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Safety and feasibility of skin-to-skin care for surgical infants: A quality improvement project☆☆☆☆

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ABSTRACT

Background: Skin-to-skin care (SSC) for infants improves physiologic stability, pain perception, brain development, parental bonding, and overall survival. Using quality improvement (QI) methodology, this project aimed to increase SSC for surgical infants in the neonatal intensive care unit (NICU).

Methods: A multidisciplinary working group composed of key NICU stakeholders instituted a needs assessment querying perceptions and concerns about SSC. Based on survey results, multiple system level interventions were implemented. Data for surgical infants receiving SSC during hospitalization were tracked over time using the electronic health record.

Results: Overall, 315 infants requiring a surgical consult were admitted to the NICU in the first 12 months of the project. After six months, SSC rates in this group increased from 51% to 60.5% ($p < 0.01$) and were sustained for 12 months. After one year, nursing staff reporting that they were somewhat to very comfortable providing SSC for surgical infants increased from 44% to 75% ($p = 0.001$) and the percent of nurses providing SSC for a surgical infant increased from 12% to 37% ($p = 0.001$). Inadvertent extubation did not significantly increase after implementation of the QI project.

Conclusions: Using QI methodology and multidisciplinary engagement, SSC was integrated safely into the routine care of surgical infants in the NICU.

Level of evidence: Level V.

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Skin-to-skin care (SSC) [1] is placement of an infant in the upright prone position, skin-to-skin and chest-to-chest with an adult [2,3]. When combined with exclusive breastfeeding, early discharge, and close follow-up at home, the therapy is termed Kangaroo Mother Care [4]. This practice was first developed in Bogotá, Columbia in the 1970's in response to limited resources for premature infants [5]. Since then,

SSC has proven to improve multiple facets of infant health including physiologic stability, brain development, state regulation, and pain perception [1,2,6–10]. Furthermore, SSC is associated with improved breast-feeding rates, parental/infant attachment [1,2,6], and decreased likelihood of nosocomial infections, decreased length of stay, decreased readmissions and lower neonatal mortality [1,2,8]. Currently, the American Academy of Pediatrics [11] and the World Health Organization [4] endorse SSC as a standard of care.

Multiple system-level barriers prevent routine SSC for infants in the neonatal intensive care unit (NICU). A previous systematic review of barriers and enablers of SSC revealed that most barriers are resource-related, including the facility environment, negative impressions of staff attitudes, lack of help with practice, and low awareness of the role of SSC in infant health [12]. These findings underscore the importance of multidisciplinary engagement between nurses, physicians and other NICU support staff to integrate SSC into the daily clinical routine for hospitalized infants.

Abbreviations: SSC, Skin-to-skin care; QI, Quality Improvement; NICU, Neonatal Intensive Care Unit.

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Our institutional policy considers SSC a therapy that should be offered to all families in the NICU. Surgical infants are at increased risk of nosocomial infection, perioperative pain and overall mortality. Currently, few studies have reported the implementation, safety and impact of SSC in surgical infants. The aim of this project was to identify baseline rates of SSC for surgical infants and to increase overall utilization through multidisciplinary engagement and quality improvement (QI) methodology.

1. Methods

1.1. Setting and context

This QI project was instituted at Nationwide Children's Hospital in Columbus, Ohio, a quaternary care pediatric referral center with 476 inpatient beds, 114 of which are dedicated NICU beds. The general pediatric surgery service has 16 attending surgeons performing over 4000 procedures annually. Several series of Plan-Do-Study-Act (PDSA) cycles with multiple interventions and tests were completed during the course of this project.

