

COMMITTEE REPORT

# Towards universal Kangaroo Mother Care: recommendations and report from the First European conference and Seventh International Workshop on Kangaroo Mother Care

KH Nyqvist (kerstin.hedberg\_nyqvist@kbh.uu.se)<sup>1</sup>, GC Anderson<sup>2\*</sup>, N Bergman<sup>3\*</sup>, A Cattaneo<sup>4\*</sup>, N Charpak<sup>5\*</sup>, R Davanzo<sup>6\*</sup>, U Ewald<sup>1\*</sup>, O Ibe<sup>7\*</sup>, S Ludington-Hoe<sup>2\*</sup>, S Mendoza<sup>8\*</sup>, C Pallás-Allonso<sup>9\*</sup>, JG Ruiz Peláez<sup>10\*</sup>, J Sizun<sup>11\*</sup>, A-M Widström<sup>12\*</sup>

- 1.Uppsala University, Uppsala, Sweden
- 2.Case Western Reserve University, Cleveland, OH, USA
- 3.University of Cape Town, Cape Town, South Africa
- 4.Institute for Maternal and Child Health IRCCS Burlo Garofolo, Trieste, Italy
- 5.Kangaroo Foundation, Bogotá, Colombia
- 6.Neonatology Department, IRCCS Burlo, Trieste, Italy
- 7.University of Nigeria, Abuja, Nigeria
- 8.Jose Fabella Memorial Hospital, Manila, Philippines
- 9.Hospital 12 de Octubre, Madrid, Spain
- 10.Pontificia Universidad Javeriana, Bogotá, Colombia
- 11.University Hospital, Brest, France
- 12.Karolinska Institute, Stockholm, Sweden

**Keywords**

Implementation, Guideline, Kangaroo Mother Care

**Correspondence**

Kerstin Hedberg Nyqvist, Department of Women's and Children's health, University Hospital, 751 85 Uppsala, Sweden.

Tel: +46 18 611 9104 |

Fax: +46 18 611 5583 |

Email: kerstin.hedberg\_nyqvist@kbh.uu.se

**Received**

22 January 2010; accepted 25 February 2010.

DOI:10.1111/j.1651-2227.2010.01787.x

\*Members of an Expert Group of the International Network on Kangaroo Mother Care.

**Abstract**

The hallmark of Kangaroo Mother Care (KMC) is the kangaroo position: the infant is cared for skin-to-skin vertically between the mother's breasts and below her clothes, 24 h/day, with father/substitute(s) participating as KMC providers. Intermittent KMC (for short periods once or a few times per day, for a variable number of days) is commonly employed in high-tech neonatal intensive care units. These two modalities should be regarded as a progressive adaptation of the mother-infant dyad, ideally towards continuous KMC, starting gradually and progressively with intermittent KMC. The other components in KMC are exclusive breastfeeding (ideally) and early discharge in kangaroo position with strict follow-up. Current evidence allows the following general statements about KMC in affluent and low-income settings: KMC enhances bonding and attachment; reduces maternal postpartum depression symptoms; enhances infant physiologic stability and reduces pain, increases parental sensitivity to infant cues; contributes to the establishment and longer duration of breastfeeding and has positive effects on infant development and infant/parent interaction. Therefore, intrapartum and postnatal care in all types of settings should adhere to a paradigm of nonseparation of infants and their mothers/families. Preterm/low-birth-weight infants should be regarded as extero-gestational fetuses needing skin-to-skin contact to promote maturation.

**Conclusion:** Kangaroo Mother Care should begin as soon as possible after birth, be applied as continuous skin-to-skin contact to the extent that this is possible and appropriate and continue for as long as appropriate.

**INTRODUCTION**

The Kangaroo Mother Care (KMC) method is a standardized, protocol-based care system for preterm and/or LBW infants and is based on skin-to-skin contact between the preterm baby and the mother. The aim is to empower the mother (parents or caregivers) by gradually transferring the skills and responsibility for becoming the child's primary caregiver and meeting every physical and emotional need. KMC was initiated at the Instituto Materno Infantil in Bogotá, Colombia, by Dr Edgar Rey in 1978. The programme consolidated in its first 15 years and became known as the 'Kangaroo Mother Programme' (1). No local evaluation was attempted for many years, but with international community interest, a body of research evolved, which lead to diffusion and dissemination of one of the

components of KMC, the so-called kangaroo position (KP), which will be defined later. The other two original components (nutrition based on exclusive breastfeeding whenever possible and early discharge in KP with strict follow-up) are less frequently identified as part of KMC.

