

## ORIGINAL ARTICLE

# Enhancement of maternal-neonatal bonding during the COVID-19 pandemic: A quality improvement initiative

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**Aim:** The COVID-19 pandemic adversely affected the essential care of newborns. In a tertiary care hospital in India, all COVID-19 suspect post-natal mothers awaiting COVID results were transferred to a ward shared with symptomatic COVID suspect female patients from other clinical specialities, due to shortage of space and functional health workforce. Babies born to COVID-19 suspect mothers were moved to a separate ward with a caretaker until their mothers tested negative. Due to shortage of beds and delay in receiving COVID results, mothers and babies were often discharged separately 2–3 days apart to their home. This deprived babies of their mother's milk and bonding. We, therefore, undertook a quality improvement (QI) initiative aiming to improve rooming-in of eligible COVID-19 suspect mother–newborn dyads from 0% to more than 90% over a period of 6 weeks.

**Methods:** A QI team was formed which ran multiple Plan-Do-Study-Act cycles. The results were reviewed at regular intervals and interventions were adopted, adapted or abandoned. These included advocacy, rearrangement of wards, counselling of mothers and caretakers regarding infection prevention practices and coordination between labour room, post-natal ward and nursery staff.

**Results:** An improvement in rooming-in from 0% to more than 90% was achieved.

**Conclusion:** QI methodology is a systematic approach in addressing and solving unexpected unforeseen problems effectively.

**Key words:** COVID-19; evidence-based practice; maternal-neonatal bonding; quality improvement; teamwork.

## What is already known on this topic

- 1 The SARS-CoV-2 virus is highly transmissible and has led to severe disruption of obstetric and newborn care.
- 2 The evidence of perinatal transmission of COVID-19 is scarce.
- 3 Disruption of maternal and newborn care during the immediate post-partum period leads to sub-optimal outcomes in both.

## What this paper adds

- 1 Asymptomatic COVID-19 mother–newborn dyads can be roomed in together safely and this can be facilitated using quality improvement (QI) methods.
- 2 In our study, none of the roomed-in COVID-19 suspect/positive mothers or newborns had adverse outcomes.
- 3 QI projects in the field of obstetric and newborn care are easily doable with minimal resources.

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Conflict of interest: None declared.

Author contributors: NJ, MP, DM, SK, SG, SN, VC, KC, BV, SA and SSS all made substantial contributions to the conception or design of the work and/or the acquisition, analysis or interpretation of data for the work. NJ drafted the paper with MP. All authors critically appraised, reviewed and approved the final version of the paper. All agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Accepted for publication 1 May 2022.

## Problem description

During the COVID pandemic, all patients admitted to our hospital were segregated into COVID suspects, positives and negatives at the entry and were admitted to designated wards. All COVID suspect female patients, including post-natal mothers, were admitted to one common ward and all male COVID suspect patients from various other specialities were admitted to another ward. This arrangement was made due to shortage of space and health workforce consequent to health-care workers falling sick, the policy of shorter shift duties, mandatory 7–14 days quarantine after 15 days of work and limited availability of personal protective equipment. The turnaround time for the reporting of the RTPCR testing for SARS-CoV-2 at our health facility was 24–48 h. Babies born to all COVID-19 suspect mothers awaiting reports were

shifted to a separate ward, as the post-natal mothers were transferred to the common ward with female patients from other clinical specialities like medicine, surgery, orthopaedics, and so on, who were usually symptomatic. There was crowding and lack of privacy in this ward and a perceived increase in risk to the baby of contracting the infection. As a result, the babies were deprived of their mother's milk and bonding. It was observed that the majority of post-natal mothers were mildly symptomatic or asymptomatic compared to symptomatic female patients from other specialities. This policy also led to an additional burden on the family as a dedicated family member was required to take care of the baby in a separate ward. Due to a constant shortage of beds for both mothers and babies, they were discharged separately to be bonded only after 2–3 days at their home thus adversely affecting the mother, baby and the family. To overcome this problem, it was planned to initiate the practice of rooming-in of newborns with mothers suspected to have COVID-19, awaiting reports in the post-natal ward. Logistically, there was a challenge to create a separate post-natal ward for COVID suspect mother–newborn dyads due to scarcity of staff, space and resources.