1.2. Interventions

A multidisciplinary team that was composed of key clinical stakeholders in the NICU, the surgeons, neonatologists, nurses, nurse practitioners, occupational and physical therapists, respiratory therapists, and QI specialists was first developed and convened in December 2015. The goal of the group was to increase the number of surgical infants in the NICU receiving SSC during hospitalization. A surgical patient was defined as any infant who received a general pediatric surgery consult during NICU admission. Of note, the QI project also included infants who ultimately did not undergo surgery. An example would be a premature infant with medically managed necrotizing enterocolitis that required a surgical consultation but did not ultimately require a surgical intervention. In a general sense, infants that may need

surgery have a higher clinical acuity and we noted initial resistance from nurses, respiratory therapists, neonatologists and surgeons to provide SSC for this population overall. Hence, the goal of the project was to apply our inclusion criteria broadly and encourage SSC for the entire surgical population, regardless of whether an infant ultimately underwent surgery.

The working group identified several key drivers as targets for improvement including NICU culture, nursing engagement, surgeon endorsement and parental empowerment (Fig. 1). The primary aim for the project was to increase the overall rate of SSC for surgical infants from a baseline of approximately 50% to 75%. An increase to 75% was selected as this would represent an overall 50% improvement and was agreed upon by the multidisciplinary group as an attainable goal.

1.2.1. Nursing engagement

An online survey was distributed to the NICU staff querying current perceptions and concerns regarding SSC (Table 1). Surveys were completed using software provided by Survey Monkey Inc. (San Mateo, California, USA). The SSC working group reviewed survey results and multiple system level interventions were developed. Several rounding tools were created to facilitate daily discussion of SSC for surgical infants. An order for SSC was made available in the electronic medical record, SSC was added to the NICU's postoperative handoff form and SSC was discussed during daily multidisciplinary surgery rounds in the NICU. Routine feedback to nursing staff and discussion of clinical barriers occurred during monthly staff meetings. Nurses were educated regarding the importance of documentation including details such as duration, tolerance, and unplanned extubation that might have occurred during SSC. Rates of SSC and unplanned extubations related to them were shared with the staff on a regular basis. A second follow up survey to gauge changes in NICU culture was also administered as shown in Table 1.

1.2.2. NICU culture & surgeon endorsement

The QI working group acknowledged that buy in from multiple levels of care within the NICU was vital to the success of the project.

