An Integrative Research Review on Intraoperative Skin-to-Skin with Cesarean Section and Its Impact on Neonatal Adaptation

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Abstract

Skin-to-skin contact (STS) between mother and newborn has become the gold standard of care following delivery. The CDC defines skin-to-skin (STS) care as, "placing the infant directly on the mother or other caregiver in an effort to maximizes surface-to-surface contact." Benefits can include, breastfeeding initiation, stress reduction and thermoregulation (Centers for Disease Control and Prevention, 2020). Because of this, STS is recommended by the CDC immediately following delivery when mothers and newborns are medically stable. Past research has centered on the implementation and importance of STS following vaginal delivery or in the recovery room following cesarean section. Many providers have questioned the risks of intraoperative STS for the neonate and mother in terms of temperature stability, breastfeeding, maintenance of sterility and infection prevention. Current research explores intraoperative STS for mothers experiencing a cesarean section. This integrative research review, centered on exploring the benefits of intraoperative STS on neonatal outcomes. Neonatal outcomes included breastfeeding, temperature regulation, and admission to the neonatal ward. Findings concluded that women who had intraoperative STS were more likely to initiate and maintain breastfeeding compared to those who did not experience STS intraoperatively (Wagner, 2018). In addition, research indicated that newborns who had intraoperative STS maintained or increased temperature. Intraoperative STS was found to have no risk on infant thermoregulation (Billner-Garcia, 2018). Finally, conventional cesarean sections without intraoperative STS were found to have approximately double the admissions to neonatal wards compared to admission for those who experience intraoperative STS (Billner-Garcia, 2018).

Research Question

In mothers who had a cesarean section what is the effect of intraoperative skin-to-skin on neonatal adaptations compared with no intraoperative skin-to-skin?

Neonatal adaptations include temperature regulation, breastfeeding outcomes, and newborn admission to neonatal ward.

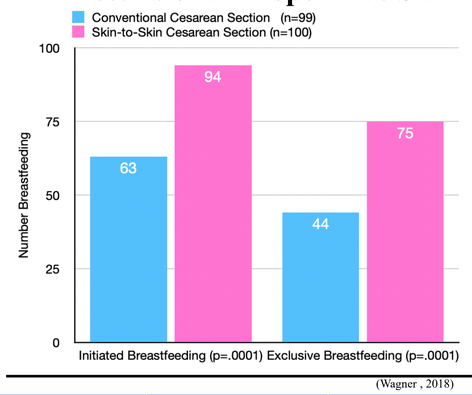
Methods

Inclusion Criteria:
- Studies that addressed intraoperative skin-to-skin in cesarean sections.
- Studies that compared traditional caesarean sections with cesarean sections that included intraoperative STS.
- Experimental Research Design Studies that were conducted in the period of 2015-2020, including systematic reviews or primary sources of original research.
- Any race or obstetric history.
- Subjects gave informed consent for participation.
- Assessments on neonates and mother's with cesarean section.
- Studies with at least one author as a nurse, certified nurse midwife, or medical doctor specializing in maternal-fetal or neonatal medicine.
- Studies from the United States or comparable level of care.

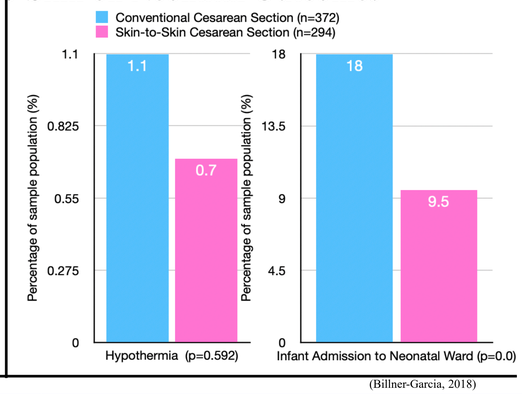
Exclusion Criteria:
- Studies that were published as abstract only.
- Studies that were published before 2015.
- Studies that did not include implementation of intraoperative skin-to-skin
- Studies that focused on maternal outcomes only.

