Implementing the practice of early skin-to-skin contact among infants ≥35 weeks gestation born vaginally: a quality improvement study

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ABSTRACT

Background Early skin-to-skin contact (SSC) at birth has been shown to improve neonatal outcomes due to enhanced cardiorespiratory stability, thermoregulation and breastfeeding success.

Local problem The practice of early SSC was virtually non-existent in our delivery room (DR).

Methods and interventions The study was conducted in a newly established tertiary care teaching hospital in Western Rajasthan, India. We aimed to improve the median duration of early SSC from 0 min to at least 60 min over 24 weeks in our DR. A quality improvement (QI) team was formed, and all inborn infants ≥35 weeks born vaginally from 9 March 2017 were included. Using the tools of point-of-care QI, we found the lack of standard operating procedure, lack of knowledge among nursing staff regarding early SSC, routine shifting of all infants to radiant warmer, the practice of prioritising birthweight documentation and vitamin K administration as the major hindrances to early SSC. Various change ideas were implemented and tested sequentially through multiple plan–do–study–act (PDSA) cycles to improve the duration of early SSC. Interventions included framing a written policy for SSC, sensitising the nursing staff and resident doctors, actively delaying the alternate priorities, making early SSC a shared responsibility among paediatricians, obstetricians, nursing staff and family members, and continuing SSC in the recovery area of the DR complex.

Results The duration of early SSC increased from 0 to 67 min without any additional resources. The practice of SSC got well established in the system as reflected by a sustained improvement of 63 min and 72 min, respectively, at the end of 2 months and 4 years after study completion.

Conclusion Using the QI approach, we established and sustained the practice of early SSC for more than 60 min in our unit by using system analysis and testing change ideas in sequential PDSA cycles.

PROBLEM

Keeping the mother–infant dyad together shortly after birth with continuous skin-to-skin contact (SSC) has been practised for centuries among all mammals, including humans. SSC is a practice defined by the WHO as ‘placing the baby naked on the mother’s bare chest, in a prone position covered by a cloth/blanket’. At least 1 hour of SSC after birth is recommended by the WHO, along with efforts to initiate breast feeding within this first hour of life.1 2 SSC provides numerous benefits for newborn infants and their mothers.3 However, over the past century, this trend has been replaced by mother–infant separation soon after birth in most parts of the world. Despite being such a low-cost affordable intervention, it is not routinely practised in most low-income countries.4

Our institute, a newly established tertiary care teaching hospital in Western Rajasthan, India, started its delivery room (DR) services in December 2015. As per 2017 (January–February) data, we conducted an average of 40 deliveries per month, 56% of which were vaginal and 89% were late preterm and term infants. The obstetric unit of the institution is supported by a level-III neonatal intensive care unit (NICU). Paediatric senior residents and a neonatology consultant provide
support to the DR round the clock and are informed timely before any delivery. The NICU team, led by a senior resident, reach the DR for resuscitation and subsequent management of the infant depending on the level of sickness.

An internal review of the DR interventions for improving maternal–neonatal outcomes made us to realise that the practice of SSC was missing from our system. Therefore, we aimed to implement and increase the duration of early SSC among vaginally born infants ≥35 weeks in our labour room from 0 to at least 60 min over 24 weeks (starting from 9 March 2017) through a point-of-care quality improvement (POCQI) approach.5

BACKGROUND

In the evolutionary history, from mammals to humans, the separation of the mother–infant dyad has been associated with poor survival and developmental outcomes. The maintenance of the maternal–infant milieu immediately after birth is necessary to elicit certain innate maternal and neonatal behaviours, promoting the establishment of breast feeding, mother–infant bonding and thus survival.6,7 SSC has been associated with success at the first lactation attempt and a longer duration of breastfeeding, up to 4 months in the postnatal period.3,4 Moreover, the probability of exclusive breast feeding is also higher till 6 months among infants receiving SSC.5 Though initially proposed as an effective intervention in vaginal deliveries, its feasibility and health benefits have also been replicated in caesarean deliveries.9–12 Other documented benefits of SSC include better thermoregulation and lesser weight loss at discharge and first follow-up.8 Early SSC offers multiple benefits to mothers too, with better birth experience, less incidence of postpartum depression, higher maternal satisfaction rate and support for maternal–infant bonding.9

A Cochrane review and meta-analysis have concluded that SSC promotes breast feeding, and infants who receive SSC have higher stability of the cardiorespiratory system and higher blood glucose levels.2 Furthermore, protocols and position statements from the Academy of Breastfeeding Medicine, American Academy of Pediatrics and Association for Women’s Health, Obstetric and Neonatal Nurses and UNICEF support SSC practices.10–13 But this evidence has variably translated into bedside practice.4 There are limited national data available on SSC from our region.