Aim & Key Drivers

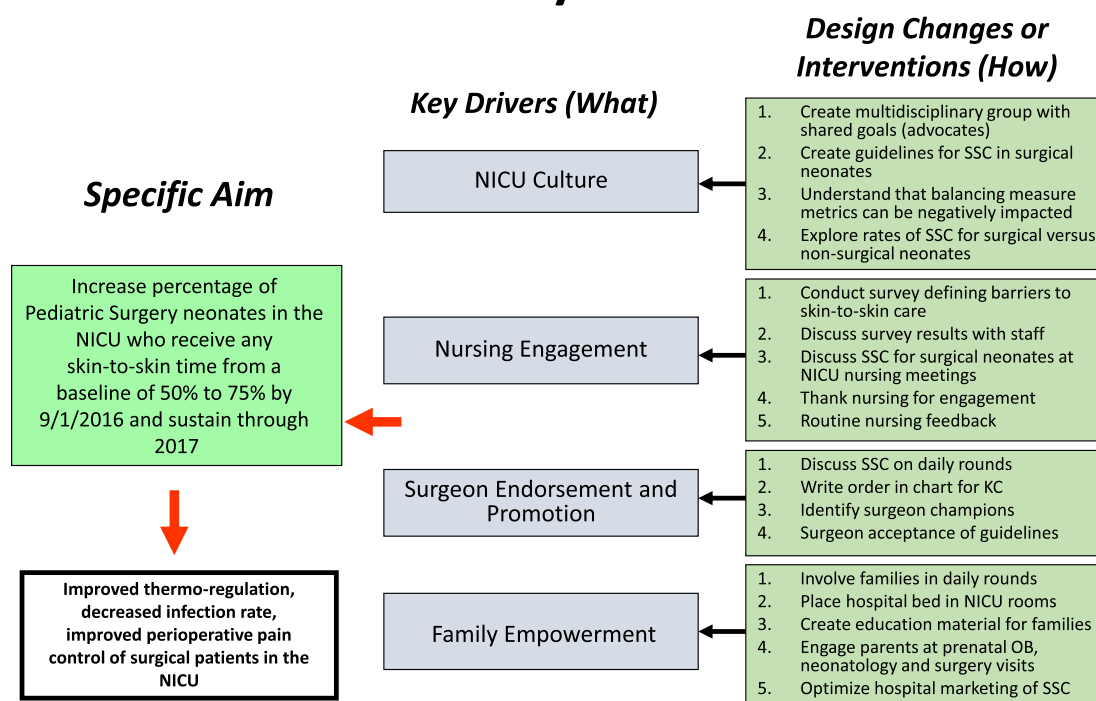


Fig. 1. Aim and key drivers diagram. Outline of engagement for instituting a quality improvement project to increase the number of surgical infants who receive skin-to-skin care.

Table 1

Neonatal intensive care unit skin-to-skin care staff survey.

Question	Answers	Pre-QI Project N = 86 (%)	Post-QI Project N = 48 (%)	p-value
How comfortable are you with patients being given SSC by parents in the first 24 h after surgery?	Very comfortable	5 (6)	9 (19)	0.04
	Somewhat comfortable	33 (38)	27 (56)	0.05
	NOT comfortable	48 (56)	12 (25)	<0.001
In the postop period, when would you recommend SSC in an intubated patient?	First 24 h	3 (4)	7 (15)	0.04
	24–48 h	39 (45)	24 (50)	0.72
	Beyond 48 h	44 (51)	17 (35)	0.02
How many surgical patients (within the past week) have you helped with SSC?	0	76 (88)	30 (63)	<0.001
	1	7 (8)	14 (29)	0.002
	2	2 (2)	0 (0)	0.54
	3	1 (1)	2 (4)	0.29
	4	0 (0)	0 (0)	-
	5 or more	0 (0)	2 (4)	0.13
What concerns do you have about surgical patients receiving SSC?	Patient comfort with the transition out bed	30 (35)	20 (42)	0.46
	Positioning the patient owing to the surgical site	25 (29)	12 (25)	0.69
	Patient decompensating on parent	15 (17)	5 (11)	0.32
	Patient will extubate or invasive lines will come out	15 (18)	10 (21)	0.65
What would help you feel more comfortable with providing SSC to the surgical patient?	Discussion EVERY day on surgical rounds	22 (25)	6 (12)	0.08
	Order in chart when surgeon felt SSC was safe with specifics about positions	42 (49)	22 (46)	0.86
	Education about transfers/positioning for surgical procedures	15 (18)	8 (17)	>0.99
	Help during transitions	6 (7)	12 (24)	0.007
What resources do you need to provide more SSC with the surgical patient?	Nursing Assistants	48 (56)	20 (41)	0.15
	Volunteers	4 (5)	3 (6)	0.70
	Respiratory Therapy Staff	60 (70)	21 (44)	0.005
	Improved Privacy	6 (7)	12 (25)	0.007
	Help moving furniture	16 (19)	11 (22)	0.65
Does SSC add a significant amount of work to the day?	Yes	34 (39)	21 (43)	0.72
	No	52 (61)	27 (57)	0.07

SSC: Skin-to-Skin Care.

All members of the working group agreed that guidelines for the safe institution of SSC for surgical infants were required. Guidelines for safe SSC in the surgical infant and establishment of inclusion and exclusion criteria for SSC were drafted by the group and reviewed by all 16 pediatric surgeons. Literature supporting SSC in the infant was widely circulated to the surgical faculty to facilitate engagement and understanding. The SSC multidisciplinary working group, the nursing staff, the NICU QI committee and the neonatology faculty further reviewed the surgical guidelines. After obtaining a consensus among the groups, a document listing the guidelines was widely distributed in the NICU wards and on hospital online portals (Fig. 2).