Search Process:
- Sources: CINAHL, PubMed, Medline with full text.
- Keywords used independently and grouped during literature search: skin-to-skin contact, skin-to-skin, skin to skin, Kangaroo care, intraoperative, cesarean section, or c-section or c/s, breastfeeding, or lactation, thermoregulation, temperature, neonatal outcome, baby or neonate or newborn.
- Systematic review of quantitative studies (1 observational, 4 retrospective chart reviews, 1 pilot quasi-experimental review, 2 RCTs, and 2 prospective designs) and qualitative studies (1 phenomenological interview, 1 medical ethnography hospital interview, and 1 ethnography interview at 6 weeks pp).
- 7 articles were reviewed by 2 authors, 2 were excluded based on publication date and lack of information regarding neonatal adaptations and intraoperative skin-to-skin.

Results of Intraoperative Skin-to-Skin on Neonatal Outcomes



(Wagner , 2018)



(Billner-Garcia, 2018)

Study (Authors)	Design (Framework)	Sample	Variables/Measures	Results	Summary
Billner-Garcia, 2018	Design: • Quantitative, descriptive, retrospective Framework: •Deidentified data was created from the electronic medical record (EMR) of all eligible mothers and their infants. • Infant's axillary temperatures were recorded before and after intraoperative skin-to-skin (STS). • Intraoperative STS was initiated after the 5 min APGAR score and concluded post closure of the cesarean section or if the mother asks to conclude sooner. • The APGAR determined neonatal stability in order to participate in intraoperative STS	• n= 91 • Mean Maternal age = 35 (SD=4.2) • Infant gestational age (IGA) Mean = 39.4 weeks • IGA Range = 38-41 weeks and 5 days • Participants needed to be full-term singleton infants of women 18 years and older. Birth had to be elective cesarean section ≥ 38 weeks to ≤ 42 weeks' gestation • Infants with known or suspected complications (ex. Congenital defects requiring intensive care, resuscitation efforts at birth, and 5 min APGAR scores of ≤ 7) were excluded from the study	• Infant APGAR scores at 5 min • Mean APGAR 5 min= 9 • Range APGAR 5 min=9-9 • Skin-to-skin (STS) contact in minutes Mean+ 13.6 (SD=5.4) • Infant Temperature change T1-T2 ºC. Temperature was taken axillary using digital thermometers to minimize risk of rectal perforation. • Infant weight in grams. Range= 2,720-4670 g, Mean= 3,566 g (SD=401.83)	Key findings r/t Neonatal Outcomes: • Infants were deemed eligible for the study based on 5 min APGAR scores. All infants that had a score of ≤ 7 were excluded. All infants included in this study had a 5 min APGAR score of 9. All of the infants included were stable. • Total STS times were extracted from the EMR • Infant Temperature – Temperature from T1 and T2 remained the same in 21% of the sample. T2 increased in 35% of the infants. Temperature decreased in 44% of infants and only 10% had an axillary temperature less than 36ºC. Over half of the sample size either increased in temperature or stayed the same in the result of STS intraoperatively.	• Overall study quality rating: III (Fair) This study supports the continuation of intraoperative STS by demonstrating that infant temperature was maintained or increased for most participants. But this study does not provide data describing the statistical significance of these findings. • This study may push other hospitals to make changes to traditional practice and offer STS in the OR. Significance for Nursing Care and Research: • Facilitating or offering Intraoperative STS for mothers is a great intervention for nurses to implement. • Neonatal hypothermia is a major concern for newborns. Originally there have been concerns of neonatal hypothermia during intraoperative STS. The findings of this study demonstrate that most infant temperatures rose or remained the same with intraoperative STS. • All healthcare providers should be educated about STS. • Should be knowledgeable of facility policy regarding neonatal hypothermia and the procedures related. • Clinical leaders should develop STS guidelines to promote higher rates of intraoperative STS. • STS occurrences can be increased by educating mothers on maternal and neonatal benefits of Intraoperative STS, throughout the pregnancy and at birth.
Gregson, 2016	Design: • Randomized control study to examine the effects of immediate STS within the operating room on breastfeeding rates at 48 hours Framework: • Participants were randomly assigned to one of two groups: intraoperative STS or delayed STS once operation was complete. • Intraoperative STS group – at birth in the intraoperative room, the newborn was placed STS in prone position on mother's chest, mother was encouraged to keep baby STS as much as possible. • Control group – received STS after operation completion • Breastfeeding rates were then measured via patient hospital records and questionnaires completed.	