Future challenges?

The potential role for positive deviance is vast. For example, which rural Kenyan families optimally use insecticide impregnated bednets, and how can they motivate their neighbours? How can South African policy makers integrate the behaviours and thinking of teenagers who practise "safe sex"? What can we learn from a poor, uninsured *Latina* mother who succeeds in properly managing her child's diabetes or asthma? What about other intractable, deadly impasses of our time—the Kashmir crisis, Israeli-Palestinian mayhem, or insurgency in Iraq? We believe that positive deviance is a valuable tool that should be part of international health policy makers' toolbox for the 21st century.

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Kangaroo Mother Care, an example to follow from developing countries

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Caring for low birthweight infants imposes a heavy burden on poor countries. An effective healthcare technique developed in 1978 may offer a solution to this problem and additionally be of use in wealthy countries too

Introduction

Each year about 20 million infants of low birth weight are born worldwide, which imposes a heavy burden on healthcare and social systems in developing countries.[1 w1] Medical care of low birthweight infants is complex, demands an expensive infrastructure and highly skilled staff, and is often a very disruptive experience for families.[2 w2 w3 w4] Premature babies in poorly resourced settings often end up in understaffed and ill equipped neonatal care units, that may be turned into potentially deadly traps by a range of factors colluding—for example, malfunctioning incubators, broken monitors, overcrowding, nosocomial infections, etc.

In 1978 Edgar Rey, a Colombian paediatrician concerned with the problems arising from a shortage of incubators and the impact of separating women from newborns in neonatal care units, developed Kangaroo Mother Care (KMC),[3] a healthcare technique for low birthweight infants that is at least as effective as traditional care in a neonatal care unit.[4 5]

What does KMC entail?

In KMC, babies weighing 2000 g or less at birth and unable to regulate their body temperature remain with their mothers as incubators, main source of stimulation, and feeding. Newborns are attached to mothers

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Additional references w1-w20 are on bmj.com

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and other carers' chests in skin to skin contact, wearing only a nappy and a baby bonnet, and are kept upright 24 hours a day. Mothers can share the role of provider of the kangaroo position with others, especially the babies' fathers, without disrupting breastfeeding routines. The carer should sleep in a semi-sitting position. The KMC begins as soon as the baby no longer requires other support from the neonatal care unit, although intermittent skin to skin contact has been used in ventilated infants[6 w5 w6] Exclusive breast feeding (plus vitamins) is attempted, and growth is closely monitored. Breast milk is fortified or formula milks are added if infants are not thriving.[7] Infants will reject permanent contact once they achieve regulation of their body temperature, at a median age of 37 weeks after conception.[4 8]

KMC usually starts in hospital with an adaptation process. During adaptation and after discharge, carers attend a day clinic where they are trained, infants are monitored, and the carer enmeshes in a social peer network. Care is thereafter provided at home with follow up visits as needed. KMC can be implemented in various facilities at different levels of care.[w8] It may be the best option if neonatal care units are unavailable.[9 w7 w8] If a neonatal care unit is available but overwhelmed by demand, KMC allows rationalisation of resources by freeing up incubators for sicker infants.[8 10 w8] Even in well resourced neonatal care units, it still enhances bonding between mother and infant and breast feeding.[8 11]

Does it work?

Evidence backs the effectiveness and safety of KMC in stable, preterm infants. In low birthweight infants weighing 2000 g or less, who are unable to regulate their temperature, KMC is at least as safe and effective as traditional care with incubators.[12] An open randomised controlled trial in Bogotá, Colombia, assessed the long term clinical effects of KMC by randomising 746 low birthweight infants.[4 5] Follow up at the 12 months of age corrected for gestational age (93% children) found that KMC had improved successful breastfeeding rates and infections were milder in these children. Hospital stay was reduced in "Kangaroo" newborns weighing 1500 g or less. A non-significant reduction in mortality (3.1% *v* 5.5%; relative risk 0.57, 95% confidence interval 0.17 to 1.18) and slight improvements in developmental indices were found with KMC. The investigators found no significant differences in physical growth patterns or in the rates of cerebral palsy, failure to thrive, visual problems, deafness, or hip dysplasia.[5] Blind assessments of bonding between mother and infant by using videos in a subsample of 488 mother-infant dyads found that bonding improved markedly with KMC,[13] as did neurodevelopmental evaluations in infants at higher risk.[14]

Fig 1 Prononged skin to skin contact in the "kangaroo" position promotes bonding

Fig 2 KMC providers (mothers "kangarooing" their infants) are enmeshed in a social peer network

