BMJ Open

Neonatal intensive care nurses' knowledge and beliefs regarding kangaroo care in China: a national survey

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To cite: Zhang Y, Deng Q, Zhu B, *et al*. Neonatal intensive care nurses' knowledge and beliefs regarding kangaroo care in China: a national survey. *BMJ Open* 2018;**8**:e021740. doi:10.1136/bmjopen-2018-021740

► Prepublication history for this paper is available online. To view these files, please visit the journal online (http://dx.doi.org/10.1136/bmjopen-2017-021740).

Received 17 January 2018
Revised 18 June 2018
Accepted 1 August 2018

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ABSTRACT

Objective Kangaroo care (KC), a well-established parent-based intervention in neonatal intensive care units (NICUs), with documented benefits for infants and their parents. However, in China there remains a lack of knowledge and a reluctance to implement KC in hospitals. Therefore, our aim was to investigate the current knowledge, beliefs and practices regarding KC among NICU nurses in China using the 'Kangaroo Care Questionnaire'.

Methods A quantitative descriptive survey was designed. This questionnaire comprised 90 items classified according to four domains: knowledge, practice, barriers and perception. Data were analysed using SPSS V.20.0, and content analysis was used to summarise data derived from open-ended questions.

Results The survey involved 861 neonatal nurses from maternity and general hospitals across China (response rate=95.7%). The findings showed that 47.7% (n=411) of the nurses had participated in the implementation of KC. Neonatal nurses in the 'experienced in KC' group showed an overall better understanding of KC and its benefits with a higher 'correct response' rate than those in the 'not experienced in KC' group. In the 'experienced in KC' group, over 90% considered KC beneficial to the parent-baby relationship and attachment, and over 80% believed that KC positively affected outcomes of preterm infants. The 'not experienced in KC' group perceived more barriers to KC implementation than did the 'experienced in KC' group.

Conclusion Although most nurses working in NICUs in China were aware of the benefits of KC, there remain substantial barriers to its routine use in practice. Education for both staff and parents is necessary, as is the provision of appropriate facilities and policies to support parents in providing this evidence-based intervention.

Strengths and limitations of this study

- This study was the first national survey in China to investigate current knowledge, practice, barriers and perceptions of nurses in neonatal intensive care units (NICUs) regarding kangaroo care (KC).
- This study provides insight into potential barriers to implementation of KC in NICUs in China.
- The participants included only neonatal nurses; other healthcare professionals were not included.
- This study did not obtain information on parents' perceptions of KC, which may be a key influential factor.

INTRODUCTION

Kangaroo Care (KC), which is often also called kangaroo mother care (KMC) or skin-to-skin contact (SSC), is a method of neonatal care practised on babies. This is typically performed with preterm infants, where the diaper-clad infant is held skin-to-skin with a parent, usually the mother. In contrast, KMC requires a very strict protocol. KMC is an established, powerful and easy-to-use method for promoting the health and well-being of preterm and full-term infants.[1] The key features of KMC are as follows: early, continuous and prolonged SSC between mother and baby; exclusive breast feeding (ideally); initiated in hospitals but can be continued at home; small babies discharged early; adequate support and follow-up for home-based mothers and a gentle and effective method, in that it reduces agitation, which is common in busy wards housing preterm infants.[2] Another modified version of KC—intermittent SSC—is the practice of holding an infant upright on a parent's chest in a manner that provides maximum bare-skin ventral contact, thereby giving the newborn the opportunity to adjust to the environment outside the womb.[3] Ideally, SSC is performed immediately after birth and as often as parents can do it during the first few days of the infant's life. Therefore, compared with KMC and SSC, the definition of KC is broader, and it is more widely used in clinical practice.

In Western and some non-Western countries, KC is a widespread, standardised, protocol-based care system for premature

infants.[4] KC is widely known as a beneficial intervention to significantly improve the development of premature infants.[5 6] Over 82% of neonatal nurses practised KC in their neonatal intensive care units (NICUs) in the USA.[7] More than 50% of all hospitals in South Africa also practice KC in some form or another.[8] KC is widespread in NICUs in several European countries (eg, Belgium, Denmark, France, Italy, the Netherlands, Spain, Sweden and the UK), which have reported encouraging results regarding parental participation (such as KC) in caring for babies.[9] However, KC is less used in China.