• n= 369 • Random assignment of participating women into one of two groups – immediate intraoperative STS (n = 182) (mean age 34.0 years) or delayed skin-to-skin once operation was complete (n = 187) (mean age 33.2 years) • All participants had an elective cesarean at ≥ 37 weeks' gestation and were a singleton pregnancy • All participants were chosen based on choice to breastfeed at birth	• Breastfeeding rates at 48 hours (primary measure) • Additional measures • feeding methods at 10 days and 6 weeks after birth • admission to neonatal unit • length of time initial STS after birth was performed in first 24 hours • women's experiences	Key findings: • Both groups were analyzed for breastfeeding rates at 48 hours after birth. • Intraoperative STS group had a 5% greater rate of exclusive breastfeeding (88%) compared to the control group at this time (83%) (p = 0.25) • Groups were analyzed again for breastfeeding rates at 10 days • Intraoperative STS had 69% while the control group has 66% (p = 0.74) • Groups were analyzed a third time at 6 weeks • Study group had 53% while the control group had 46% (p = 0.44) • Correlation between length of time of STS and feeding method at 48 hours and 6 weeks was also significant • At 48 hours participants who had STS < 8 hours had 94% of infants breastfeeding, those who had 8-12 hours of STS had 97% of infants breastfeeding, and those who had > 12 hours of STS had 100% breastfeeding (p = 0.04) • At 6 weeks participants who had STS < 8 hours had 58% of infants breastfeeding, those who had 8-12 hours of STS had 36% of infants breastfeeding, and those who had > 12 hours of STS had 56% breastfeeding (p = 0.003). • Thus, results concluded that, although not statistically significant, those who had intraoperative STS did have higher rates of breastfeeding at 48 hours, 10 days and 6 weeks compared to those in the control group. In addition, findings concluded that there is a correlation between length of STS time and rates of breastfeeding at 48 hours and 6 weeks; women with longer STS time had higher rates of breastfeeding at 48 hours and 6 weeks.	• Overall study quality rating: II (Good) This study provides evidence comparing groups who had intraoperative versus traditional STS with a cesarean section. Findings conclude that the study group that participated in intraoperative STS did have higher rates of breastfeeding than the group that did not. This information was straightforward and concise and identified that even though the findings were not statistically significant any increase in breastfeeding rates is positive due to the immense benefits for the newborn. Significance for Nursing Care and Research: • Intraoperative STS between mother and baby is associated with a trend in better breastfeeding outcomes and this practice can be safely performed in the operating room. • Nursing staff should be trained on implementation of intraoperative STS and ensure safety for mother and baby during the process. • Further research should investigate the association between intraoperative STS and the impact on breastfeeding outcomes.
Posthuma, 2016	Design: Retrospective Cohort Study Framework: • This study compared a Conventional Cesarean Section (CCS) to a more "natural" cesarean section or "Skin-To-Skin" Cesarean Section (STSC). • STSC is performed much like a conventional CCS, but during the operation the sterile drape is lowered allowing the mother to observe the birth. The surgeon double gloves prior to lowering the drape in order to regain sterility. Once the infant is born, they are placed on the mother's bare chest. Before continuing with the surgical procedure the surgeon removes the exterior pair of gloves and the drape is raised and therefore sterility is restored. If no neonatal distress is present skin-to-skin (STS) is continued for as long as possible, during the duration of the STSC is preferred. • Maternal and neonatal outcomes were compared in CCS vs STSC	• n=650 • 44% of the women in the study had a STSC and 56% had a traditional CCS • STSC(n=285) and CCS(n=365) • STSC were only performed on women who were greater than 37 weeks and were having elective cesarean sections. • The women and the infants were not eligible for STSC if either were in distress or if the mother was under general anesthesia • Data from the women and their infants were extracted from electronic hospital records. Information was stored anonymously and deidentified in a separate file	Maternal outcomes: • Infection • Blood loss • Maternal Admission • PACU recovery time • Total Surgical time *Neonatal outcomes • Hypothermia (n, %) • STSC: n=2 (0.7%) • CCS: n= 4 (1.1%) • p-value= 0.592 • APGAR Score < 7 at 5 min (n, %) • STSC: n= 7 (2.4%) • CCS: n=6 (1.6%) • Admission to Neonatal Ward (n, %) • STSC: n= 28 (9.5%) • CCS: n=75 (18%) • p-value= 0.0	Key findings r/t Neonatal Outcomes: • Fewer neonates were admitted for suspected infection proceeding STSC. This may be r/t delayed pediatrician intervention and allowing the infant more time to self-regulate before intervention was needed. During STSC, infant is only handed over to pediatrician if neonate is in distress. • STSC decreased need for antibiotic treatment in neonates. • Infants who were born and participated in a STSC, had reduced occurrences of hypothermia. • Infants were more likely to breastfeed which benefited mother and infant. • Increased mother-infant bonding.	Overall study quality rating: II (Good) This study showed no increased maternal or neonatal adverse effects when comparing STSC and CCS. Significance for Nursing Care and Research: • Skin-to-skin cesarean sections or "natural" cesareans are a wonderful way to increase maternal and paternal bonding with their infant compared to a CCS. • Infants showed improved outcomes in a reduction of admissions to the neonatal unit, decreased rates of sepsis or signs of infection, increased likelihood of breastfeeding, and decreased rates of hypothermia. • This study shows that STSC is a great intervention to increase the involvement of the parents as they are usually no the focus during a CCS