In developing countries, other studies of varying methodological soundness have found similar results with regard to infections.[w9 w10] Studies in wealthy countries have not found significant improvement in morbidity, but standard care has still failed to outperform KMC. Current evidence indicates that KMC is at least as good as standard care.[1 12]

KMC may not suit everyone and every circumstance. People travelling long hours to attend the KMC clinic while caring for other children may rather rely on care in hospital; harsh or risky environments (such as extreme climates, floods, landmines, or conflict areas) or dangerous traffic conditions may make it safer to remain in hospital. Nevertheless, during the one year follow up in the Bogotá study, no transport incidents between home and the KMC clinic were reported.

To overcome transport problems, KMC has been delivered in "Kangaroo wards," where mothers and infants stay for days or weeks until they can be safely discharged home once frequent monitoring is unnecessary. This is the standard way of delivering KMC in several large facilities in both developing countries (for example, Jose Fabella Hospital, Manila) and developed countries (for example, Helsingborg Hospital, Sweden).

KMC may be unsuitable for carers with important mental, cognitive, or behavioural problems. Some

parents may feel intimidated or overwhelmed by caring for a premature baby, but most parents cope well with the demands of KMC.[4 13 15 w11] Most caregivers prefer skin to skin contact over conventional care and find themselves empowered by KMC. Parental sense of fulfilment and confidence are improved, and these improvements are consistently found in affluent settings as well as impoverished settings.[1 5 12–13 w11 w12]

Where has KMC been implemented and where else can it be implemented?

The Bogotá experience has been replicated in other places. KMC has now been embraced by Colombia's Ministry of Health, and with variable uptake in other countries including Vietnam, Brazil, and South Africa. The Fundación Canguro trained a "second generation" of KMC centres that now deliver KMC in large healthcare centres in 25 developing countries: in Asia (including Ukraine, India and South East Asian countries), Africa (fig 1), and Latin America.[w13] Different modalities of KMC (mainly kangaroo position and nutrition) are currently used in many industrialised countries such as France, Sweden, the United Kingdom, and the United States. A survey among 1133 hospitals providing neonatal intensive care in the United States found that among the 669 (59%) hospitals that responded, 548 (82%) used KMC.[w14] The World Health Organization backed its uptake: "Almost two decades of implementation and research have made it clear that KMC is more than an alternative to incubator care. It has been shown to be effective for thermal control, breastfeeding and bonding in all newborn infants, irrespective of setting, weight, gestational age, and clinical conditions."[1]

Guidance on KMC implementation is available, including WHO guidelines that can be downloaded free of charge.[1] Other free information sources are also available.[w13 w15 w16]

Current evidence shows that KMC should be encouraged in affluent settings; inertia and unfounded wariness are perhaps the biggest hurdles to overcome to achieve this. Despite being developed in a resource stricken setting, parents and healthcare providers alike have often expressed that they are happier with KMC than with standard care, even in the well resourced settings.[w8 w17-w19]

Conclusion

KMC delivers ideal conditions for stable, low birthweight infants to thrive, strengthens parental participation and empowerment, and contributes to the healing process.[5 13 w9 w20] Despite relying on simple interventions, KMC is a scientifically sound, effective, and efficient alternative to neonatal care units in many settings (fig 2).[12] It delivers high quality care at a fraction of the cost of usual care,[9 w7 w8] and improves satisfaction for consumers and providers alike. KMC should be implemented as early as possible; it prepares the family and the environment for a successful discharge from hospital, allowing parents to remain the main direct providers for the physical and emotional needs of low birthweight infants in affluent as well as impoverished environments. In impoverished environments, the evidence shows that KMC may also reduce morbidity and hospital stay. One of the main barriers for rolling out KMC may be unfounded cautiousness, particularly among clinicians and policy makers.

Summary points

Low birthweight infants are particularly vulnerable to the increased morbidity and mortality in overcrowded neonatal units

Kangaroo Mother Care (KMC), a technique developed in Colombia to deal with overcrowding of neonatal units, delivers ideal conditions for low birthweight infants to thrive

The technique is welcomed by most parents and centres where it has been made available

KMC is safe, works at a fraction of the cost of an incubator, reduces morbidity (in impoverished settings), improves breastfeeding rates, improves bonding between mother and infant, and increases satisfaction in parents and care providers

KMC has not been outperformed by standard care in any evaluation and is deemed a sound, evidence based alternative to treat premature babies in most settings

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