## Available knowledge

Understanding about the modes of transmission of the novel SARS-CoV-2 (severe acute respiratory syndrome coronavirus-2) is limited and still evolving. WHO<sup>1</sup> (World Health Organization) recommends that mothers with suspected or confirmed COVID-19 and their newborns should be allowed to remain together and practice skin-to-skin contact, kangaroo care and to practice rooming-in (keeping the post-natal mother and newborn together in the same room 24 h a day). Breastfeeding is strongly recommended, given its known advantages to both mothers and newborns. Mothers should be counselled that the benefits of rooming-in and breastfeeding substantially outweigh the potential risk of transmission of any infection. The benefits of rooming-in have been well described, and the associated skin-to-skin newborn care and breastfeeding promote optimal maternal and neonatal outcomes.<sup>2,3</sup> Practices during the pandemic need continuous evaluation in view of emerging evidence, to strike an optimal balance between the benefits of rooming-in and newborn safety.

## Specific aim

The smart aim of this project was to achieve rooming-in of eligible COVID-19 suspect mother–newborn dyads in the post-natal ward from a baseline of 0% to more than 90% over a period of 6 weeks.

## Methods

### Context

This quality improvement (QI) project was initiated in the obstetric unit of a public sector, tertiary care health facility with approximately 800–1000 deliveries per month, but during the COVID-19 pandemic due to travel restrictions and financial constraints, the number of deliveries was decreased by more than 50% in the months from April 2020 to December 2020. The

majority of women reporting to hospital were of unknown COVID report status. They underwent mandatory RTPCR for SARS-CoV-2 at admission and were managed in COVID suspect ward until their report was received.

The timeline of this project was from 1 October 2020 to 25 December 2020 including the preparedness and baseline assessment, intervention phase and the postintervention phase. The study subjects were mother–newborn dyads admitted to the COVID suspect ward till their RTPCR report for SAR-CoV-2 was available. The majority of these subjects were asymptomatic or mildly symptomatic for COVID-19 infection. The exclusion criteria included mothers who required respiratory support or supplemental oxygen and did not feel well enough to take care of their baby, mothers who had given birth to a stillborn or premature or a malformed baby and those whose newborns required nursery and NICU care.

### Baseline phase

As per the existing hospital policy, there was no rooming-in of COVID suspect mother–newborn dyads. A QI team was formed including obstetric faculty members, neonatologists, nursing officers and resident doctors. Total number of COVID suspect deliveries per month and the number of COVID suspect mother–newborn dyads who were eligible for rooming-in were recorded. This was done to assess the feasibility and logistics required to implement the idea of transferring COVID suspect post-natal mothers with their newborns to one ward. The team held multiple meetings to understand the likely challenges and obstacles in achieving the goal. The team did a root cause analysis using a Fishbone diagram<sup>4</sup> to identify the modifiable factors and possible solutions (Fig. 1). This was followed by sensitisation and advocacy among health-care providers from other specialities and preparation for implementation of change ideas.

### Intervention phase

After root cause analysis, the team tested a series of interventions in multiple PDSA cycles (Table 1) starting in the third week of October 2020. The existing arrangement of one common suspect ward for all male patients and one for all female patients from all specialities including post-natal mothers was changed to the new arrangement of one ward designated as 'post-natal' ward to receive COVID suspect mother–newborn dyads with caretakers, and another ward as 'General' ward to receive all male and female COVID suspect patients of other clinical specialities awaiting reports. Sensitisation of nursing officers and resident doctors and neonatologists posted in COVID suspect labour room regarding this new initiative was done. Health-care workers and nursing officers counselled mothers about safe rooming-in practices, which included handwashing, wearing a mask while breastfeeding or providing newborn care and maintaining physical distancing of approximately 1 m from babies at other times. All babies born to COVID suspect mothers underwent RTPCR testing via nasopharyngeal (NP) swab within 24–48 h of birth as per hospital policy. The mother–newborn dyads were either discharged directly from the post-natal ward or shifted to a COVID negative or COVID positive ward as per their report received.

