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Quality improvement initiative approach to increase the duration of Kangaroo Mother Care in a neonatal intensive care unit of a tertiary care institute in South India during the COVID-19 pandemic

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ABSTRACT

Introduction: Kangaroo mother care (KMC) provided to stable babies in hospitals is associated with 40% relative risk reduction in death, 65% risk reduction in nosocomial infections. Despite clear existing evidence of advantages of KMC, its implementation remains limited. This study aimed to improve the median KMC practice hours in eligible preterm and low birth weight (LBW) neonates by 50% from the baseline practice.

Methods: This was a Quality Improvement study conducted at Neonatal unit of a tertiary care institute in South India. All stable preterm and LBW neonates were included after obtaining written informed consent from mother. Those who needed interruption in KMC due to medical reason were excluded. A team comprising of 2 principal investigators (UG students), 2 consultants and 2 in-charge nurses was formed. Baseline data were collected between January and February 2021 to find out the median duration of KMC practice and to identify limiting factors (barriers) and the facilitating ones through in-depth interviews and team meetings. The study was conducted over a 10 month period. Steps were taken to tackle these in two PDSA cycles, each lasting for 3 weeks (1st PDSA: Education of Mothers and Nurses; 2nd PDSA: KMC technique, orders by residents). The PDSA was followed by monitoring for 10 weeks for sustenance.

Results: The baseline data showed that the median duration (in hours) of KMC practice was 2.6 which increased to 5.0 and 5.5 h by the end of first and second PDSA cycle, respectively and showed a lasting change, peaking at a median value of 6.1 h during the sustenance phase over the next 10 weeks.

Conclusion: Through simple measures and closing the communication gap between health care workers and mothers, we were able to increase the duration of KMC, which remained high during the 10 week follow up period.

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Introduction

Kangaroo mother care (KMC) is a method of care of preterm and low birthweight infants which involves infants being cared, usually by the mother, or other relatives, with skin-to-skin contact, exclusive breastfeeding, early discharge from health care facility and supportive care (Chan, Labar, et al., 2016).

Preterm births are the biggest cause of neonatal deaths worldwide. In India annually 3.6 million babies are born preterm out of which nearly 300,000 die due to complications (Blencowe et al., 2012; Howson et al., 2013). Many of the families in whom these LBW infants

are born do not have access to or cannot afford the cost of conventional neonatal care that includes the use of incubators and skilled personnel (Garg & Nagpal, 2014; Joshi et al., 2013). Kangaroo Mother Care has numerous benefits for the baby like stabilizing the heart and respiratory rates, improving oxygen saturation, better regulation of the infant's body temperature and conserve the baby's calories (Chan, Valsangkar, et al., 2016).

KMC provided to stable babies in hospitals is associated with a 40% relative reduction in the risk of death, 65% reduction in the risk of nosocomial infections and a 72% reduction in hypothermia, at discharge or 40–41 weeks postmenstrual age compared to conventional care (Mazumder et al., 2018). Despite clear existing evidence of the advantages of KMC and their role the coverage and implementation has remained limited and only a fraction of the neonates gets the benefit of this in practice (Jayaraman et al., 2017; Soni et al., 2016).

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Our hospital is a multi-speciality, tertiary care hospital in South India with a dedicated Department of Neonatology. The institute caters to an average of 3200 deliveries with 800 admissions to the neonatal unit annually.

COVID pandemic has changed the functioning of healthcare aspects in many different ways. There were changes in the visitation policy in our unit where instead of parental visit being 24/7, restriction was implemented to the visit of father as 2 h. This could potentially affect the duration of KMC in this pandemic.

We aimed to study the factors which prevent and those which enable the practice of KMC, based on this data, design a model in order to improve the KMC care and practice and eventually study the success of the model.

Our SMART (Specific, Measurable, Achievable, Relevant and Timely) aim was to increase the median duration of KMC for preterm and low birth weight neonates, two times from the baseline over a period of 6 months.

Methods

Baseline data were collected between January and February 2021 to find out the median duration of KMC practice. The daily hours of practice of KMC by eligible mothers, details about gestational age, birth weight, sex and the mode of delivery were recorded and collected by 2 medical students through the nurses' records over a period of 5 weeks. The duration of KMC was calculated based on the total duration of skin-to-skin contact between the parents and the baby during a 24 h period, while ensuring all other components of KMC are being incorporated. The median length of stay during each baseline, PDSA 1 and PDSA 2 were 5, 6 and 8 days respectively. Baseline data were reviewed by the QI team.