The Kangaroo Mother Intervention is offered to preterm and/or low-birth-weight (LBW) infants as far as the baby can tolerate it. KP is the hallmark of KMC. In KP, the mother and the child are in direct skin-to-skin contact, 24 h a day; the baby is placed vertically between the mother's breasts and below her clothes. Mothers both maintain the infants' body temperature and also are the main source of nutrition and stimulation. This characterizes continuous KMC (C-KMC), and there are KMC programmes that use C-KMC in both developing and developed countries.

Intermittent KMC (for short periods once or a few times per day and for a variable number of days) is commonly employed in high-tech settings. This modality of KMC is usually called 'Kangaroo Care' or 'skin-to-skin care' and aims to initiate and maintain a physical relationship between the mother and the infant, with a series of expected good outcomes including (but not limited to) enhancing mother-infant bonding, promoting breastfeeding and helping the mother to cope with the premature birth. The authors of the present report propose to call this as intermittent KMC (I-KMC).

There should be no antagonism between the two modalities, as they should be regarded as a continuous and progressive adaptation of the mother-infant dyad to full C-KMC, starting gradually and progressively with I-KMC.

Full-term infants with adequate weight for their gestational age may benefit from the KP for a limited period during the day and for a limited number of days (as long as the mother-baby accept the skin-to-skin contact), and there is evidence (2,3) of the positive effect this position has in promoting breastfeeding and the mother-infant relationships (4). These effects are similar in terms of trend, not necessarily in magnitude to those observed in preterm and/or LBW infants.

Since 1996, biannual workshops have been organized by an informal core group of people involved in the promotion of KMC, the 'International Network of KMC'. The goal of the workshops has been to promote the method through providing professionals engaged in education, clinical implementation, management, research and development related to KMC with the opportunities for sharing new knowledge and experience. At the 1996 workshop, the KMC method was defined as: 'Early, continuous and prolonged mother-infant skin-to-skin contact, with (ideally) exclusive breastfeeding, early discharge with adequate follow-up and recommendations for three different levels of application of the method, depending on availability of health and medical care resources' (5). During the 2004 workshop, participants identified the relatively low prevalence of C-KMC in countries with high infant morbidity and mortality as a major cause for concern and agreed that the integration of C-KMC, whenever applicable, should be regarded as an indispensable component of newborn care even in high-tech neonatal intensive care. Arguments for this were based on both the conviction that infants/parents in high-tech neonatal intensive care units (NICUs) would benefit from extended periods of KMC, continuous whenever possible, and the assumption that integration of C-KMC in high-tech NICUs would exert positive influence on the advancement of C-KMC in settings with limited resources. At the ensuing KMC workshop in 2006, the decision was taken to arrange a European Conference with a special focus on KMC in the high-tech environment, in conjunction with the Seventh International Workshop, which addressed application in all types of settings in Uppsala, Sweden in October, 2008.

The aim of this study was to report about the aspects of KMC that are universally applicable to all types of settings,

presented at the First European Conference and recommendations formulated by experts at the Seventh International Workshop on Kangaroo Mother Care.

#### **EVIDENCE SUPPORTING C-KMC IN BOTH LOW-INCOME AND HIGH-TECH SETTINGS: SUMMARY OF ORAL PRESENTATIONS AT THE FIRST EUROPEAN CONFERENCE ON KMC 2008**

##### **Lessons from the human past, evidence about physiological and endocrinological effects, mother-infant contact and breastfeeding seen from a feminist perspective and as a peace-building model**

The pattern of infant care practiced in hunting/gathering societies such as Bushmen in Botswana and Namibia was described by Konner (Atlanta, USA) (6). This pattern was used for millions of years by the ancestors of mankind during human evolution, and is characterized by very high levels of mother-infant skin-to-skin contact, verbal and focal interaction and prompt response to crying. Nursing commences with a frequency of about four times an hour and slowly declines to the age of 3 years. The consequences of the recent departure from this pattern in human history are not yet known. This historical change can be related to the extremes in the care of the newborn described by Widström (Stockholm, Sweden) as ranging from 'native closeness' to 'industrialized separation'. Immediately after birth, the healthy newborn baby engages in a sequence of inborn pre-feeding and initial feeding behavioural phases; birth cry, relaxation, awakening, crawling, breast preparation and at breast and suckling (7). Mother-infant skin-to-skin contact during the first hours, allowing the infant to experience these phases, has shown positive effects on maternal sensitivity to the infant, infant self-regulation and mutuality during play when the infant is 1-year-old (8). Oxytocin release has been suggested as one mediator for positive effects of mother-infant skin-to-skin contact. Uvnäs Moberg (Skara, Sweden) described hormonal processes, whereby hospital routines in connection with labour and in the care of newborns, full term and preterm, are associated with short- and long-term consequences on maternal chest temperature and infant temperature, lactation and breastfeeding, maternal levels of anxiety and social competence and mother-infant interaction (9–11). Ludington-Hoe (Cleveland, OH, USA) described typical preterm infant responses to KMC such as physiological stability, increased temperature, decreased pain response and neurophysiological effects such as better sleep state organization and accelerated brain maturation (12–14).