1.2.3. Family empowerment

NICU families were identified by the QI SSC working group as a key target stakeholder. Educational lectures/materials regarding SSC for surgical infants were provided to NICU family advocacy groups. A partnership with the Nationwide Children's Hospital marketing department was developed and digital signage in the NICU mother's room and in public areas of the hospital promoting SSC was created. SSC was highlighted on the hospital blog and during the hospital's annual TedX event [13,14]. Garments to facilitate SSC were also provided to NICU families. Guidelines for safe SSC in surgical infants were distributed within the Ohio Fetal Medicine Collaborative, a multidisciplinary group of experts in high-risk pregnancy care serving six hospital systems within the central Ohio.

1.3. Measures

The primary outcome of interest was the overall number of infants who received SSC at any time during hospital admission. This was extracted from prospective review of the electronic medical record. The primary balancing measure was inadvertent extubation during SSC, captured using a daily nursing handout and by querying the electronic medical record. Unplanned extubations are rigorously reviewed in our

NICU and tracked by our hospital quality improvement team. After any unplanned extubation, nurses, respiratory therapists and physicians have a huddle and a data collection sheet that is filled out. These data are input into our NICU quality improvement registry in real time making unplanned extubations an accurate balancing measure.

1.4. Study of the Intervention

The QI project was launched in January 2016. The electronic medical records were queried to identify infants who received SSC during hospitalization. Data collection occurred prospectively on a monthly basis, was compared to historical trends, and was fed back to NICU staff and surgical faculty.

1.5. Analysis

At our institution, statistical process control chart (SPC) software is readily available on our intranet. This was utilized to develop Shewart charts [15] and identify common and special cause variations in the process. Attributable data analyzed using percent chart (p-chart) was used to monitor rates of SSC over time. A Fisher's exact 2 proportion test was performed to compare survey responses before the QI project began and one year afterwards. A p-value <0.05 was considered significant.

1.6. Ethics

As part of patient quality improvement, this project did not require Institutional Review Board review according to Nationwide Children's Hospital policy.

2. Results

In the first year of the QI project, 315 infants requiring a surgical consult were admitted to the NICU. Data for SSC were available in the

Kangaroo Care Guidelines for General Surgery Infants

All general surgery infants are eligible for Kangaroo Care before and after their operation with the exception of the cases listed below. This includes the time immediately after they return from the OR.

Clinical Exceptions:

1. ECMO
2. New tracheostomy
3. Gastroschisis with silo or Schuster for omphalocele (after closure OK to kangaroo)
4. Tracheoesophageal Fistula

There is no increased risk of wound dehiscence with kangaroo care. Wounds should be cared for per routine nursing standards or per attending/wound care team directions.

There is no need for additional pain medications prior to kangaroo care. If the infant is currently receiving PRN pain medication in the first 24-48h post op, it is OK to time the dosing to coincide with a transfer for kangaroo care.

Fresh gastrostomy tubes/buttons should be bolstered with a roll of gauze (Corpaks) or several 2x2 gauze (Mic-key/buttons) prior to kangarooing in order to prevent tension and torque on the tube (see picture). In addition, place the infant with their legs tucked under them to off load weight on the new G-tube site.

If an infant has a chest tube, the surgery attending who performed the operation will determine whether kangaroo care is appropriate while the chest tube is in place.

If any tube (ET tube, OGT, JP drain, chest tube, or G-tube, IVs) is dislodged during kangaroo care, please document the event in EPIC and page the surgery fellow on call for further management if needed.

For infants who are on non-general surgery services (i.e. neurosurgery, ENT, urology), please discuss eligibility for kangaroo care with that service.

This project is supported by the Department of Pediatric Surgery at Nationwide Children's Hospital. For further questions regarding kangaroo care for the surgical infants and our ongoing QI project, please email Dr. Lorraine Kelley-Quon at Lorraine.Kelley-Quon@nationwidechildrens.org.