Wagner, 2018	Design: • Retrospective study, case-control design Framework: • Participants charts were reviewed retrospectively • Participants were placed into two groups – those who experienced intraoperative STS and those that did not. • Researchers reviewed patient need for analgesics and anxiolytics with intraoperative STS compared to group that did not experience intraoperative STS. • Researchers also reviewed outcomes related to breastfeeding rates.	• N= 199 • Two groups were examined – women who received intraoperative STS (n = 100)and those who did not (n = 99) • Women who were included were 18 years and older and were deemed medically stable • Newborns were 37-42 weeks' gestation, with Apgar's > 7 and were deemed medically stable • Participants charts were randomly selected for review	• The association between STS in the operating room and administration of analgesics and anxiolytics following a cesarean section • Sedative medication usage by mother • *Breastfeeding frequency – number and	Key finding r/t neonatal outcomes: • Women who experienced intraoperative STS were 9.40 timely more likely to initiate breastfeeding compared to woman who did not experience intraoperative STS (p = 0.0001) • Women who experience intraoperative STS were 3.25 times more likely to exclusively breastfeed compared to those that did not experience intraoperative STS (p = 0.0001) • 94% of women who experienced intraoperative STS breastfed compared to 63% of women who did not experience intraoperative STS breastfed. • At discharge, 75% of women who experienced intraoperative STS were exclusively breastfeeding compared to 44% who did not experience intraoperative STS. • Thus, findings related to neonatal adaptation and outcomes for this study conclude that intraoperative STS does impact breastfeeding outcomes positively.	• Overall study quality rating: II (Good). This study provides evidence that supports the idea that intraoperative STS for mothers with cesarean sections improves breastfeeding initiation and exclusivity for infants. This study also discussed maternal need for analgesics and anxiolytics, but this was not the focus of this research project. So conclusions, center on breastfeeding outcomes for this study. Significance for Nursing Care and Research: • Results of this study indicate that STS in the intraoperative suite positively impacted breastfeeding outcomes for women and newborns. • These results further support the need for early STS and the growing body of research discussing intraoperative STS and positive neonatal outcomes.
Systematic Review	**Purpose of Review, Search Strategies and Keywords**	**Variables and Measures**	**Number and Description of Article Types**	**Results**	**Summary**
Frederick, 2020	Purpose: to describe the current state of research on intraoperative STS, discuss benefits for mother and baby and the increase of physician awareness on benefits and risks of this practice. Search Strategies: •Databases: CINAHL, PubMed and Embase •Search terms/keywords: skin-to-skin, cesarean, kangaroo, and intraoperative Inclusion criteria/Sample population: • Considered quantitative and qualitative research studies focused on intraoperative STS (10 quantitative and 3 qualitative) • Included articles involved STS in the operative room • Excluded articles involved STS in the recovery room • Population include mothers giving birth by cesarean section who had STS intraoperatively	• Description of total contact time of STS intraoperatively compared with postoperatively to explore differences of each • Maternal outcomes – pain anxiety, comfort, stress and oxytocin • *Neonatal outcomes – temperature, Apgar scores, oxygen saturation, heart rate (HR), safety and admission to the NICU. • Breastfeeding outcomes	Number of articles: • 13 articles total include • 10 quantitative • 3 qualitative Description of Article Types: • Quantitative – 1 observational, 4 retrospective chart reviews, 1 pilot-quasi-experimental review, 2 RCTs, and 2 prospective designs. • Qualitative – 1 phenomenological interview, 1 medical ethnography hospital interview, and 1 ethnography interview at 6 weeks pp	Key Findings r/t Neonatal Outcomes: • Temperature – no significant difference in neonatal temperature between intraoperative and postoperative STS. One study found lower neonatal temperature with intraoperative STS, but values were considered within normal range (p= 0.029). • Apgar scores – scores at 1 minutes and 5 minutes were similar in intraoperative and postoperative STS. One study found that infants who did not receive intraoperative STS had lower Apgar scores (p = 0.02). • Oxygen saturation and HR – no significant difference reported. • Safety – no statistical significance reported. • Admission to NICU – no significant difference in admission between intraoperative and postoperative STS. • Breastfeeding outcomes -- woman who experienced intraoperative STS were found to be more likely to initiate breastfeeding and continue to breastfeed exclusively following discharge (p = 0.0001).	Provides evidence related to expected outcomes of newborn related to STS. Evidence concludes that intraoperative STS did not negatively impact neonatal physiological adaptations during the immediate post-birth period. Findings did conclude a statistically significant relationship between intraoperative STS and breastfeeding. Therefore, results indicate that intraoperative SSC is a beneficial and safe intervention following cesarean birth. Thus, healthcare staff should initiate and support intraoperative STS for alert and stable mothers and newborns and vigilant monitoring should be maintained.