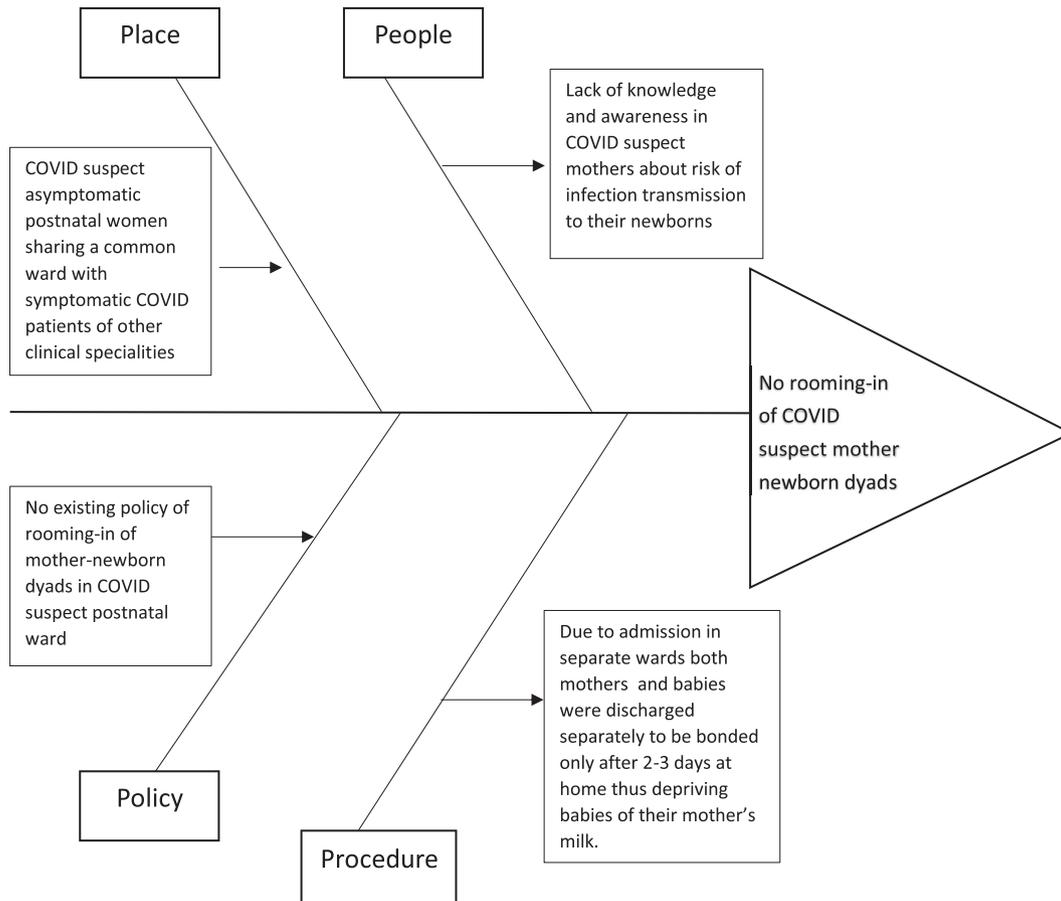


Fig. 1 Fishbone analysis.

**Analysis**

After ensuring readiness of the resources, it was decided to room-in only COVID-19 suspect mother–newborn dyads with vaginal deliveries in order to avoid the difficulties associated with the care of post-caesarean delivery patients. The first mother–newborn dyad was transferred to the post-natal ward on 23 October 2020. After achieving 85% rooming-in of newborns of post-natal mothers with vaginal deliveries, the team planned to room-in post caesarean mothers. The quantitative approach to study the data and the improvement process involved a run chart (Fig. 2).

For assessment of unintended impact of the interventions, which in this study was mother-to-child transmission of SARS-Cov-2 infection, the infants were followed through telehealth after 4 weeks of hospital discharge by a resident doctor.

**Measures**

We calculated the percentage of COVID suspect eligible mother–newborn dyads roomed-in (numerator) among the total eligible COVID suspect mother–newborn dyads (denominator) daily as a ‘process measure’. The percentage of newborns who were roomed-in getting infected with COVID-19, out of the total newborns roomed-in, in the COVID suspect ward, was the ‘outcome measure’. The task of data collection was assigned to the nursing

officer posted in the COVID suspect post-natal ward. Data were collected from the ward admission registers and shared with the team online. The data collection was done daily and was evaluated weekly so that required interventions could be initiated timely.

**Postintervention phase**

The data was followed at regular intervals for further 1 month. All the interventions were continued and adopted. Decline in the number of mother–newborn dyads roomed-in to 85–86% was seen on 2 days due to non-availability of a caretaker to look after the newborn in some of the un-booked patients admitted through emergency in the post-natal ward.