Fig. 2. Guidelines for Skin-to-Skin Care. NICU handout describing appropriate exclusion criteria, positioning and management of lines and tubes.

electronic medical record for all infants. Baseline rates of SSC increased from 51% to 60.5% ($p < 0.01$) by June 2016 and were sustained (Fig. 3) for one year from July 2016 to June 2017. Overall rates of SSC showed a preliminary but not statistically significant drop in the final six months of 2017. When examining a subgroup of surgical infants who did undergo surgery, rates of SSC did not significantly increase over time.

After one year, nursing staff reporting that they were somewhat to very comfortable providing SSC for surgical infants increased from 44% to 75% ($p = 0.001$, Table 1). Staff concerns regarding patient comfort with the transition out of bed to the parent and back remained common, at 35% and 42% ($p = 0.46$), respectively. An order in the chart when

surgeon felt SSC was safe with specifics about positions remained the most helpful intervention reported both before and after the project began (49% vs 46%, $p = 0.86$).

Additional support staff for transitions (7% vs. 24%, $p = 0.007$) and improved patient privacy (7% vs. 25%, $p = 0.007$) were recognized as additional resources needed after the project was implemented. While initially 70% of respondents stated that they would need additional respiratory therapy staffing to facilitate SSC in surgical infants, after the first year of the project, that proportion dropped to 44% ($p = 0.005$). Overall, the number of nurses who provided SSC for a surgical infant in the past week increased from 12% to 37% ($p = 0.001$). Finally, despite

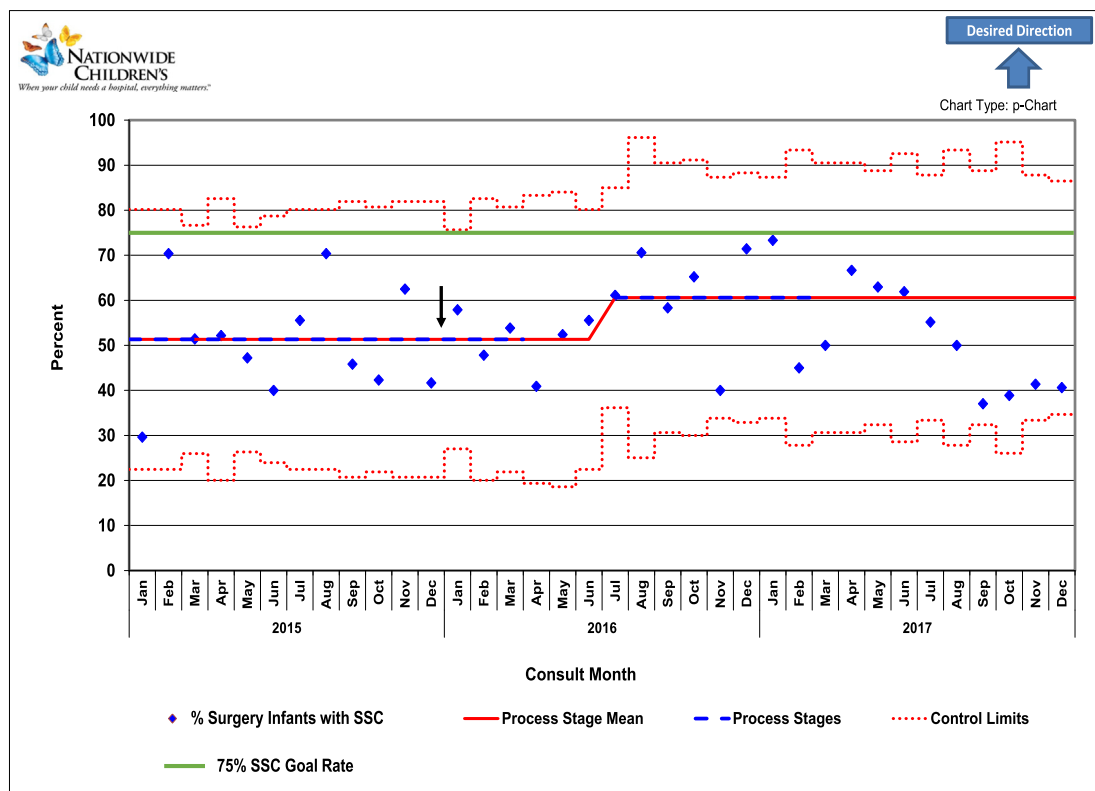


Fig. 3. Rates of skin-to-skin care for infants receiving a surgical consultation. Arrow denotes project start date in January 2016.

the requests noted before and after project institution, most nursing staff did not feel that SSC added a significant amount of work to their day.