Discussion

Strengths:
- Evidence concludes that the implementation of intraoperative skin-to-skin does not pose risk for impaired thermoregulation. Most neonates in the Billner-Garcia (2018) study were found to have maintained or increased temperature with intraoperative skin-to-skin.
- Intraoperative skin-to-skin reveals itself to be a strong promoter of breastfeeding initiation and maintenance. The Wagner (2018), Gregson (2016) and Frederick (2020) studies all mention the benefits of intraoperative STS on breastfeeding outcomes.
- The research studies utilized presented both maternal and neonatal outcomes related to intraoperative skin-to-skin. Conclusions focused on the findings that intraoperative skin-to-skin posed no significant risks to the infant or mother compared to delayed skin-to-skin. This supports the implementation of intraoperative skin-to-skin.

Limitations:
- Cesarean section practices and policies may vary across countries and health systems.
- Variations in how intraoperative skin-to-skin was performed differ widely.
- It's difficult to come to conclusions when research studies discussed multiple maternal and neonatal outcomes related to intraoperative skin-to-skin.
- Generalizability is limited as not all the studies were conducted in the U.S. and nursing care differs,
- It's difficult to draw conclusions as not all research studies yielded statistically significant results for neonatal adaptation and outcomes.

Conclusions

Level of evidence for entire body of research:
- Evidence provided by these articles supports the implementation of intraoperative skin-to-skin for mothers experiencing a cesarean section as there was found to be no negative impact on neonatal adaptation and neonates often benefitted with breastfeeding outcomes.
- Quality rating of these studies ranged from levels II-III, as not all studies included statistically significant data. However, all studies did mention that despite lack of statistically significant values, any slight increase in neonatal adaptations or outcome is valuable.

Nursing recommendations:
- Intraoperative skin-to-skin was found to have a positive effect on breastfeeding frequency and outcomes so nursing staff and providers can implement this practice with cesarean section.
- Future studies can explore the training and utilization of nursing staff for intraoperative skin-to-skin.
- Exploration of inclusion of other providers such as Lactation Consultants during intraoperative STS could also be investigated.

References

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