**Ethical consideration**

This work is exempted from clearance from the institutional ethics committee as it involves the use of existing data, documents and records. These sources are publicly available, and the information was recorded by the investigators in such a manner that subjects cannot be identified directly or through identifiers linked to the subject.

**Table 1** Plan Do Study Act (PDSA) cycles for implementation of change ideas

PDSA cycle no.	Plan	Do	Study	Act	Remarks
PDSA 1	To transfer eligible mother–newborn dyads to post-natal ward and all other patients to general ward.	<ol style="list-style-type: none"> <li>All concerned teams were informed.</li> <li>All eligible COVID suspect mother–newborn dyads were transferred to post-natal ward along with a caretaker.</li> <li>All COVID suspect male and female patients of other specialities were shifted to a general ward.</li> </ol>	<p>At the end of the first PDSA cycle, only three eligible COVID suspect mother–newborn dyads were shifted to the post-natal ward.</p> <p>Problems identified:</p> <ul style="list-style-type: none"> <li>Mothers and their families were informed of the shifting of babies with them in COVID suspect ward only at the time of their transfer out of labour room.</li> <li>Non-availability of a female relative to stay with the baby continuously in ward as male attendants were not allowed as per hospital policy.</li> </ul>	Adapted	There was need to provide timely information and detailed counselling to the mother and family.
PDSA 2	To prepare and counsel the pregnant woman and her family on the new arrangements timely and in detail.	<p>The nursing officers and residents counselled the pregnant woman and her family at the time of admission to the labour room about the new arrangements.</p> <p>Display of posters in wards supporting breastfeeding and explaining the importance of hand hygiene in newborn care.</p>	<p>Percentage of rooming-in of COVID suspect mother–newborn dyads increased from a baseline of zero to 68.75% by the end of 1 week.</p> <p>Problems identified:</p> <ul style="list-style-type: none"> <li>Unregulated flow of relatives in ward and many were without masks.</li> <li>Inability of the same caretaker to stay continuously with the baby throughout day and night.</li> <li>Nursing officer was unable to differentiate between the caretakers and other visitors.</li> </ul>	Adapted	There was need to provide identification cards to caretakers.
PDSA 3	To provide caretakers with identity badges and ensure their availability.	<p>Steps taken:</p> <ul style="list-style-type: none"> <li>Identification of babies and mother beds by pasting bedside stickers</li> <li>12 h shift allowed for caretakers to stay in post-natal ward</li> <li>Disposable gowns and masks and Identification badges provided to caretakers.</li> </ul>	<p>Both the mothers and caretakers were comfortable. The nursing officers had better control in the ward.</p> <p>The data studied at the end of third PDSA cycle on 6 November showed an increase in rooming-in of COVID suspect mother–newborn dyads to 84.61%.</p>	Adopted	There was a need for timely discharge of newborns by neonatologist for rapid turnover of patients.

*(Continues)*

**Table 1** (Continued)

PDSA cycle no.	Plan	Do	Study	Act	Remarks
			The reason for failure in some was due to delay in discharges of newborns by neonatologists resulting in non-availability of vacant beds to shift mothers from labour room.		
PDSA 4	To increase coordination between labour room teams, post-natal ward teams and neonatologists for timely discharge of newborns.	Steps taken: <ul style="list-style-type: none"> <li>Fixed timing of clinical rounds of neonatologists and baby discharges between 10 and 11 am.</li> <li>Labour room team to inform post-natal ward team regarding potential transfers of mother–newborn dyads at the end of every shift.</li> <li>Post-natal ward team to inform neonatologists if vacant beds were not available in post-natal ward.</li> </ul>	During this period, the rooming-in rate of mothers following vaginal delivery fluctuated between 70% and 88%. The variation depended upon the number of mothers following vaginal deliveries as compared to caesarean delivery in the post-natal ward.	Adopted	The team decided to room-in mother–newborn dyads following caesarean deliveries also.
PDSA 5	To start rooming-in of COVID-19 suspect mother–newborn dyads of caesarean deliveries.	Shifting of newborns of caesarean deliveries with COVID suspect mothers in post-natal ward.	At the end of 4 weeks, an improvement was observed in rooming-in of COVID suspect mother–newborn dyads from a baseline of zero to 90%. Problem identified: Problems faced by post-operative mothers to feed their newborns.	Adopted	Lactation support was provided by lactation counsellors from Milk Bank (Comprehensive Lactation Management Centre) at our health facility. The team continued with the interventions in the sustenance phase.