Another perspective of the mother-infant relationship is feminism. From this point of view in western societies, a dualistic thinking emerged on culture and nature, man and woman. With reference to breastfeeding, this process was analysed by Ohrlander (Stockholm, Sweden) as an issue of 'love, authority and regulation' (15). When children are perceived as objects of social planning, mothers are allocated a role with a focus on regulating and controlling their children. Simultaneously, with industrialization, the medical profession insisted on fixed feeding and child-care

schedules and discouraged emotional expressions such as caressing. However, according to one recent view on feminism, the dualism can be reconstructed, taking the wellbeing of both mother and infant into account and emphasizing the role of the father. Midwives Leslie Wolf and Aisha Saifi raised the ultimate goal of mother–infant contact to a higher universal level in their presentation of a joint project in Israel and Palestine, under the auspices of Circle of Health International. This project had the goal of introducing skin-to-skin contact between newborns and their mothers for supporting breastfeeding, thereby laying the foundation for peaceful societies through supporting peaceful births.

### **KMC in low-income and high-tech settings: prevention of parent–infant separation and effects on infants, mothers and fathers**

Kangaroo Mother Care, as practiced initially, was initiated after stabilization of the infant, not from birth. Bergman (Cape Town, South Africa) presented a study of KMC from birth, conducted in a 'low-tech' setting (16), which revealed dramatic improvement in survival. A more recent randomized controlled trial (RCT) of KMC from birth in a high-tech NICU in South Africa (17) illustrated that this model was superior to incubator care in stabilizing noncritically ill infants (vaginal delivery, 1 min Apgar score >6) with a birth weight from 1200 g. The results of Bergman and associates support earlier human findings (18,19). Together with data from animal research on the protest-despair response to mother–infant separation, these findings support the view of KMC from birth as the norm, and interpretation of mother–infant separation immediately after birth as a violation of mothers' and infants' rights, with possible maladaptive changes in physiological stability and co-regulation of stress (20).

Mokhachane (Johannesburg, South Africa) demonstrated that the KMC method produces safer discharge of high-risk very-low birth-weight infants at a weight of  $\geq 1650$  g, than the previous practice of discharging at a weight of  $\geq 1800$  g, in a low-income population in a setting with limited resources, population explosion, an AIDS epidemic and migration problems in the community (21). In response to these multiple challenges encountered, a local programme for Kangaroo Father Care was added, which was also beneficial. Under such circumstances, it is evident that a holistic approach based on the concept of Kangaroo Family Care is necessary for optimal KMC practice.

A quasi-experimental study on preterm infants with mechanical ventilation during KMC was presented by Azevedo (Minas Gerais 2, Brazil). Statistically, but not clinically, significant improvements were determined in heart rate, blood pressure, temperature and inspired oxygen fraction, indicating that KMC was safe for the study group. Differences were found depending on infants' age and duration of ventilatory support.

Another important aspect of neonatal care is pain management. Considering preterm infants' frequent exposure to painful care-giving procedures, it is satisfying that KMC was