WHO reports an average preterm birth rate of 7.1% in China, which makes the country second to India in the highest number of preterm births (ie, >250 000 in 2010).[10] In 2016, Gregson *et al*[11] reported that KC is not well known in China; however, with assistance from an international charity, UK midwives have helped promote KC in China. However, overall, KC remains uncommon in China, and there is very little about this practice in Chinese peer-reviewed journals, even though KC is recognised globally as an evidence-based solution for reducing mortality and improving health outcomes for babies in both high-income and low-income countries. In addition, there is no formal, standard KC training/education or relevant guidelines across China (only a few informal training programmes are provided).

Several studies have recognised the importance of neonatal care (including KC) delivered by parents.[12 13] Although KC has been applied for around 25 years in several countries,[13] it is still relatively new in Chinese NICUs. A retrospective cohort study[14] reported that the top three barriers to its implementation are issues related to physical facilities in NICUs, negative impressions about the practice among staff and fear of injuring infants during KC. In China, the most frequently cited barrier to KC is the National Health Policy, which stipulates as an infection-control mechanism that parents are not allowed to enter NICU wards during their infants' entire stay a policy, which inhibits parent-infant interactions and affects infant outcomes. Denying parents access to infants in NICUs is a standard practice in majority of Chinese hospitals. Visitation is not permitted or is strictly limited; therefore, NICU care for most neonates is provided by healthcare professionals, with sharply limited parental participation.[15] Nonetheless, although hospital policies generally do not support KC, a few high-level maternity hospitals (the hospitals have over 500 beds which are believed to have doctors with the best medical skills and provide high-quality medical care by employing outstanding medical techniques) have started to implement KC in their NICUs for pilot study.

Education of nursing staff regarding KC has been shown to be critical for its successful implementation.[16] However, there is scant knowledge about the practice of KC in China.[11] Consequently, we investigated nurses' knowledge and beliefs regarding KC practice in NICUs in China.

METHODS

Study design and participants

This study was conducted to investigate neonatal nurses' knowledge and beliefs on KC practice in NICUs across China, using an adapted and translated version of the 'Kangaroo Care Questionnaire' (KCQ), which was designed by Engler and Ludington.[16]

Instruments

As noted, the instrument was adapted from the English version of the KCQ initially developed by Engler and Ludington[17]; then, the original version was translated into Chinese and back-translated into English to check for any difference between the two versions. A pilot study was undertaken with a convenience sample (n=68) in three public women's hospitals in Zhejiang province to determine the relevance of the items to the Chinese clinical context and to ascertain time taken to complete the survey. According to the pilot study results, we used a revised Chinese version of the KCQ (ie, a 90-item questionnaire; 79 quantitative items and 11 qualitative items). As all Chinese nurses work full time, nine questions regarding working patterns were deleted. The questionnaire included four subscales: knowledge (17 items), practice (18 items), barriers (20 items) and perceptions (24 items). Some quantitative items were answered on a five-point rating scale and others with true/false responses.

Basic demographic data were collected anonymously, including gender level of nursing education, and level of neonatal intensive care provided where the respondent worked. Engler *et al*[16] ensured the questionnaire's reliability by calculating a Cronbach's alpha reliability coefficient for each scale, as did we.

The reliability and validity of the Mainland Chinese version of the KCQ were acceptable: Cronbach's alphas for the entire scale, 0.891; perceptions, 0.753; knowledge, 0.827; barriers, 0.938 and practice, 0.919.

Research setting and participants

The email list of the Chinese Association of Maternal and Child Healthcare was used to send the online survey to the director of nursing in each hospital; directors were asked to send it on to neonatal nurses working in their NICUs. These nurses had not received formal education on KC before.

The questionnaire was sent to 73 hospitals in 32 provinces across China in February 2017 and April 2017. The questionnaire was completed online via SoJump online survey software. Completed questionnaires were collected and stored in a secure online database.

Statistical analyses

Quantitative analysis of survey responses was undertaken using SPSS V.20.0. Categorical variables were presented as number of participants (percentage). Data were analysed with X^2 tests for multinomial variables and Fisher's exact tests (two-tailed). P values <0.05 (two-sided) were

regarded as significant. Content analysis was employed for open-ended questions.

