities in terms of physical structure and personnel. They can also be applied in the hospital or in another place, which meets these requirements. Vaccines implementation within the Kangaroo Mothercare Program can ensure greater compliance and lower patient dropout during follow-up. Each country has its own vaccination schedule; however, it is advisable to apply the inactivated poliovirus vaccine and acellular pertussis vaccine to these high-risk children who participate in the collective kangaroo consultation, given their neurological fragility.

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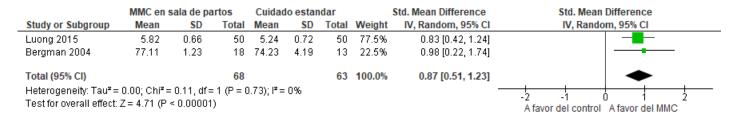
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## **Appendix - Forest plots for some questions**

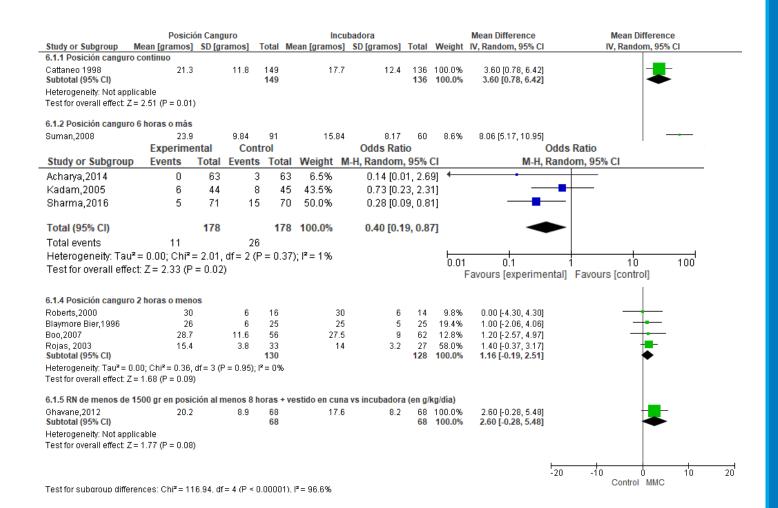
## CMM from delivery room and physiological stability SCRIP



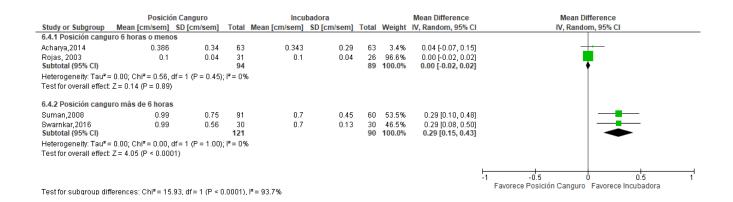
## KMC initiated from delivery room and breastfeeding at one month of age



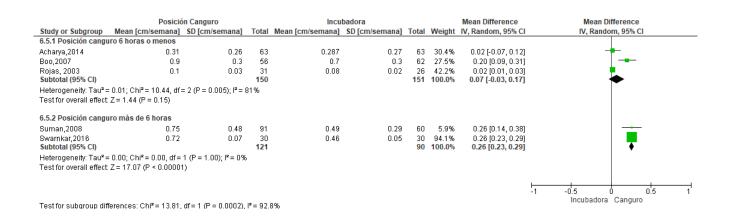
## **Kangaroo Position and Somatic Growth - Weight**



#### **Kangaroo Position and Somatic Growth - Size**



## **Kangaroo Position and Somatic Growth - Head Circumference**



#### **Kangaroo Position and Apneas**

## Pain measured by PIPP and Kangaroo Position