Balancing measures including inadvertent extubation during an episode of SSC did not significantly increase after implementation of the QI project. The rate of inadvertent extubation during SSC in 2015 was 0.09% ($n = 5/5674$) compared to 0.16% ($n = 18/10,990$) from January 2016 to December 2017 ($p = 0.17$).

3. Discussion

Here we present a novel QI project outlining the safe integration of SSC into the routine management of infants requiring surgical consultation in the NICU. SSC does not require sophisticated equipment and available evidence suggests benefits for most infants, including surgical infants. However, multiple system-level barriers prevent routine SSC for infants in the NICU, particularly during the perioperative period. In this project, the key QI interventions included development of evidence-based SSC guidelines to enhance consistency in practice among nursing staff, safety criteria to help with initiation and implementation of SSC, conducive environment, staff education, preparation of parent [16,17] and family empowerment [18]. Our results underscore the need for shared engagement at all levels of care within the NICU in order to increase SSC utilization for surgical patients.

In designing our intervention, the first barrier to overcome was creating a change in NICU culture. Organizational culture is defined as the norms, values and basic assumption shared by members of an organization [19]. In order to change culture in a health care setting, leadership commitment, shared vision and involvement at all levels is required [20]. As illustrated in the preintervention survey results, providing SSC for surgical infants was perceived with skepticism by many staff members. In a systematic review of barriers and enablers of SSC by Seidman et al., "negative impressions of staff attitudes or interactions with staff," was identified as a key barrier for families to practice SSC

[12]. Overcoming hospital culture often requires interventions at multiple levels. This challenge made QI methodology an ideal strategy to employ as QI requires buy in from all stakeholders in the formative stages of a project [21]. Establishing a project endorsed by surgeons, neonatologists and nursing leadership emphasized to NICU staff that SSC is an important therapy for surgical infants. Subsequent engagement and education of nurses and families regarding safety guidelines were paramount to a successful intervention.

In addition to overcoming a culture initially resistant to SSC, safety, particularly the incidence of unplanned extubations, was also a key concern for surgeons, neonatologists and nursing staff. In 2015 our hospital established protocols for safe administration of SSC for intubated infants, including infants on an oscillating ventilator. These protocols were put in place in response to the overwhelming evidence stating that SSC performed within a protocol for an intubated patient did not increase the likelihood of an inadvertent extubation [22–25]. Furthermore, some literature suggests that SSC for an intubated infant may even facilitate earlier extubation [23]. The incidence of inadvertent extubation for infants receiving SSC did not significantly increase during this project, likely because protocols for safe SSC for intubated infants were in place prior to the start of the QI project. Additionally, a lower proportion of nurses identified respiratory therapy staffing as a barrier to SSC at the project's one year mark. This survey response could be a proxy for increased comfort providing SSC for intubated infants. Consequently, hospitals interested in facilitating SSC for surgical infants must first develop safety protocols for patients requiring invasive respiratory support prior to pursuing SSC.