found efficacious in decreasing pain response in studies presented by Johnston (Montreal, Canada) (22–24). Pain study results support the designation of the parent's chest as the optimal place for care of preterm and ill infants. Nyqvist (Uppsala, Sweden) addressed the breastfeeding component in the KMC model with a description of the development of early oral motor competence during breastfeeding in a group of 15 very preterm infants, 13 of whom required initial ventilator support (25). These infants demonstrated a capacity for attainment of full breastfeeding as early as a postmenstrual age of 32 weeks, with a median of 35 weeks. This evidence supports encouragement of early breastfeeding initiation, which may result in early establishment of full breastfeeding and facilitate early discharge from hospital. Tallandini (Trieste, Italy) found that UK mothers who practiced daily 1-h sessions of KMC for at least 2 weeks were less stressed and perceived their infants as less difficult than mothers of infants receiving traditional care (26). Abul-Fadl (Benha, Egypt) described the effects of KMC on maternal depression scores in NICUs. KMC mothers had lower depression scores six weeks post-partum than mothers in a control group. However, the study also revealed considerable staff resistance towards KMC and highlighted the necessity of designing culturally acceptable interventions for changing staff attitudes to KMC. Bigelow (Antigonish, Canada) explored the effects on mothers of 5-h daily KMC sessions during their infants' first week, followed by 3 h/day until the age of 1 month. There were no differences after 1 week, but by 1 month the KMC mothers were more responsive to their infants' behaviour. A Swedish RCT on newborn term infants' behavioural responses according to the Neonatal Behavioural Assessment Scale to skin-to-skin contact with their fathers or cot care after caesarean delivery was described by Erlandsson (Västerås, Sweden) (27). The skin-to-skin group cried less, displayed more rooting and sucking activities and general wakefulness, and reached a drowsy state earlier, which supported the conclusion that the father should be regarded as the primary caregiver for the infant during a period of mother–infant separation. Tessier (Québec, Canada) compared KMC infants in Colombia with a traditional care group after discharge and found KMC mothers created a more stimulating home environment, and the environment was even more optimal when fathers were also involved (28).

Practical guidelines for KMC were published by the World Health Organization (WHO) in 2003 (29). Although this document addresses preterm/LBW infants in both developing and affluent settings, the focus was on practical application in less developed settings. Unfortunately, the current situation regarding infants' experience in neonatal units and parents' involvement in their infants' care in settings with optimal medical–technical and staff resources is not optimal.

### **Why KMC should be the norm in all types of settings?**

Charpak from the Fundación Canguro, Bogotá, which has published evidence-based clinical practice guidelines for KMC (30), addressed why KMC is important both in settings with limited resources and in industrialized countries, where the norm is to treat infants with advanced technology

**Table 1** Effectiveness and safety of KMC: summary of a systematic review by Ruiz Peláez and Charpak (31)

The practice of KMC:

- Is as effective as incubators for keeping infants with unstable temperature regulation warm, but care in the kangaroo position must be continuous
- Will not destabilize the already stable LBW infant
- Will not increase the rate of apnoea or gastro-oesophageal reflux
- Diminishes pain response and stress, and improves physiological recovery in infants as young as 28 weeks
- Will improve sleep organization
- Makes feeding a sociable and pleasant experience
- Is a feasible and available tool for transportation
- Improves neurobehavioral development
- Empowers the mother and the family and prevents feelings of helplessness and separation anxiety
- Strengthens the family role in the care of a fragile infant
- Promotes the participation of the mother and father in the infant's care
- Promotes breastfeeding initiation, exclusivity and duration
- Promotes the early and opportune discharge home or to a step down facility
- Decreases the length of hospital stay

KMC = Kangaroo Mother Care; LBW = low birth weight.

and separated from their parents. Instead of being regarded as an inferior alternative to western high-tech care, KMC is superior because of its biological effectiveness and safety and its positive psychosocial and cognitive impact on infants and their families (31) (Table 1). Therefore, infants' care should follow a process of gradual preparation and adaptation from intra-uterine to extra-uterine life by applying the principles of the Newborn Individualized Developmental Care and Assessment Programme (NIDCAP), combined with care in the KP, with the complete KMC intervention in hospital and continued at home after early discharge. This concept of neonatal care enhances parent-infant bonding and attachment and transforms the crisis of having a preterm or ill newborn infant into a more gratifying experience for the whole family.

## RECOMMENDATIONS OF THE SEVENTH INTERNATIONAL WORKSHOP ON KMC 2008

The discussions in working groups, based on scientific evidence and participants' clinical experience, resulted in agreement on a view of KMC, as specified below.

### What is universal in KMC?

From the existing evidence, the following recommendations for the care of newborn LBW infants can be considered universal, including the care of extremely preterm and very preterm infants and full-term infants requiring neonatal intensive care.

#### General aspects

The KP is the preferred routine place of care, taking into consideration the actual physiological and behavioural state of the infant and mother/parent. Removal from this place of care should only occur for justifiable reasons, as KMC may contribute to stabilization of physiological parameters,

especially in late preterm infants. However, KMC cannot replace essential neonatal care that all newborns deserve.