Patient and public involvement

Previous published literature has identified that greater family involvement in the delivery of care to their infant in the NICU reduces the stress and distress of the parent, promotes bonding, improves breast feeding and reduces length of admission. Despite WHO's recommendations for instituting KC early during the NICU stay, many hospitals still fail to implement this practice. This survey was undertaken with NICU nurses by using a revised version of the KCQ in China to gain an understanding of their knowledge of KC and their perspectives on the barriers to implementation. The focus of this study was on NICU nurses using a previously validated survey instrument. Families of NICU babies and their babies were not involved in this study. The results will be disseminated to the NICUs that participated. The next phase of this study will be to explore parents' views of KC.

RESULTS

Participants' demographic characteristics

Nine-hundred surveys (with an invitation to participate and a link to the survey) were sent to nurse unit managers of NICUs in hospitals in 32 provinces in China. Eight hundred sixty-one were returned fully answered (response rate=95.7%) and 411 had experienced delivery of KC. We defined the standard for 'experienced in KC' as implementation of at least 20 cases of KC in the last 12 months, which is widely recognised as a standard for experience with clinical procedures by the Chinese Association of Maternal and Child Healthcare (the only authorised maternal and child healthcare organisation in China).

The findings showed that 45% (n=391) of respondents worked in dedicated maternity hospitals, whereas 54.6% (n=470) worked in maternity units of general hospitals. In addition, 60% (n=518) of respondents had earned a university degree in nursing. Key demographics are shown in table 1, the majority of nurses were females in the age range 26–40, who worked in level II nurseries (ie, provided high-dependence care). Moreover, a majority of respondents were from Northern and Eastern China; 16.1% (n=139) from Northern China and 23.5% (n=202) from Eastern China.

Table 1 Participants' descriptive characteristics

Descriptive characteristics	Experienced in KC (n=411), n (%)	Not experienced in KC (n=450), n (%)
Gender		
Male	4 (1.0)	1 (0.2)
Female	407 (99.0)	449 (99.8)
Age (years)		
18–25	91 (22.1)	81 (18.0)
26–30	149 (36.3)	158 (35.1)
31–40	124 (30.2)	151 (33.6)
41–50	39 (9.4)	46 (10.2)
51–60	8 (2.0)	14 (3.1)
Highest education level		
Associate's degree	147 (35.8)	169 (37.6)
Bachelor's degree	251 (61.1)	256 (56.9)
Master's degree	5 (1.2)	6 (1.3)
Other*	8 (1.9)	19 (4.2)
Hospital type		
General hospital	169 (41.1)	301 (66.9)
Maternity hospital	242 (58.9)	149 (33.1)
NICU level		
III	136 (33.1)	60 (13.3)
II	155 (37.7)	276 (61.3)
I	120 (29.2)	114 (25.3)
Geography		
Northeastern China	68 (16.6)	60 (13.3)
Eastern China	80 (19.5)	122 (27.1)
Northern China	100 (24.3)	39 (8.7)
Central China	33 (8.0)	36 (8.0)
Southern China	42 (10.2)	80 (17.8)
Southwestern China	16 (3.9)	46 (10.2)
Northwestern China	72 (17.5)	67 (14.9)

*Other: includes doctoral degree (n=2) and postgraduate certificate (n=25).
KC, kangaroo care; NICU, neonatal intensive care unit.

Nurses' knowledge of kangaroo care

The first question in the survey asked respondents to indicate if they had experienced implementation of KC. Overall, 411 (47.7%) respondents affirmed they had implemented KC ≥20 times in the past 12 months (ie, 'experienced in KC' group). The findings showed that 58.9% (n=242) of those 'experienced in KC' nurses worked in dedicated maternity hospitals (and the others in general hospitals). In contrast, 66.9% (n=301) of those 'not experienced in KC' nurses worked in maternity units in general hospitals (and the others in dedicated maternity hospitals). The ratio of general hospital versus maternity hospital nurses was very similar across groups in our study. Although detailed information on informal education was not collected, we expect that nurses working in the maternity hospitals might have more opportunity to attend (informal, in the Chinese context) lectures or training in KC, perhaps explaining these responses.