## Results

### Process measure

At the beginning of this project, there was no rooming-in of mother–newborn dyads in the COVID suspect ward but after the implementation of the change ideas, there was a significant increase. Data were calculated every day from the first day of start of intervention on 23 October 2020. A run chart was plotted with the collected data (Fig. 2).

By the end of first PDSA cycle, only 3 out of 20 eligible COVID suspect mother–newborn dyads were roomed in, increasing rooming-in rate from a baseline of 0–15%. Problems identified were the lack of preparedness of the family to provide a caretaker to stay with the newborn round the clock in the post-natal ward. This was due to lack of proper and timely counselling of COVID suspect mothers and their families. This was rectified in the second PDSA cycle resulting in an increase in rooming-in of COVID suspect mother–newborn dyads from 15% to 68.75%. These

interventions were adopted and further issues related to the caretakers were identified and resolved in the third PDSA cycle. These included a need to have two caretakers per newborn to do a 12-h shift.

The data analysed at the end of third PDSA cycle showed a rooming-in rate of 84.61%. It was realised that there was a need for timely discharge of newborns by the neonatologists for a faster turnover of beds. This was worked out in the fourth PDSA cycle, but the rooming-in rate fluctuated between 70% and 88% depending on the proportion of vaginal deliveries in ward as compared to caesarean deliveries each day. In the fifth PDSA cycle, rooming-in of COVID-19 suspect mother–newborn dyads of caesarean deliveries was also started to achieve our goal of 90%.

### Outcome measure

During the study period, a total of 439 eligible mother–newborn dyads were roomed-in, in the COVID suspect post-natal ward.

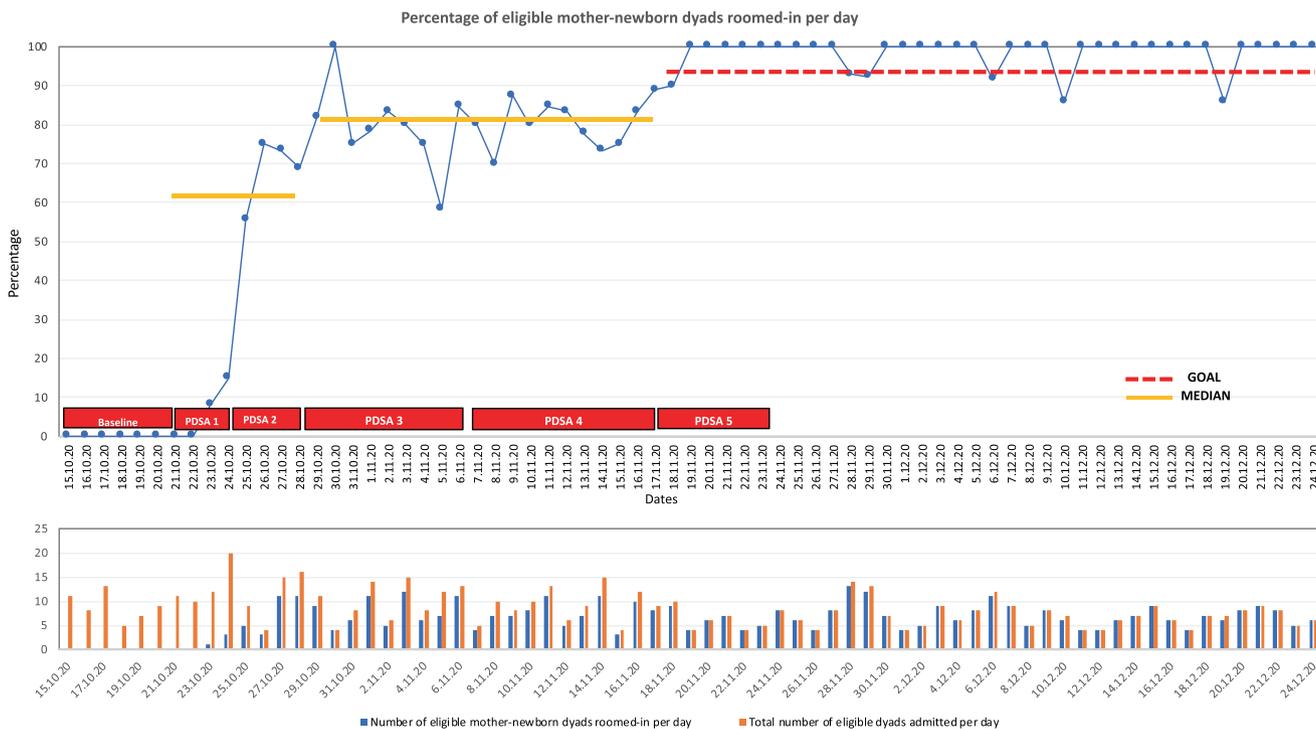


Fig. 2 Run chart for daily percentage of COVID suspect eligible mother–newborn dyads roomed-in.