#### Health/medical care facilities

Every facility providing services and care for infants should have written KMC policies for healthy and at-risk newborn LBW infants and ill full-term infants who are routinely communicated to all health care professionals, and professionals are expected to carefully document all components in the process of providing KMC. All pregnant women and their families should be informed of the benefits and provision of KMC, and information material, written and pictorial, should be available at all levels of facilities.

#### Health care professionals

Information about KMC should be included in the curricula of all health care professionals. All health care professionals should be trained in the skills necessary to implement the KMC policy pertaining to their area of care. All professionals, midwives, nurses and physicians, working in antenatal, intranatal and neonatal care should be proficient and dedicated to KMC.

#### Information to mothers and families

All pregnant women and their families should receive information about the benefits and provision of KMC when the infant is born preterm, LBW or ill. Written (or in the appropriate format for illiterate parents) information about all components of KMC should be provided prenatally and on arrival in the neonatal unit. All mothers and families should be supported in the provision and maintenance of KMC throughout hospitalization and after discharge, and the formation of parent-to-parent support groups should be encouraged. Measures should be taken for positive representation of KMC in mass media.

#### Initiation and duration of KMC

Kangaroo Mother Care should begin as soon as possible and from birth whenever possible, be provided to assist in transition (including thermal control) after delivery of the infant and with appropriate and available support and continue 24 h/day, 7 days/week (depending on circumstances) until the infant no longer needs it for thermoregulation. Intermittent KMC may precede C-KMC in some infants. Timing and duration of KMC sessions are dependent on individual infant and parent physiological and behavioural responses. If the infant is not in C-KMC and because transfer to/from KMC may be stressful, a minimum duration of one hour of KMC per session is strongly recommended. KMC should be used for the infant's warming, comfort, physiological and behavioural stabilization, sleep, growth, neuro-development and psychological benefits. KMC should also be used as a strategy to minimize procedural pain.

#### KMC providers

Mother-infant separation should be minimized as far as possible. KMC should be used to promote lactation,

breastfeeding initiation and longer breastfeeding duration and to satisfy the psychological needs of the family. KMC may be provided by the mother and father. When the parents are unable to be with the infant, a limited number of substitutes (family members or members of their social network) designated by the family should be trained in providing KMC. Appropriate postpartum care in close proximity to the infant should be offered the mother by supportive postpartum personnel. The mother should have easy access to a breast pump and associated equipment. To practice C-KMC in hospital, the mother/substitute needs free access to the baby (24 h/day, 7 days/week), a comfortable chair and/or bed and support to secure the infant in the KP. The mother should be educated how to sleep with the infant in the KP. All mothers and families/substitutes should be supported in the provision and maintenance of KMC throughout hospitalization and after discharge. Parents should be regarded as their infants' primary caregivers and be involved in the formulation and evaluation of the infant's care plan. The formation of parent-to-parent support groups should be encouraged for support of KMC practice by parents acting as role models.

#### *Kangaroo position*

The infant is placed in skin-to-skin contact in the frontal position, vertical or semi-reclined, on the mother's chest with flexed arms and flexed legs in froglike position and the head turned sideways and upright (not flexed or extended), secured so he/she cannot fall down or out of the KP. It is essential to secure the patency of the airway to prevent obstructive apnoea by adequate positioning. The infant may wear a hat and a diaper or local surrogate to avoid hypothermia in the infant and discomfort for the mother. The mother needs assistance in maintaining the position for 24 h a day. The use of a simple device, such as an elastic cloth band placed around the mother's chest, or a binder or tube top (local available and culturally accepted attire) helps maintain the infant properly positioned. Thermal insulation is achieved by placing the infant under the mother's clothes and/or by placing a blanket on the infant's back and head. The KP is also needed in a hot and humid climate.

#### *Breastfeeding (national HIV guidelines should be followed)*

All preterm and LBW infants should be positioned at the breast as early as possible to simulate lactation even if latching on and sucking do not occur. If an infant is unable to breastfeed, expression of colostrum should begin as soon as possible and used to feed the infant (by clean teaspoon, cup, syringe or via tube feeding). Pre-lacteal feeds should be avoided. Initially, breastfeeding the LBW infant should not occur on demand; scheduled and/or semi-demand feeding is required in all preterm and ill infants and should be promoted until the infant sucks well and adequate growth is confirmed. In the case of inadequate growth, increased milk production should be supported, and hind milk and safe donor milk can be used (whenever available). Supplementation is given with expressed breast

milk. Preterm formula should only be used when no breast milk is available.