Regarding the knowledge domain of KC, the 'experienced in KC' group showed better understanding of KC and its benefits, and obtained higher rates of correct responses on seven items (no. 1, 2, 3, 6, 7, 10 and 16) compared with those neonatal nurses who reported they had never practised KC in their NICU (the 'not

Table 2 Knowledge of kangaroo care*

Items	Correct response in 'experienced in KC' group (n=411), n (%)	Correct response in 'not experienced in KC' group (n=450), n (%)	P values
Babies appear to be contented in KC	378 (91.7)	322 (71.6)	<0.001
Babies on oxygen therapy experience a decrease in oxygen saturation	153 (37.2)	99 (22.0)	<0.001
Babies on phototherapy can participate in KC	248 (60.3)	88 (19.6)	<0.001
Babies on vasopressors should NOT engage in KC	126 (30.7)	174 (38.7)	0.174
Babies typically experience more bradycardic episodes during KC	46 (11.2)	41 (9.1)	0.154
Babies with peripheral intravenous can participate in KC	338 (82.2)	318 (70.7)	0.516
KC has been shown to improve breathing patterns in preterm babies by reducing apnoea	308 (74.9)	257 (57.1)	0.062
KC is contraindicated in babies <28 weeks gestation	100 (24.3)	132 (29.3)	0.714
KC is contraindicated in babies weighing <1000 g	116 (28.2)	158 (35.1)	0.097
KC is now considered safe as an alternative approach to care for medically stable, continuing care preterm babies	351 (85.4)	338 (75.1)	0.971
Most babies experience a decrease in temperature during KC	45 (10.9)	63 (14.0)	0.166
Published reports of clinical observations indicate that the rate of accidental extubation is higher with KC than with traditional methods of holding	170 (41.3)	222 (49.3)	0.176
Research has indicated that babies who receive KC increase their mother's milk supply	351 (85.4)	371 (82.4)	0.072
Research indicates that KC promotes quiet sleep	389 (94.6)	406 (90.2)	0.559
Research shows that babies with arterial lines should NOT engage in KC	160 (38.9)	162 (36.0)	0.553
The most physiologically stressful part of KC for the baby is the transfer to the parent's chest	181 (44.0)	157 (34.9)	0.003
There is an increased risk of infection in the baby with KC	148 (36.0)	189 (42.0)	0.627

*Based on the original literature review from the Kangaroo Care Questionnaire (Engler *et al*, 1999)[17]; p<0.05 was considered significant.
KC, kangaroo care.

experienced in KC' group) (table 2). The majority of the nurses in the 'experienced in KC' group correctly answered that KC promoted quiet sleep (94.6%), increased mother's milk supply (85.4%) and improved breathing patterns (74.9%), whereas only 57% in the 'not experienced in KC' group correctly identified reduction in apnoea. In addition, 70% of respondents in the 'not experienced in KC' group (vs 82% in the 'experienced in KC' group) provided correct responses to the item concerning participation by babies with peripheral intravenous cathethers.

Practice of kangaroo care

The respondents in the 'experienced in KC' group reported prominent levels of comfort facilitating KC for babies with specific conditions or receiving certain treatment interventions, as described in the practice domain of the questionnaire. Differences were observed between the groups for items related to intravenous catheters, nasal continuous positive airway pressure and percutaneous central lines: more respondents in the 'experienced in KC' group than in the 'not experienced in KC' group felt 'very/somewhat comfortable' with these interventions (table 3).

Barriers to implementing kangaroo care

The barriers domain of the questionnaire included items related to work environment (including workload and physical environment) and family engagement in KC. Table 4 lists the barriers identified by respondents as 'somewhat/very influential' on implementation of KC. A high number of respondents in the 'not experienced in KC' group identified fear of accidental extubation, inability to provide adequate family time during KC, KC adding burden to workload and KC interfering with care delivery as factors affecting implementation.