To our knowledge, this is the largest cohort of surgical infants reported in a project focused on the implementation of SSC during the perioperative period. A review of the literature reveals a single case study of an 18-day old with hypoplastic left heart syndrome and a small cohort of ten mothers with infants with complex congenital heart disease receiving SSC in the NICU [26,27]. In these studies, enrollment was more restricted and SSC was initiated when the infant was

extubated, was not receiving vasopressors, had begun oral feedings and the chest incision was closed. SSC was concluded to be feasible in infants with complex congenital heart disease requiring surgery and improvements in autonomic nervous function were observed. Our project builds on this initial work to expand the population of infants eligible for safe SSC to include those requiring general pediatric surgical consultation and procedures. As we build on this and expand the scope of our project we hope to measure other outcome measures such as postoperative pain management, length of stay, benefits to the families and other balancing measures including infection rates and thermoregulation. Future studies should consider evaluation of other neonatal surgical populations to determine if feasibility and safety are comparable, as these populations would also likely benefit from SSC in the NICU.

In our project, the overall rates of SSC showed a sustained increase for 12 months. However, there is a notable decline in the latter half of 2017. On further review, this appears temporally related to the departure of the primary surgical champion for this project in June 2017. Until then, the surgical champion attended daily multidisciplinary NICU rounds and routinely reinforced the need for SSC for all surgical patients. The American College of Surgeons National Surgical Quality Improvement Project (NSQIP) is a nationwide QI effort aimed at enabling surgeons and hospitals to reliably collect, analyze, and act on clinically collected outcomes data [28]. NSQIP requires each enrolled hospital to identify a surgeon champion to regularly review data and disseminate findings to administrative and clinical leaders. Surgeon champions therefore play a key role in successful quality improvement at the hospital level. The decline in SSC rates observed in this report emphasizes the importance of establishing a surgical champion to ensure continuity of a surgical QI intervention. A surgical champion could also be a leader from an alternative discipline such as a nurse leader or physical therapist. In response to this decline, a multidisciplinary team is now working towards further enhancing and supporting the culture of SSC as a default for all NICU infants. If SSC is contraindicated owing to clinical concerns, an order prohibiting SSC will be placed in the chart. Future efforts to integrate SSC into the routine care of infants requiring surgical consultation in the NICU will require similar longitudinal continuity with a surgeon champion to obtain sustainable change.

The proportion of staff requesting assistance during SSC significantly increased from 7% to 24% after our intervention. Likely, once SSC was routinely offered to surgical infants, the added logistics and time required for the transition became more apparent to NICU staff. Similar findings were reported in Seidman et al.'s systematic review of barriers to SSC, specifically, "increased workload, lack of clear guidelines/training and issues with facility environment/resources" [12]. One novel way to overcome resourcing barriers would be to introduce the concept of a SSC consultant, similar to a lactation consultant. Historically, lactation consultants have aided in overcoming significant barriers to breast feeding for high risk infants in the NICU [29]. Of note, SSC is also associated with increased likelihood of sustained breast feeding at discharge [1]. Incorporating a conversation about SSC for surgical infants with a lactation consultant or similar support staff could potentially address some of the barriers of workload and training that nursing staff experience with providing SSC for surgical infants.

Limitations of this project were primarily driven by the challenges of changing practice culture within the clinical setting. Nurses, neonatologist and surgeons all have preconceived notions of how important and safe SSC is and overcoming these presuppositions was a continuing challenge through the course of our intervention period. As the scope of this project was to study safety and feasibility, we included all infants receiving a surgical consult. Future efforts to evaluate subgroups who ultimately underwent surgery and the temporal relationship between SSC and surgery over time are warranted and will be pursued by our team in future studies. In addition, our findings may not be easily generalizable to other settings, particularly those with more limited resources for neonatal care. Durable changes in clinical practice for

both physicians and nurses are challenging and interventions that continually engage stakeholders are required for sustainability.

4. Conclusion

Using QI methodology and multidisciplinary engagement, this report illustrates that SSC can be safely integrated into the routine management of infants in the NICU requiring pediatric surgical consultation. Key elements of success include engagement of nurses, surgeons, neonatologists and families, guideline development, staff buy in and surgeon champions. These findings can be used as a blueprint for other medical centers to incorporate SSC into their daily workflows to potentially improve outcomes for high risk surgical infants. Future studies aimed at evaluating outcomes such as postoperative pain control and physiologic stability after SSC for surgical infants are warranted.