#### *Neonatal unit environment*

Ideally, families should have access to a family room where they can sleep and eat in close proximity to the infant or with the infant in the KP, and where the mother/parents can stay together with the infant when this is appropriate. Emergency equipment and family bathrooms should be available. Directly from birth, the physical environment around the infant should have enough space and be as developmentally supportive and calming for the infant as possible, with as low level of sound as possible. The infant's eyes should be protected from direct light at all times.

#### *Early discharge, home care and follow-up*

A home care programme should include clear criteria for inclusion, discharge, support to the family and follow-up. Criteria for infant discharge include infant stability, ability to maintain body temperature in the KP, capacity for some oral intake and weight gain. An assessment of appropriateness of home KMC must consider the family's social situation and home environment and education of the mother and the family/other KMC providers. Education should cover maintenance of the KP for warmth and patency of airways, breastfeeding and infant nutrition and oral feeding methods when the mother does not breastfeed or breastfeeds partly. It should also include knowledge about 'alarm signs', manifestations of infant illness and nonsmoking while providing KMC. The mother's and family's proficiency in providing KMC and evidence of commitment and compliance with KMC and the follow-up programme, and safe transportation back and forth to hospital must be ensured. The infant needs close follow-up until at least 40 weeks postmenstrual age. The follow-up programme should include long-term follow-up for detection of sequelae due to LBW and/or preterm birth.

#### *Psychosocial concerns*

Sufficient evidence exists to support the capacity of the KMC method for ensuring mothers of preterm/LBW infants, and ill newborn infants feel less stress, have increased confidence and self-esteem and a higher sense of fulfilment in the parental role. Mothers feel empowered in that they can do something for their infants through confidence in handling and feeding their infants; fathers feel more relaxed and contented and are comfortable while providing KMC. However, a school age or teenage mother may need special assistance with KMC. KMC can cause harm if a mother has a skin or other contagious infection that may affect the infant, or if the mother is forced to practice KMC against her own will. KMC may be inappropriate or needs to be individualized when the mother has a physical impairment that restricts her from carrying the infant safely, when the mother is depressed or has a mental illness or is drug dependent. Substance abuse use and criminality in the family must need to be considered.

## CONCLUSIONS

There is sufficient evidence to make the following general statements about KMC:

- The kangaroo position provides a neutral thermal environment that provides immature infants with optimal thermal regulation, which is the same or better than provided by an incubator.
- KMC enhances bonding and attachment; universal human needs that apply to all preterm and LBW infants, their parents and families.
- Avoiding unwarranted mother–infant separation and initiating the kangaroo position as early as possible helps repair a bonding process that is disrupted by delivering a preterm or ill infant.
- KMC helps reduce maternal postpartum depression symptoms and increases parental sensitivity to infant cues.
- Initiation of KMC as soon as possible is essential for the establishment of breastfeeding and for increasing the duration of exclusive and any breastfeeding.
- KMC has positive effects on infant/parent psychological development and the development of mutual communication, understanding and social recognition, reduces parenting stress and contributes to an optimal family home environment.

Therefore, the following guiding principles should pervade all components in KMC protocols:

- All intrapartum and postnatal care should adhere to a paradigm of nonseparation of infants and their mothers/families.
- Preterm/LBW infants should be regarded as extero-gestational foetuses needing skin-to-skin contact to promote maturation.
- KMC should begin as soon as possible after birth and continue as often and for as long as appropriate (depending on circumstances).

If KMC has to be widely applied to contribute to neonatal survival (32) and if this is extended universally so that it also contributes to the wellbeing of preterm and LBW infants and their families worldwide, practical guidelines for implementation are needed. The focus of the present WHO practical guide (29), as clarified by Zupan and von Xylander (WHO Geneva) during the Seventh International Workshop, is to primarily address the situation in low-income settings. In this context, KMC is initiated at the second level of care, where resources for management of maternal and foetal complications are usually available. KMC follow-up and support of home care after early discharge are at primary health care level, where emergency pre-referral care can be given. Unfortunately, the initiation of KMC in these settings is slow and coverage is partial. High rates of LBW infants, with a world average of about 15%, differences in proportions of births attended by skilled health workers and low use of skilled birth attendants in areas where most deaths

occur constitute serious barriers to successful implementation. A practical guide covering mainly clinical care and hospital organization is insufficient if higher coverage is a priority. Companion tools on education and planning, such as those developed and used in South Africa (33,34), are needed and WHO should lead and coordinate this effort.