MEASUREMENTS

The primary outcome measure was the duration of early SSC in vaginally delivered inborn infants ≥35 weeks of gestation. All inborn infants ≥35 weeks born vaginally and cried immediately after birth were enrolled in the study. We excluded infants with congenital malformations, requiring positive pressure ventilation and those with maternal complications in the immediate postpartum period.

The baseline data were collected for 4 weeks (9 March 2017–6 April 2017; 4 weeks) before initiating the QI study. The duration of early SSC was documented in the DR register and was audited fortnightly to track progress. Other details were also documented, like the time spent in the recovery room and the time of shifting to the postnatal wards. Since the practice was non-existent in our DR, the baseline duration of SSC was 0 min.

During the sequential plan–do–study–act (PDSA) cycles, the following process measures were used to assess and monitor the test changes. For the first PDSA cycle, the number of counselling sessions held for the nursing officers and resident doctors was taken as the process measure. In PDSA cycle 2, the proportion of infants put on the mothers’ abdomen for initiating early SSC was taken as a process measure.14 The number of counselling sessions held for the female birth companion accompanying the mother was the process measure for the third PDSA cycle. In contrast, the proportion of infants receiving vitamin K was considered a balancing measure. We used run charts to interpret the serial measurements of the primary outcome and to study the impact of test changes after each PDSA cycle. We followed the SQUIRE 2.0 (Standards for QUality Improvement Reporting Excellence) guidelines for reporting.

DESIGN

We formulated a QI team composed of nursing in-charge and three nursing officers of the DR, one each of paediatric and obstetric resident doctor and head of obstetrics and neonatology. The head of the neonatology unit led the team. Since it was an interprofessional multidisciplinary team, it was crucial that all members were given equal representation and that all believed in the importance and benefits of early SSC. For this, the team was sensitised and updated on the latest available evidence on the benefits of early SSC and the non-existence of this cost-effective, evidence-based practice in our unit. Multiple opportunities were given to all team members to clarify any doubts.

During the preimplementation phase, the QI team conducted brainstorming sessions, where all the possible reasons for the lack of early SSC in our setting and the potential obstacles in its implementation were discussed and documented using QI tools such as process mapping and fishbone analysis (figure 1). Since the nursing officers and nurse in-charge of the DR were working at the grass-root level with the mothers, they were empowered. Two of them were identified as nurse champions and were given the responsibility of initiating the test changes generated by the team during each PDSA cycle. After testing each change idea during shift duties, the nurse champions shared their feedback. The team did a detailed discussion to deliberate on adopting, adapting or abandoning the
test idea. We ensured that the nurse in charge meticulously supervised the data collection during the study period and postintervention audits.

After the initial analysis of the existing system in the preimplementation phase (9 March 2017–6 April 2017; 4 weeks), the following problems were identified: (a) there was a lack of Standard Operating Procedure (SOP) regarding the practice of SSC in our unit; all infants were routinely shifted to the radiant warmer after delivery; (b) lack of awareness among the stakeholders on the benefits of early SSC; (c) there were alternate priorities like birth-weight documentation and vitamin K administration and (d) lack of sharing of responsibility for implementation of SSC.

**STRATEGY**

Our project aimed to increase the median duration of early SSC in our DR from 0 min to at least 60 min over 24 weeks among inborn vaginally delivered infants. We used multiple PDSA cycles to test and refine the interventions. The project team met at the end of each cycle to review data and discussed the following action steps.

**PDSA cycle #1 (7 April 2017–20 April 2017, 2 weeks)**

The first PDSA cycle involved reinforcing the benefits and developing an SOP for early SSC in the unit. We started by initiating combined sessions for the nursing officers and the resident doctors on the benefits of early SSC. We chose the number of counselling sessions held for nursing staff and residents as a process measure in this cycle. After analysing the baseline data, we noticed that all healthy infants were routinely shifted to the radiant warmer after delayed cord clamping instead of placing them on the mother’s abdomen for providing SSC (figure 1). Hence, an SOP was made where only infants who did not cry immediately after birth underwent immediate cord clamping and shifted to the radiant warmer. Those who cried at birth were received on the mother’s abdomen.