Context

The study was conducted in the Department of Neonatology, in a tertiary care hospital in South India. Written informed consent was obtained from all mothers who were included in the study. We included stable preterm neonates and low birth weight neonates admitted in the neonatal unit who were deemed eligible for KMC by the consultants. Those infants who needed interruption in KMC due to medical reason were excluded from the study. All eligible mothers' and babies admitted at the beginning of each cycle were included in the study, any new admissions in the middle of the cycles were continuously enrolled in the study and their hours of practice was also logged.

A QI team comprising of 2 principal investigators (medical students), 2 consultants and 2 in-charge nurses was formed. Baseline data were reviewed and in-depth interviews and team meetings were conducted to identify limiting factors. We collected data over a period of 3 weeks from 9 mothers and 34 nurses through in-depth interviews to understand the current process and barriers. We identified key processes where improvements were needed. Primary barriers identified through a fish-bone analysis include inadequate knowledge about the proper practice of KMC among nurses; lack of awareness about the necessity and benefits of KMC among mothers; father not able to take part in giving KMC and maternal discomfort due to non-enforcement of convenient techniques.

We approached eliminating the identified hurdles through multiple Plan-Do-Study-Act (PDSA) cycles. We targeted to educate and sensitize the healthcare workers in the KMC ward and the parents. A record of exact hours of KMC practice by eligible mothers was meticulously maintained by the staff nurses in each shift. This data were collected by the medical students and reviewed regularly by the senior consultants. The staff nurses were given continuous feedback regarding possible ways of improvements and sustenance of the practice.

Intervention

The following PDSA cycles were executed one after the other to implement the desired changed ideas (Table 1).

The study team met at regular intervals to review the practice of KMC and discuss methods of tackling any new hurdles or problems, hindering adequate practice of KMC.

Study and evaluation of intervention

Process indicators were the compliance of education program for the nurses for the first PDSA cycle and compliance of the prescription by resident neonatologist for the second PDSA cycle. Outcome indicator was the median duration of KMC practiced during each phase of the study namely PDSA1, PDSA2 and sustenance period. Run chart was reviewed weekly by the QI team and displayed in the notice board to increase the awareness among both health care workers and caregivers.

Statistical analysis

Daily data of hours of KMC practice was logged in MS Excel and the median hours/days were calculated using standard formulae on the same software. The data were represented graphically using MS Excel.

Ethical concerns

The QI study received ethical clearance from the Institutional Ethics Committee of our Institute before commencing the project. The Ethics Approval Number was CSP/21/JAN/89/27.

Results

The number of preterm infants in each of the phases was as follows: 9 (12.1%) in the baseline study, 27 (36.4%) in the 1st cycle of PDSA, 12 (16.2%) during the 2nd cycle of PDSA and 26 (35.1%) during the sustenance period. Number of patient days in baseline, 1st PDSA, 2nd PDSA and sustenance were 63, 225, 83 and 192, respectively. Mean gestational age and mean birth weight of study subjects were 31.8 (± 1.8) weeks and 1490 (± 418) grams, respectively. Male neonates were 34 (46%). 40 (54%) were born through LSCS.

During the baseline period, based on the in-depth interviews for the nurses and mothers practicing KMC, the major barriers to the practice were identified, which are summarized in Fig. 1.

At the end of the baseline study the median practice of KMC was 2.6 h per day. We started the 1st PDSA cycle with the target of a median of 4 h per day.

As a part of the PDSA Cycle 1 we prepared a presentation highlighting the clinical aspects and importance of KMC. Their role in bridging the communication gap between healthcare workers and the parents was reasserted. All nurses in the department of neonatology were counselled in groups of 10. We talked to a total of 34 nurses and their knowledge was judged on the basis of a pre-test/ post-test questionnaire consisting of 10 objective questions. The questions included details about the components of KMC, methods of practice, need of the practice and the benefits to the baby and the child. The average percentage correct in the pre-test was 65.7% which increased to 94.1% in the post test. The process of educating the nurses were accomplished in all with a compliance of 100% and records were maintained. The median duration of KMC increased from 2.6 h to 5.0 h per day by the end of the 1st PDSA Cycle. Run chart of the outcome was calculated every 4 days and displayed.