More neonatal nurses in the 'not experienced in KC' group than in the 'experienced in KC' group also cited the following barriers as 'somewhat/very influential': difficulty assessing baby readiness for KC, fear of safety of KC for babies below a certain weight, inability to provide adequate family time during KC, inconsistency in KC

Table 3 Practice issues in providing KC (specific treatments and conditions)*

Items	Very/somewhat uncomfortable in 'experienced in KC' group (n=411), n (%)	Very/somewhat uncomfortable in 'not experienced in KC' group (n=450), n (%)	P values
Intravenous catheters	30 (7.3)	42 (9.3)	0.943
During the perioperative period	84 (20.4)	95 (21.1)	0.479
Endotracheal intubation	143 (34.8)	209 (46.4)	0.005
High-frequency jet or oscillator ventilation	186 (45.3)	240 (53.4)	0.359
Nasal cannula oxygen	70 (17.0)	114 (25.4)	0.868
Nasal continuous positive airway pressure	100 (24.3)	160 (35.6)	0.222
Percutaneous central lines	56 (13.6)	110 (24.4)	0.001
Phototherapy	151 (36.7)	193 (42.9)	0.841
Umbilical arterial catheters	142 (34.6)	171 (38.0)	0.657
Umbilical venous catheters	130 (31.6)	160 (35.5)	0.698
Vasopressors	105 (25.5)	141 (31.3)	0.712

*Based on the original literature review from the Kangaroo Care Questionnaire (Engler *et al*, 1999)[17]; p<0.05 was considered significant.
KC, kangaroo care.

practice, a nurse's feeling that KC adds burden to workload and parents' discomfort with exposing chest during KC.

Perceptions of kangaroo care

The comparison of neonatal nurses' perceptions of KC between groups indicated convergence on some items and divergence on others (table 5). Both groups agreed on statements that KC encouraged parenting roles, enhanced attachment between parent and baby, benefited preterm babies, helped parents become confident caregivers and improved outcomes for babies. There was less agreement between the groups on other items. The respondents in the 'experienced in KC' group (21.7%) were less in agreement with the statement that KC keeps nurses too tied to the bedside as compared with the 'not experienced in KC' group (34.4%); similarly, only 23.3% of respondents in the 'experienced in KC' group agreed with the statement that KC interferes with task completion as opposed to 37.4% of the 'not experienced in KC' group. Furthermore, 66.2% of the 'not experienced in KC' group agreed that 'modern day NICUs are NOT the place for KC', whereas only 43.5% of the 'experienced in KC' group agreed with the statement.

DISCUSSION

Initially conceptualised as a low-cost mechanism to care for preterm babies in resource-poor countries,[18] KC was later recognised as an intervention with a wide range of benefits for small and sick babies everywhere.[19] The recognition of the moral, ethical and evidence-based impetus for supporting family centred care in NICUs[20] has led the intervention to be widely implemented in high-dependency neonatal units, especially with technology-dependent babies in neonatal intensive care. Previous research globally has identified the challenges associated with KC implementation, which include nurses' (lack of) knowledge and perceived barriers to implementation.[21] To advance the implementation of this evidence-based intervention in China, where it is rare, a survey was conducted to identify current NICU nurses' knowledge, practice, barriers and perceptions regarding KC. This section presents the results, which show broad similarities and some differences to other studies.

Knowledge

Our results showed that even without formal KC training, most neonatal nurses from Northern and Eastern China in the 'experienced in KC' group had better knowledge of the benefits and effects of KC than those who did not have any experience on KC, which might be because the areas of Northern and Eastern China are more developed than other areas; therefore, nurses have greater opportunities to advance their knowledge. Another reason may be that the 'experienced in KC' group had received informal education about KC before; this assumption is similar to those of Engler *et al*[16] and Solomons and Rosant.[22]

We also verified nurses' uncertainty towards KC inclusion and exclusion criteria, especially for preterm infants receiving specific treatments or with specific conditions. Although it is undeniable that nurses working in maternity hospitals have more opportunities to attend academic lectures and conferences on maternal-infant healthcare than do those who work in general hospitals, many respondents in both groups felt ambiguous towards KC (eg, for preterm infants with specific treatments and conditions) because of the lack of formal KC training; therefore, there were clear gaps in their knowledge and practical skills, which is covered in the 'Practice' section.