**Figure 1** Process mapping (A) and fishbone diagram (B) for problem analysis in the preimplementation phase. NICU, neonatal intensive care unit.
abdomen (online supplemental figure 1). Delayed cord clamping and routine care were given on the mother’s abdomen. This was followed by the initiation of early SSC by the resident doctor and the nursing officer who attended the delivery. The nurse champions tested the new SOP during their respective shifts, which led to the beginning of the practice of SSC in our unit. After implementing these two test changes, the QI team adopted the changes based on feedback from the nursing officers and discussion with the team. All stakeholders were educated regarding the new SOP for DR care using audiovisual aids, and printouts of the new SOP were also placed in the DR. Hence, the new SOP was implemented for all deliveries in the DR.

PDSA cycle #2 (21 April 2017–6 June 2017; 7 weeks) After the first PDSA cycle, which lasted 2 weeks, we succeeded in establishing the practice of early SSC in our DR, but the median duration of early SSC was only 27 min. The members of the QI team met again with an agenda to identify the potential obstacles in achieving the target duration of SSC. After problem analysis, it was found that SSC was getting terminated early due to the following reasons: (a) resident doctors were in a hurry to apply cord tie, administer vitamin K injection, documenting the birth weight and perform a detailed examination of the infant as early as possible, (b) mothers were being shifted out of the DR to the recovery area as soon as the placenta was delivered and episiotomy wound gets stitched as there was a pressure to keep the delivery tables vacant for any emergency delivery (online supplemental figure 2). During this PDSA cycle, the following change ideas were tested: (a) residents were counselled and advised not to prioritise the process of cord tie application, vitamin K administration, birthweight documentation and detailed neonatal examination until the completion of 1 hour of early SSC and the first breastfeeding session and (b) DR staff were counselled, and an SOP was made to continue early SSC once mother gets shifted to the recovery room located in the DR complex itself. The nurse champions tested these changes during their respective shifts. During the feedback session and discussion with the team, it was found that it was practically difficult for the busy resident doctor attending the delivery to wait for 1 hour for the completion of early SSC to examine the infant and administer vitamin K. Hence, it was decided to adapt this change idea; early SSC was to be initiated at birth for all mothers; however, it was allowed to be discontinued for 5–10 min once the mother needed to be shifted to the recovery room. The resident doctors used this window to examine, weigh and administer vitamin K to the infant. On the other hand, continuing early SSC in the recovery room was readily acceptable and feasible, and the team agreed to adopt this idea. The idea of temporary discontinuation of SSC while shifting the mother from the delivery table was subsequently pilot tested by the nurse champions during their shifts. Since it was feasible for the nursing officers and the resident doctors, the revised SOP was adopted and shared with all stakeholders and then implemented for all deliveries under the supervision of the nurse in-charge.

PDSA cycle #3 (9 June 2017–24 August 2017; 11 weeks) After the second PDSA cycle, the median duration of early SSC doubled and had increased to 57 min, thus bringing us very close to our target of 60 min. On process mapping, it was found that though the SSC was continued in the recovery room, there was a lack of supervision by the nursing officers due to a shortage of staff and other commitments (online supplemental figure 2). This led to premature discontinuation of early SSC before 60 min. The team devised the idea to make early SSC the shared responsibility of the healthcare professionals and the family members. So, additional counselling sessions were started for the female birth companion accompanying the mother regarding the benefits of early SSC and breast feeding and the need for continuing it after the mother gets shifted to the recovery room. A PDSA tested this change idea. We found that motivating and counselling the female birth companion on the benefits of SSC was feasible and ensured the continuation of SSC in the recovery room. This change was adopted unanimously by the team and subsequently implemented for all deliveries under the supervision of the nurse in-charge.

Postimplementation/sustenance phase (25 August 2017–20 October 2022; 2 months) After the third PDSA cycle, the median duration of early SSC improved to 67 min, and we achieved our primary target. The fortnightly audits of early SSC duration and a visual display of the run chart highlighting the overall performance were continued. Eight weeks after the completion of the third PDSA cycle, the median duration of early SSC was still sustained and maintained above the target duration of 60 min (63 min) (figure 2). We achieved the target of 60 min of SSC among 83% (n=53) of the participants. A regular auditing framework was arranged in place, which periodically reported on early SSC duration every 3 months, and this was discussed and analysed in the quarterly perinatal meetings by all stakeholders. Moreover, this was supplemented by regular training of the newly joined residents and nursing officers about SSC and other DR practices. A recent audit conducted 4 years after the completion of this QI study revealed that, though there was a fluctuation in the duration of early SSC, the mean duration of SSC was 72 min (figure 3).