Out of all these, 12 asymptomatic mothers were reported as COVID-19 positive. Two babies born to these COVID positive mothers were found positive. On telehealth follow-up of the newborns including those of COVID-19 positive mothers, all babies were reported to be well.

**Discussion**

**Summary**

During the COVID-19 pandemic, mothers awaiting COVID reports were shifted to a separate ward without their newborns in the post-natal period due to constraints related to space and workforce. In most of the facilities, the departments were merged and redivided into zones; COVID positive, suspect and negative zones across gender lines. Issues like need for privacy and emotional support by post-natal mother–newborn dyads went unaddressed. This deprived them of breastfeeding and bonding.

Skin-to-skin contact and breastfeeding in the first hours of life have many benefits and are associated with reduced risk of post-partum haemorrhage, decreased rates of post-partum depression and anxiety, and successful establishment of breastfeeding.<sup>5–7</sup> The impact of post-partum separation of mother–newborn dyad on the mental health of mother and their newborns can be enormous. QI methodology helped us resolve this problem with the support from other clinical specialities.

There are several strengths of this project including the aim of implementing evidence-based health-care practices of rooming-in, involvement and consensus building among various stakeholders including other clinical specialities, collecting robust

background data to convince others regarding the feasibility of implementing change idea of having a separate ward for mother–newborn dyads and use of an interactive WhatsApp platform for an effective communication.

**Interpretation**

Studies emphasise direct breastfeeding with proper hand hygiene and use of face mask by COVID suspect or positive mothers while nursing their babies.<sup>8</sup> The evidence of confirmed vertical transmission of COVID-19 from the mother to newborn postnatally is low quality.<sup>9,10</sup> In comparison to published case reports, case series and a systematic review and metaanalysis,<sup>11</sup> the vertical transmission rate in the present study was higher at 16% (2 out of 12 neonates born to COVID positive mothers) but all newborns did well later in the neonatal period.

Moreover, in the metaanalysis published by Kotlyar et al.,<sup>11</sup> most of the studies had a high or moderate risk of bias and the results were synthesised from case reports and case series. The caesarean percentage in their study was 73%, whereas in our project majority (79.2%) of women had normal vaginal delivery. The 3.2% vertical transmission rate has been documented in a diverse set of COVID-19 positive pregnancies (mild, moderate as well as severe disease); whereas the present study was a cohort of asymptomatic pregnant women.

**Limitations**

Regarding the limitations of this QI initiative, it was realised that the team could have assessed the successful establishment of

breastfeeding as an additional outcome measures to capture the actual impact of rooming-in.

We did not have the baseline data on the percentage of newborns who tested positive after being born to COVID positive mothers before the initiation of this project, when they were kept separate from their mothers. So the impact of the intervention of rooming-in on the newborn positivity rate cannot be gauged.

## Conclusion

Pandemics like COVID-19 overwhelm the health system and are bound to spring unforeseen complex problems. The basic steps and principles of point of care QI methodology of making a team, analysing the problem, implementing change ideas by multiple PDSA cycles and following the process and outcome measures can solve any problem however complex it is. In interdisciplinary issues, advocacy of all those involved in the planning and implementation of change ideas, are helpful in incorporating known evidence-based practice into the daily routine even in these challenging times of COVID and make a significant difference in the patient outcome. This initiative had a positive impact on the post-natal mothers who could breastfeed and bond with their newborns. The staff felt satisfied and happy by achieving better outcomes for their patients and gained confidence in their QI skills. This study concludes and supports 100% rooming-in for healthy mother–newborn dyads who are suspected to have COVID-19 except if the mother is very sick and requires ICU care or if the baby is sick and needs to be in the neonatal ICU care. However, there is a need for long term follow-up of newborns that were roomed-in with their COVID positive mothers.

## Acknowledgements

The authors would like to acknowledge the cooperation of the nursing and medical staff in the study hospital.

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