Practice

As in another study,[23] nurses were uncertain how to implement KC for infants with intubation, under phototherapy

Table 4 Barriers to implementing kangaroo care*

Items	Somewhat/ very influential in 'experienced in KC' group (n=411), n (%)	Somewhat/very influential in 'not experienced in KC' group (n=450), n (%)	P values
Senior nurses' reluctance to allow KC	206 (50.2)	243 (54.0)	0.123
Belief that technology (eg, incubators) is more beneficial to babies than the care a parent can provide	180 (43.8)	214 (47.6)	0.471
Difficult providing privacy for families during KC	216 (52.6)	263 (58.4)	0.056
Difficulty assessing babies readiness for KC	188 (45.7)	257 (57.2)	0.001
Family reluctance to initiate KC	297 (72.3)	323 (71.7)	0.370
Family reluctance to participate in KC	297 (72.3)	333 (74.0)	0.184
Fear of accidental extubation	278 (67.6)	334 (74.2)	0.453
Fear of arterial or venous line dislodgement	276 (67.2)	330 (73.3)	0.932
Fear of safety of KC for babies below a certain weight	252 (61.4)	325 (72.2)	0.083
Inability to provide adequate time to families during KC	253 (61.6)	320 (71.1)	0.117
Inconsistency in the practice of KC	228 (55.5)	298 (66.2)	0.156
Medical staff reluctance to allow KC	296 (72.0)	340 (75.5)	0.155
Nurses' belief that KC is used for babies who are NOT developmentally ready for it	232 (56.4)	275 (61.1)	0.730
Nurses' feeling that KC adds a burden to their workload	242 (58.9)	317 (70.4)	0.187
Nurses' feeling that KC makes it difficult to administer care	255 (62.0)	323 (71.7)	0.758
Nursing staff reluctance to participate in KC	281 (68.3)	328 (72.9)	0.760
Parents' discomfort with exposing their chest during KC	250 (60.8)	306 (68.0)	0.338
Parents' presence in the NICU for extended periods of time	194 (47.2)	268 (59.5)	0.014
Parents' provision of too much stimulation to their baby during KC	188 (45.7)	221 (49.2)	0.430
Staff's lack of exposure to parents participating in KC	232 (56.4)	276 (61.3)	0.761

*Based on the original literature review from the Kangaroo Care Questionnaire (Engler *et al*, 1999)[17]; p<0.05 was considered significant.
KC, kangaroo care; NICU, neonatal intensive care unit.

or with an umbilical line in situ. The study of quasi-experimental study by Almutairi and Ludington-Hoe indicated that nurses' knowledge and skills with KC improved after continuing education.[24] Specific KC education including simulation training for neonatal nurses may increase their confidence in KC and promote its implementation.

Although KC is a key intervention for newborn health, there has been limited information available on KC practice in China, and parents and neonatal nurses generally cannot practice it with confidence.

Barriers

Our study identified barriers to KC implementation including lack of consistent guidelines and standards, reluctance among medical staff to support KC due to safety fears and hospital policy of denying parents access to NICU. The systematic review by Seidman *et al*[25] proposed that resource-related barriers (eg, lack of guidelines/education) and sociocultural barriers (eg, concerns about medical conditions/care) negatively affected nurses; our study supports these points. Furthermore, other studies also proposed that lack of knowledge and skills were main barriers to KC implementation,[23 26–29] as well as medical staff reluctance to allow KC.[10 28–30] Resistance of medical staff is mainly associated with fear of harming infants and lack of experience and specific education in KC. These might be reasons why KC has had slow uptake in Chinese hospitals despite being a well-supported therapy.

An inappropriate physical environment was another key barrier that we identified, which was consistent with research from Eichel[31] and Pratomo *et al*.[30] Most NICUs in China do not have sufficient space or nursing staff[32] for parents to implement KC. Xin Zhang's cross-sectional exploratory study[33] stated that a better nurse-patient ratio was the strongest factor for a nurse's likelihood to implement KC in NICUs.