RESULTS As the practice of early SSC was non-existent in our unit, we started with a baseline duration of zero minutes. A total of 102 eligible infants were born in our DR during the implementation phase (7 April 2017–24 August 2017), out of which 99 (56 males) received early SSC, with a mean gestational age of 386/7 (1.4) weeks and mean (SD) birth weight of 3098 (183) g. After PDSA #1 (2 weeks), SSC was provided to 13 of the 15 eligible infants; however,
the median duration was only 27 min. None of the infants received the target of 60 min of SSC. After meticulous planning, identifying problems, organising multiple counselling sessions and adopting different change ideas, the median duration of early SSC gradually increased to 57 min after PDSA #2 (7 weeks). However, 60 min of SSC was achieved in 13 of the 29 (45%) infants. PDSA #3 lasted for 11 weeks and 47 of the 57 infants (82%) received the target SSC of 60 min (online supplemental table 1).

During the postimplementation phase (2 months), we maintained the goal of at least 60 min of early SSC among 53 of the 64 (83%) participants. The median duration of SSC was 63 min, and the maximum duration achieved was 90 min (figure 2). None of the infants missed our balancing measure, which was receiving of intramuscular vitamin K injection in the DR.

After the postimplementation phase, periodic 3 monthly audits of early SSC were continued, and 3 monthly run

![Figure 2](https://example.com/figure2.png)

**Figure 2** Run chart depicting the duration of early SSC during the different phases of the study. PDSA, plan–do–study–act; SSC, skin-to-skin contact.

![Figure 3](https://example.com/figure3.png)

**Figure 3** Statistical process control chart depicting periodic audit data for early SSC up to 4 years after study completion. SSC, skin-to-skin contact. SPC, statistical process control.
charts were displayed on the DR notice board for reinforcement. A follow-up audit at 4 years of the completion of this study showed that the average early SSC duration in the unit was 72 min (figure 3).

To ensure compliance and smooth continuity of the practice, the newly joined nursing officers and residents were given orientation and ongoing training regarding early SSC policy and implementation.

Lessons and limitations
In this QI initiative, we successfully established and sustained the practice of early SSC for at least 60 min for vaginally delivered infants in the DR. The duration of early SSC improved from 0 to 67 min over 6 months. This practice not only persisted throughout the sustenance phase but also 4 years after the study completion.

Since ours was a newly established tertiary care teaching hospital with a recent start of DR services, undertaking this QI study presented us with both challenges and unique opportunities. This was the first QI initiative taken by anyone in our institute. Everyone was initially apprehensive and reluctant to take any additional responsibility due to multiple other responsibilities; however, a handful of nursing officers and resident doctors were enthusiastic about trying this strategy. They were sensitised about the QI approach and included in the team. Their enthusiasm and participation acted as a catalyst in carrying out this QI and in motivating others in due course, which helped in establishing the practice of early SSC in our unit.

There were many operational difficulties, such as interdepartmental differences regarding priorities, limited DR beds, inadequate personnel and time. All these limitations were circumvented with a customised approach and empowerment of each stakeholder.

The key lesson from this study was that one should identify the root causes and prioritise them during the preimplementation phase. During the problem analysis, we identified the lack of knowledge about the benefits of early SSC and routine shifting of all infants to the radiant warmer after birth as the priority causes. Hence, sensitisation regarding the benefits of early SSC and implementing an SOP where all infants are universally received on the mother’s abdomen and earmarking the clear indications where the infant needs to be separated from the mother itself succeeded in reaching nearly half of our target duration. We conducted regular brainstorming sessions after each PDSA cycle and identified the potential problems hindering early SSC practice. We encountered several obstacles on our path. However, since our team had representations from all the stakeholders, the members themselves came forward with many practical solutions. Accordingly, the PDSA cycles were conducted, keeping in mind whether these changes were sustainable or not. As expected in any policy change, we also encountered initial resistance, especially among the nursing officers. However, empowering them by identifying them as nurse champions and providing equal status and acknowledgement of the role played by each team member kept them motivated once they were convinced of the benefits of early SSC.