The current WHO practical guide is no longer sufficient for clinical purposes; it needs a revising and updating. This requires extensive grading of evidence and specification of populations and relevant interventions, with short-term and long-term outcome measures included in evaluations. It also needs an extension for application in settings with high levels of resources and technology. A proposal for such an extension has been prepared by the expert group participating in the Seventh International Workshop and First European Conference on KMC. This proposal represents an excellent starting point that WHO could use to develop in its revised guidelines. The participants of the Workshop and Conference, and the authors of this study, would strongly support WHO in the endeavour for enhanced practice of KMC worldwide.

## ACKNOWLEDGEMENTS

The authors would like to express their gratitude to the Acta Paediatrica Foundation for supporting the attendance of experts from low-income settings at the Seventh International Workshop on Kangaroo Mother Care, which enabled them to participate in the preparation and compilation of this document.

## References

1. Martinez HG, Rey ES, Marshall D. The Mother Kangaroo Programme. *Int Child Health* 1992; 3: 55–67.
2. Christensson K, Siles C, Moreno L, Belaustequi A, De La Fuente P, Lagercrantz H, et al. Temperature, metabolic adaptation and crying in healthy fullterm newborns care for skin-to-skin compared to in a cot. *Acta Paediatr* 1992; 8: 488–93.
3. Boggs K, Walters M, Morrison B, Ludington-Hoe S. Kangaroo care at birth for full term infants. *MCN Am J Matern Child Nurs* 2006; 32: 375–81.
4. Chwo MJ, Anderson GC, Dowling DA, Shiau S-H, Chu DM. A randomized controlled trial of early kangaroo care for preterm infants: effects on temperature, weight, behavior and acuity. *J Nurs Res* 2002; 10: 129–42.
5. Cattaneo A, Davanzo R, Uxa F, Tamburlini G. Recommendations for the implementation of Kangaroo Mother Care for low birthweight infants. International Network on Kangaroo Mother Care. *Acta Paediatr* 1998; 87: 440–5.
6. Konner M, Worthman C. Nursing frequency, gonadal function, and birth spacing among !Kung hunter-gatherers. *Science* 1980; 207: 788–91.
7. Ransjo-Arvidson AB, Matthiesen AS, Lilja G, Nissen E, Widstrom AM, Uvnas-Moberg K. Maternal analgesia during labor disturbs newborn behavior: effects on breastfeeding, temperature, and crying. *Birth* 2001; 28: 5–12.
8. Bystrova K, Ivanova V, Edhborg M, Matthiesen AS, Ransjo-Arvidson AB, Mukhamedrakhimov R, et al. Early contact versus separation: effects on mother-infant interaction one year later. *Birth* 2009; 36: 97–109.