Table 5 Nurse's perceptions about kangaroo care*

Items	Disagree in 'experienced in KC' group, n (%)	Disagree in 'not experienced in KC' group, n (%)	P values	Agree in 'experienced in KC' group, n (%)	Agree in 'not experienced in KC' group, n (%)	P values
All preterm babies should be allowed to participate in KC regardless of gestational age	68 (16.5)	68 (15.1)	0.776	241 (58.7)	225 (50.0)	0.824
All preterm babies should be allowed to participate in KC regardless of weight	73 (17.8)	72 (16.0)	0.373	228 (55.4)	209 (46.4)	0.622
Babies receiving intravenous fluids should NOT be allowed to participate in KC	285 (69.3)	241 (53.6)	0.161	46 (11.2)	71 (15.7)	0.035
Babies who are intubated should NOT be allowed to participate in KC	193 (47.0)	170 (37.8)	0.782	127 (30.9)	163 (36.2)	0.770
Babies with umbilical catheters should NOT be allowed to participate in KC	195 (47.4)	168 (37.3)	0.307	108 (26.3)	138 (30.7)	0.426
KC encourages the parenting role	11 (2.7)	16 (3.6)	0.410	371 (90.2)	372 (82.6)	0.454
KC enhances the attachment process between parent and baby	11 (2.7)	12 (2.7)	0.356	374 (91.0)	383 (85.1)	0.458
KC increases the quality of care on our unit	20 (4.9)	41 (9.1)	0.022	322 (78.3)	277 (61.6)	0.002
KC interrupts patient caregiving	222 (54.0)	173 (38.4)	0.636	81 (19.7)	121 (26.9)	0.526
KC should be available only to breastfeeding mothers	292 (71.0)	264 (58.7)	0.326	62 (15.1)	82 (18.2)	0.532
KC is NOT feasible with some patients	110 (26.8)	70 (15.6)	0.760	192 (46.7)	245 (54.4)	0.959
KC keeps nurses too tied to the bedside	167 (40.6)	100 (22.3)	0.012	89 (21.7)	155 (34.4)	0.014
KC should be offered to all parents in the NICU	74 (18.0)	84 (18.6)	0.216	231 (56.2)	237 (52.7)	0.199
KC will benefit preterm babies	13 (3.2)	16 (3.5)	0.753	366 (89.0)	379 (84.3)	0.751
KC will help parents feel more confident in caring for their preterm baby	10 (2.4)	10 (2.2)	0.771	367 (89.3)	373 (82.9)	0.846
KC will improve the baby's outcome	13 (3.2)	16 (3.5)	0.715	344 (83.7)	356 (79.2)	0.443
KC will interfere with the completion of my tasks	177 (43.1)	100 (22.2)	0.485	96 (23.3)	168 (37.4)	0.197
Learning about KC will help me be a better nurse	21 (5.1)	27 (6.0)	0.603	329 (80.1)	317 (70.4)	0.551
Modern-day NICUs are NOT the place for KC	115 (28.0)	50 (11.1)	0.000	179 (43.5)	299 (66.2)	0.001
Nurses look forward to introducing KC to a new parent	13 (3.2)	24 (5.3)	0.013	342 (83.2)	319 (70.9)	0.003
Our patients have adequate time for parent-baby contact without the use of KC	109 (26.5)	100 (22.2)	0.771	153 (37.2)	214 (47.6)	0.973
The increased amount of time required to prepare a baby for a KC session is out of proportion to the benefits	169 (41.1)	112 (24.8)	0.567	107 (26.0)	165 (36.8)	0.371
The teamwork required between nurses and parents when doing KC is worth the effort	13 (3.2)	11 (2.4)	0.312	355 (86.3)	353 (78.5)	0.726
There is NOT enough flexibility in the NICU to allow parents extended visits (>2 hours) for KC	80 (19.5)	49 (10.9)	0.122	218 (53.0)	277 (61.5)	0.306

Experienced KMC (n=411); not experienced KMC (n=450).
*Based on the original literature review from the Kangaroo Care Questionnaire (Engler *et al*, 1999)[17]; p<0.05 was considered significant.
KC, kangaroo care; KMC, kangaroo mother care; NICU, neonatal intensive care unit.

Perhaps the biggest barrier to routine implementation of KC in China is the policy limiting parental visitation, although visitation does not increase rates of nosocomial infection, bronchopulmonary dysplasia, intraventricular haemorrhage, necrotising enterocolitis or retinopathy of prematurity.[15] The study by Blomqvist *et al*[28] in Sweden demonstrated that lack of parental visitation also discouraged KC in NICUs there, as did the study by Lee *et al*[27] in the USA.