By standard definition, early SSC refers to SSC initiated within 10 min of birth and practised uninterrupted till the completion of first breastfeeding or 60 min. In our study, the SSC was started immediately after birth. However, the process had to be interrupted for 5–10 min while the mother was being shifted to the recovery room in the DR complex. The resident doctors used this brief time to examine the infant, administer vitamin K and weigh the infant. Once the mother was moved to the recovery room, the early SSC was continued uninterrupted and breastfeeding was ensured. Thus, it is important to understand the contextual factors affecting resource availability and team performance. In our setup, we did not have labour delivery recovery tables; hence there was pressure to keep the DR table empty for the next delivery. We also did not have dedicated resident doctors in the DR; the NICU team covered the DR areas 24×7. Though all infants were routinely initiated on breast feeding during the initial SSC, and neonates’ temperatures were documented routinely in the file, we did not study the impact of this interruption on either of the above. None of the infants missed the balancing measure of vitamin K administration.

Multiple studies have shown the association between early SSC and the benefits of breastfeeding. Few studies have demonstrated the dose-responsive relationship between breastfeeding rates and the duration of SSC. Others have explored the benefits of early SSC beyond the standard of 60 min and found it beneficial. Sustaining any QI initiative is challenging as people are busy and get easily distracted due to the pressure to focus on new tasks. Moreover, keeping people motivated for longer is daunting in any health system. However, the success of our research was not only reflected in the sustained early SSC practice during the postimplementation phase but even after 4 years of the study completion. This was only possible due to teamwork, with true front-line leaders being the nursing officers posted in the DR. We used early wins to build momentum. The staff motivation was the regular appreciation, display of success in the form of run charts on notice boards, and sensitisation of the newly joined nursing officers and resident doctors.

We were able to sustain this practice even during the COVID-19 pandemic. This was due to the fact that by the time the pandemic started, it was almost 3 years from the start of the QI project. The system has already imbibed this practice by that time. Moreover, all the suspected or proven COVID-19 pregnant mothers were delivered in a separate area within the hospital premises without affecting the routine DR services.

CONCLUSION
We introduced and sustained the practice of early SSC for at least 60 min after birth for all inborn infants ≥35 weeks

gestation delivered vaginally over 6 months without any additional resources. This was possible by implementing the principles of POCQI.

**Contributors** Concept and design: NKB, RS and NG. Participant recruitment: NKB, KLP, BB, PS, RS. Implementation: NKB, KLP, BB, NG, PS, KS, AS. Collection and analysis of data: NKB, RS, KLP, BB, BY, NT and NG. Writing of manuscript and revisions: NKB, RS, BY, NT, NG, PS, KS and AS. All authors approved the final manuscript as submitted and agreed to be accountable for all aspects of the work. NG: guarantor and responsible for overall content of the manuscript.

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**Patient and public involvement** Patients and/or the public were not involved in the design, conduct, or reporting, or dissemination plans of this research.

**Patient consent for publication** Not applicable.

**Ethics approval** This study involves human participants. As it was a QI initiative to implement an evidence-based recommendation, no ethical clearance was required. Participants gave informed consent to participate in the study before taking part.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** Data are available on reasonable request.

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**REFERENCES**


Supplementary Figure 1: Standard operating procedure for early SSC tested during PDSA cycle #1

1. Put infant on mother’s abdomen
2. Delayed cord clamping
3. Provide routine care
4. Initiate early SSC

- Shifting of mother to delivery table
- Delivery
- Immediate cry
- >35 weeks
- Yes
  - Immediate cord clamping
  - Gets shifted to radiant warmer
  - Further management (including resuscitation) based on the overall
  - Delayed cord clamping
- No
  - Did not cry immediately
Supplementary Figure 2: Process mapping for problem analysis during PDSA cycles #2 and #3

- Shifting of mother to delivery table
- Delivery
- Eligible infants
  - Yes: SSC in LR till placenta is out ± stitching of episiotomy
  - No: Further management
- Mother gets shifted out to recovery bed in Delivery Room complex immediately
- Infant gets shifted to radiant warmer
- Shifting of mother-infant dyad to the post-natal ward
- Mother-infant dyad stays together in the recovery room
- Infant examined, cord tie applied, weighed, inj. Vit K administered & covered

Notes:
- SCC stopped
- ↑ Duration
**Supplementary table 1: Breakup of the primary outcomes achieved after each PDSA cycle**

<table>
<thead>
<tr>
<th>PDSA cycles</th>
<th>No of eligible participants (n)</th>
<th>SSC initiated n (%)</th>
<th>Mean duration of SSC (mins)</th>
<th>Median duration of SSC (mins)</th>
<th>Completed 60 minutes of SSC n (%)</th>
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<td>67</td>
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<tr>
<td>Total</td>
<td>102</td>
<td>99</td>
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PDSA-Plan Do Study Act, SSC-Skin-to-skin contact