The 2nd cycle of PDSA was aimed at addressing the shortcomings which persisted despite the 1st PDSA Cycle. Maternal discomfort and limitation of mobility were the primary factors which impeded proper implementation of KMC and therefore we started the 2nd PDSA Cycle with the aim to tackle these and to increase the average hours of KMC

Table 1
Plan of Action in the PDSA cycles.

PDSA cycle no.	Plan	Do	Study	Act
1	Education and sensitisation of nurses about the importance of their role in improving the practice of KMC Bridging the communication gap between the healthcare workers and parents	Existing nurses were educated in groups of 10 using PowerPoint presentations over a period of 3 weeks. Newly recruited nurses were educated within 1 week of joining. Mothers and nurses were encouraged to involve other family members in providing KMC	Median KMC duration (increased to 5 h / day)	Plan adopted
2	Seek to alleviate maternal discomfort by improving position and technique of KMC Reinforce the need for longer duration of KMC practice	Mothers were educated through the nurses about proper KMC tying technique to reduce restriction in their mobility and allow them to carry their daily activities while providing KMC. Recommended hours of KMC were prescribed in the daily non-drug order charts by the resident neonatologists.	Median KMC duration (increased to 5.5 h / day)	Plan adopted

practice to at least 6 h per day. Both the problems were addressed by educating the mothers through the nurses about the proper KMC tying technique which allowed the mother to practice KMC in any position comfortable to the mother and also carry out basic day-to-day activities without hinderance.

Though this did lead to an increase in the median practice hours, the change was minimal. On talking to the nurses, it was brought to our notice that the patients lacked reassurance about the need for KMC practice from the doctors. It was therefore decided that the resident doctors, while on daily rounds, encouraged the mothers to practice KMC for adequate duration and also a recommendation of 6 h of daily practice was added to the daily charts. The compliance of this practice by the residents was 100%. The median duration of KMC increased from 5.0 h to 5.5 h per day by the end of the 2nd PDSA Cycle.

After the 2 cycles of PDSA we monitored the practice of KMC for further 10 weeks and a sustained improvement in the median hours of practice of KMC was seen. The median hours of practice during the follow up was 6.1 h. Most of the mothers were seen practicing the KMC tying technique and active involvement of the father was also seen in the practice which helped maintain the increased daily KMC hours.

The run chart depicting the duration of KMC hours during baseline, 1st and 2nd PDSA along with sustenance period is shown in Fig. 2.

Discussion

We achieved our SMART aim and double the median hours of practice of Kangaroo Mother Care in low birth weight or preterm infants using 2 PDSA cycles over a 5-month period and sustained the achieved KMC practice for 10 weeks.

Through in-depth interviews of the mothers and nurses, we were able to identify a wide array of hurdles for KMC practice. We talked to 34 nurses which included junior, newly trained nurses and senior

nurses with vast experience which helped us obtain a wide perspective on the barriers and identify which were the most significant. Interviewing the mothers after the nurses highlighted that though the nurses do have basic knowledge of the practice, there exists a gap in the transfer of that necessary knowledge to the mothers.

Prior quality improvement studies and systematic reviews identify, like our study, KMC knowledge among both the mothers and the healthcare workers as the biggest barrier to the practice of KMC and enhancing knowledge is an important strategy to address in the effort to improve its uptake. Other problems including post-partum maternal discomfort and limited family involvement due to hospital visitor policies were common between ours and older studies (Chan et al., 2017; Chan, Labar, et al., 2016; Seidman et al., 2015).

While studies mention personal and sociocultural beliefs playing a significant role in reducing the KMC practice, we did not notice this in our study and all mothers were agreeable to adopt the practice after being properly educated about the practice and its benefits (Smith et al., 2017).