Alongside these similarities, several differences on barriers were also observed between our study and past research. In our study, respondents in the 'not experienced in KC' group but not the 'experienced in KC' group perceived KC as a burden. Chia *et al*[34] found that respondents in Australia expressed strong frustration with workloads and staffing levels, which left them without time to facilitate KC. Another study, addressing KMC,[10] mentioned cultural issues in India and financial problems as barriers; however, these items were not investigated in our study. Namnabati *et al*[35] in Iran proposed that older, more experienced physicians were more likely to implement KC in NICUs; by contrast, no age or general experience factor was apparent in our study.

Perceptions

Perceptions may be more essential than knowledge and practice for successful implementation of KC in NICUs. Knowledge alone does not change practice; however, perceptions strongly influence action. We found that nurses in the 'experienced in KC' group both held similar beliefs on the importance, advantages and appropriateness of KC. Misunderstandings about KC were apparent in the 'not experienced in KC' group, likely because nurses lacked formal or informal KC education. Although the nurses in the 'experienced group' had not had formal training in KC but had very likely had informal training before they started implementation of KC in their NICUs. However, we do think there should be a formal and standard training or education in KC across China. It would be better for both groups to have more knowledge and practical skills on KC.

Overall, many nurses in both groups agreed that KC promotes parent-baby attachment, parental confidence and infant health. However, concerns were raised about the deleterious effects of environment on ability to implement KC, duration of KC and nurses' workload.

LIMITATIONS

A notable limitation of this study was that only neonatal nurses were surveyed, and other healthcare professionals were excluded. We also did not gather information on parents' perceptions of KC, a crucial factor if implementation of KC is to be successful.

RECOMMENDATIONS FOR POLICY, PRACTICE, EDUCATION AND RESEARCH

The shift from a one-child to a two-child policy and the wide use of assisted reproductive technology in China have resulted in rapid increase in preterm birth in recent years. In this situation, KC seems to be a convenient, economical and effective method; it is highly suitable for preterm as well as other infants. Based on our results, the following recommendations are made for clinical practice in China:

- The limits on parental visitation in Chinese NICUs should be changed; visitation hours should be extended to foster KC implementation.
- Hospitals should improve their environment, such as widening ward spaces and allocating more staff, to promote the implementation of KC.
- Simulation training and interactive workshops on KC may be needed to improve nurses' knowledge, skills and confidence in the implementation of safe and effective KC with preterm infants. Chinese guidelines for preterm birth and KC implementation should be considered.
- Only a few studies have been conducted on KC implementation in China. All NICU nurses should be encouraged to closely monitor KC delivery to premature infants. Distinct barriers can affect KC implementation in diverse ways (eg, effect of different education methods on nurses' knowledge of KC, implementation of KC and outcomes of KC for newborns).
- Considerable research is needed to investigate the current application of KC and to clarify perceptions and knowledge of KC among parents and medical staff in Chinese NICUs.

CONCLUSION

This was the first study to describe the knowledge and perceptions of neonatal nurses in China regarding KC. Substantial barriers included parent visitation policies and lack of formal education for nurses on the benefits and applicability of KC. These barriers should be addressed immediately if preterm infants and their families in China are to receive routine, evidence-based, parent-centred care such as KC.

Acknowledgements The authors would like to thank all the responding nurses and their hospitals for their assistance.

Contributors YZ: participation in the whole work; drafting of the article; data analysis; QD: collecting data; translating the survey; BZ: data analysis; QL: implementing survey; FW: implementing survey; HW: implementing survey; XX: financial support; implementing survey; LJ: perception and design; final approval of the version to be published.

Funding This study was supported by the National Natural Science Foundation of China (81371244), the Zhejiang Provincial Natural Science Foundation of China (LY17H040007) and Zhejiang University Science and Technology Innovation Program (2016R401274).

Competing interests None declared.

Patient consent Obtained.

Ethics approval This study was approved by the Ethics Committee of Women's Hospital, School of Medicine, Zhejiang University. Clinical governance approvals were granted for each of the hospitals included in the survey.

Provenance and peer review Not commissioned; externally peer reviewed.

Data sharing statement No additional unpublished data are available.

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