9. Uvnas-Moberg K, Petersson M. [Oxytocin, a mediator of anti-stress, well-being, social interaction, growth and healing]. *Z Psychosom Med Psychother* 2005; 51: 57–80.
10. Bystrova K, Matthiesen AS, Vorontsov I, Widstrom AM, Ransjo-Arvidson AB, Uvnas-Moberg K. Maternal axillar and breast temperature after giving birth: effects of delivery ward practices and relation to infant temperature. *Birth* 2007; 34: 291–300.
11. Jonas W, Nissen E, Ransjo-Arvidson AB, Matthiesen AS, Uvnas-Moberg K. Influence of oxytocin or epidural analgesia on personality profile in breastfeeding women: a comparative study. *Arch Womens Ment Health* 2008; 11: 335–45.
12. Ludington-Hoe SM, Johnson MW, Morgan K, Lewis T, Gutman J, Wilson PD, et al. Neurophysiologic assessment of neonatal sleep organization: preliminary results of a randomized, controlled trial of skin contact with preterm infants. *Pediatrics* 2006; 117: e909–23.
13. Ludington-Hoe S, Morgan K, Abouelfetoh A. A clinical guideline for implementation of kangaroo care with premature infants of 50 or more weeks' postmenstrual age. *Adv Neonatal Care* 2008; 8: 3–23.
14. Scher MS, Ludington-Hoe S, Kaffashi F, Johnson MW, Hol-ditch-Davis D, Loparo KA. Neurophysiologic assessment of brain maturation after an 8-week trial of skin-to-skin contact on preterm infants. *Clin Neurophysiol* 2009; 120: 1812–8.
15. Ohrlander K. [In the interest of children and the nation: social liberal reform politics 1903–1930]. Stockholm: Almqvist & Wiksell International, 1992.
16. Bergman NJ, Jurisoo LA. The 'kangaroo-method' for treating low birth weight babies in a developing country. *Trop Doct* 1994; 24: 57–60.
17. Bergman NJ, Linley LL, Fawcus SR. Randomized controlled trial of skin-to-skin contact from birth versus conventional incubator for physiological stabilization in 1200- to 2199-gram newborns. *Acta Paediatr* 2004; 93: 779–85.
18. Ludington-Hoe SM, Anderson GC, Simpson S, Hollingsead A, Argote LA, Medellin G, et al. Skin-to-skin contact beginning in the delivery room for Colombian mothers and their preterm infants. *J Hum Lact* 1993; 9: 241–2.
19. Ludington-Hoe SM, Anderson GC, Simpson S, Hollingsead A, Argote LA, Rey H. Birth-related fatigue in 34–36-week preterm neonates: rapid recovery with very early kangaroo (skin-to-skin) care. *J Obstet Gynecol Neonatal Nurs* 1999; 28: 94–103.
20. Neu M, Laudenslager ML, Robinson J. Coregulation in salivary cortisol during maternal holding of premature infants. *Biol Res Nurs* 2009; 10: 226–40.
21. Mokhachane M, Saloojee H, Cooper PA. Earlier discharge of very low birthweight infants from an under-resourced African hospital: a randomised trial. *Ann Trop Paediatr* 2006; 26: 43–51.
22. Johnston CC, Stevens B, Pinelli J, Gibbins S, Filion F, Jack A, et al. Kangaroo care is effective in diminishing pain response in preterm neonates. *Arch Pediatr Adolesc Med* 2003; 157: 1084–8.
23. Johnston CC, Filion F, Campbell-Yeo M, Goulet C, Bell L, McNaughton K, et al. Kangaroo mother care diminishes pain from heel lance in very preterm neonates: a crossover trial. *BMC Pediatr* 2008; 8: 13.
24. Johnston CC, Filion F, Campbell-Yeo M, Goulet C, Bell L, McNaughton K, et al. Enhanced kangaroo mother care for heel lance in preterm neonates: a crossover trial. *J Perinatol* 2009; 29: 51–6.
25. Nyqvist KH. Early attainment of breastfeeding competence in very preterm infants. *Acta Paediatr* 2008; 97: 776–81.
26. Tallandini MA, Scalembra C. Kangaroo Mother Care and mother-premature infant dyadic interaction. *Infant Ment Health J* 2006; 27: 251–75.
27. Erlandsson K, Christensson K, Fagerberg I. Fathers' lived experiences of getting to know their baby while acting as primary caregivers immediately following birth. *J Perinat Educ* 2008; 17: 28–36.
28. Tessier R, Charpak N, Giron M, Cristo M, de Calume ZF, Ruiz-Pelaez JG. Kangaroo Mother Care, home environment and father involvement in the first year of life: a randomized controlled study. *Acta Paediatr* 2009; 98: 1444–50.
29. World Health Organization (WHO). Kangaroo mother care: a practical guide. Geneva: WHO, 2003.
30. Fundación Canguro and Department of Clinical Epidemiology and Biostatistics. Evidence-based clinical practice guidelines for an optimal use of the Kangaroo Mother method in preterm and/or low birthweight infants. Bogota: Pontificia Universidad Javeriana, 2007.
31. Charpak N, Ruiz-Pelaez JG. Resistance to implementing Kangaroo Mother Care in developing countries, and proposed solutions. *Acta Paediatr* 2006; 95: 529–34.
32. Darmstadt GL, Bhutta ZA, Cousens S, Adam T, Walker N, de Bernis L. Evidence-based, cost-effective interventions: how many newborn babies can we save? *Lancet* 2005; 365: 977–88.
33. Pattinson RC, Arsalo I, Bergh AM, Malan AF, Patrick M, Phillips N. Implementation of kangaroo mother care: a randomized trial of two outreach strategies. *Acta Paediatr* 2005; 94: 924–7.
34. Bergh AM, van Rooyen E, Pattinson RC. Scaling up kangaroo mother care in South Africa: 'on-site' versus 'off-site' educational facilitation. *Hum Resour Health* 2008; 6: 13.