During our study, we learnt that one of the key barriers to adequate KMC practice was the communication gap between the healthcare worker and the parents which existed secondary to lack of complete knowledge and awareness about the ideal practice. Therefore, education and sensitisation of the nurses and making them aware about the importance of their role in actualizing the practice of KMC lead to significant improvement in the median practice hours during the first PDSA cycle (Joshi et al., 2018). Wrapping the infant with the mother using ordinary cloth, alleviated the limitation of immobility which is one of the key barriers to KMC practice. As our study was conducted during the COVID-19 pandemic the involvement of the father and other family members in providing KMC was limited due to COVID-19 related hospital restriction allowing attenders to visit for a small period of time. We believe that eventual removal of the COVID-19 related restrictions and

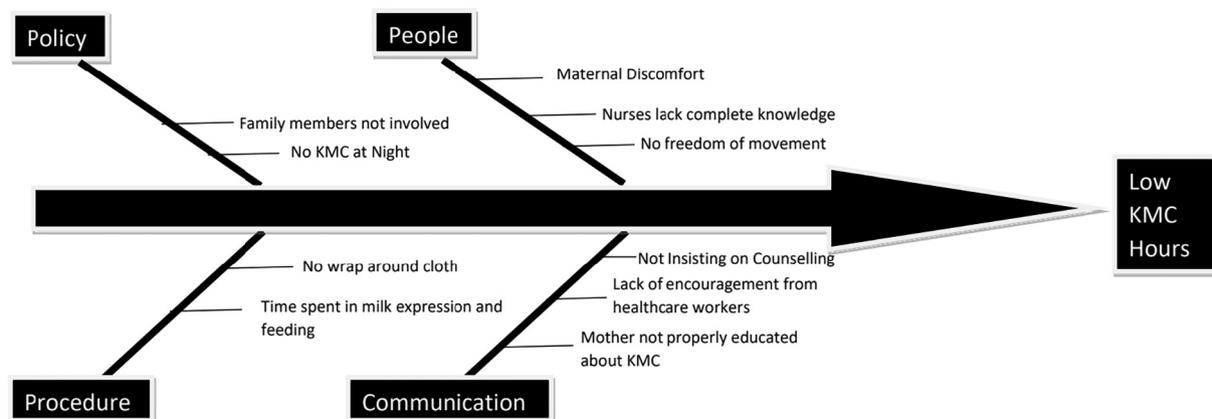


Fig. 1. Fish Bone Analysis to identify key barriers to KMC practice.

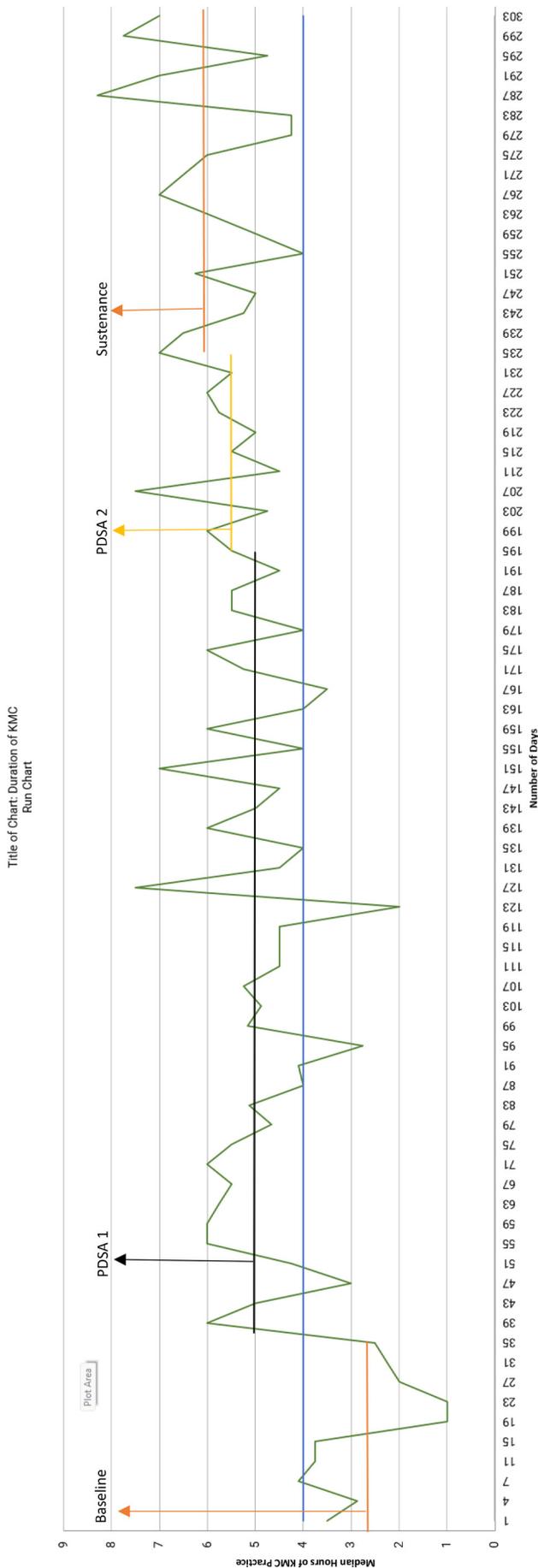


Fig. 2. Run Chart showing median duration KMC hours during Baseline, 1st PDSA, 2nd PDSA and Sustenance period.

continuous encouragement by the nurses in the post implementation phase will further improve the practice of KMC.

Towards the end of the 1st cycle, our country witnessed the 2nd wave of COVID-19 which led to reintroduction of lockdowns and major shift of focus of the healthcare systems. Majority of the healthcare workers were involved in the care of COVID-19 patients and the Non COVID-19 hospital admissions were reduced to the cases which required intensive care. Thus, during this period of the study, despite the best efforts of our team, the median hours of KMC practice witnessed a slight fall. We started the 2nd PDSA cycle, 4 months after the first one once the COVID-19 situation settled.

During our study, regular feedback was taken from the nurses and minor problems were solved to the best of our capabilities. We learnt that this continuous process of audit-and-feedback is of prime importance as it is the nurses who are involved in providing the direct healthcare services and therefore the best source of information of any problems and implementation of any solutions.

In the 10-week sustenance period, we saw a wide fluctuation of daily hours of practice, portraying certain shortcomings in our action plan. We noticed a large increase in the number of twins during this period which led to division of KMC hours among the 2 infants. There were 35% twins during the follow up period. The nursing staff tried to combat this challenge by encouraging the mother to provide KMC to both the infants together but that too had limited benefits because of maternal discomfort. However, all neonates received KMC for at least 4 h which is much higher than the baseline duration.

Limitations

The key limitation of our study was the lack of follow up after discharge. No records of the hours of KMC practice at home and its impact of the baby were maintained. Also, the proportion of twins in our study was particularly high, reaching as high as 35% in the 2nd PDSA cycle. This led to different set of barriers to the practice of KMC for the mothers which were not particularly addressed in our study. Although we successfully accomplished our aim to increase the baseline practice by 50%, it is still well below the WHO standard.

We had full support from the healthcare team including nurses and doctors during our study, unlike other studies where the participation was limited due to excessive workload (Chan et al., 2017; Seidman et al., 2015). During our study, we introduced the practice of using cloth to wrap the neonate with the mother, which in turn increased freedom of mobility. This led to an increase in the practice of KMC and being a simple measure, we highly recommend its use.

Conclusion

The median hours of practice of KMC increased more than two-fold in the 10-month period from a baseline of 2.6 h to 6.1 h. In-depth interview of mothers and nurses helped us in understanding the key barriers. Through simple measures and closing the communication gap between health care workers and mothers, we managed to increase the duration of KMC, which further prevailed during the 10-week follow-up period that succeeded the study.

Ethics approval

The study has been approved by Sri Ramachandra Institute of Higher Education & Research Ethics Committee for Student Projects.

Contributorship

Concept of work: HJ, IC, UB and PA. Data Collection: HJ, IC and VD. Data Analysis and Interpretation: HJ, IC and UB.

Drafting the article

HJ and IC. Critical revision of the article: UB. Final approval of the version to be published: HJ, IC, UB and PA.

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Conflict of interest

The Authors declare that there is no conflict of interest.

CRediT authorship contribution statement

Harsh Jain: Conceptualization, Methodology, Writing – original draft. **Ishwarya Chandrasekaran:** Writing – original draft. **Umamaheswari Balakrishnan:** Conceptualization, Writing – review & editing. **Prakash Amboiram:** Supervision, Writing – review & editing.

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