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References

- [1] Boundy EO, Dastjerdi R, Spiegelman D, et al. Kangaroo mother care and neonatal outcomes: a meta-analysis. *Pediatrics* 2016;137:e20152238. <https://doi.org/10.1542/peds.2015-2238>.
- [2] Ludington-Hoe SM. Thirty years of kangaroo care science and practice. *Neonatal Netw* 2011;30:357–62. <https://doi.org/10.1891/0730-0832.30.5.357>.
- [3] Gao H, Xu G, Gao H, et al. Effect of repeated kangaroo mother care on repeated procedural pain in preterm infants: a randomized controlled trial. *Int J Nurs Stud* 2015;52:1157–65. <https://doi.org/10.1016/j.ijnurstu.2015.04.006>.
- [4] World Health Organization. Kangaroo mother care: a practical guide. Geneva, Switzerland: World Health Organization; 2003. <https://doi.org/10.4038/sljch.v34i1.564>.
- [5] Samra NM, Taweel A, El Cadwell K. Effect of intermittent kangaroo mother care on weight gain of low birth weight neonates with delayed weight gain. *J Perinat Educ* 2013;22:194–200. <https://doi.org/10.1891/1058-1243.22.4.194>.
- [6] Cho E-S, Kim S-J, Kwon MS, et al. The effects of kangaroo care in the neonatal intensive care unit on the physiological functions of preterm infants, maternal-infant attachment, and maternal stress. *J Pediatr Nurs* 2016;31:430–8. <https://doi.org/10.1016/j.pedn.2016.02.007>.
- [7] Baley J. Committee on Fetus and Newborn. Skin-to-skin care for term and preterm infants in the neonatal ICU. *Pediatrics* 2015;136:596–9. <https://doi.org/10.1542/peds.2015-2335>.
- [8] Mitchell AJ, Yates CC, Williams DK, et al. Does daily kangaroo care provide sustained pain and stress relief in preterm infants? *J Neonatal Perinatal Med* 2013;6:45–52. <https://doi.org/10.3233/NPM-1364212>.
- [9] Cong X, Ludington-Hoe SM, McCain G, et al. Kangaroo care modifies preterm infant heart rate variability in response to heel stick pain: pilot study. *Early Hum Dev* 2009;85:561–7. <https://doi.org/10.1016/j.earlhumdev.2009.05.012>.
- [10] Johnston CC, Stevens B, Pinelli J, et al. Kangaroo care is effective in diminishing pain response in preterm neonates. *Arch Pediatr Adolesc Med* 2003;157:1084–8. <https://doi.org/10.1001/archpedi.157.11.1084>.
- [11] Batton DG, Barrington KJ, Wallman C. Prevention and management of pain in the neonate: an update. Policy statement from the American Academy of Pediatrics Committee on Fetus and Newborn, Section on Surgery, and Section on Anesthesiology and Pain Medicine and the Canadian Paediatric Society Fetus and Newborn Committee. *Pediatrics* 2006;118(5):2231–41. <https://doi.org/10.1542/peds.2006-2277>.
- [12] Seidman G, Unnikrishnan S, Kenny E, et al. Barriers and enablers of kangaroo mother care practice: a systematic review. *PLoS One* 2015;10:e0125643. <https://doi.org/10.1371/journal.pone.0125643>.
- [13] Kelley-Quon L. Post-surgical kangaroo care for babies in the NICU. <https://700childrens.nationwidechildrens.org/post-surgical-kangaroo-care-babies-nicu>, Accessed date: 10 April 2018.
- [14] Kelley-Quon L. Hold your baby: transforming neonate health with kangaroo care. <https://www.nationwidechildrens.org/research/resources-infrastructure/research-and-academic-events/discoveryx-2017/lorraine-kelleyquon-hold-your-baby-transforminginfant-health-with-kangaroo-care>, Accessed date: 10 April 2018.
- [15] Provost LP, Murray SK. The health care data guide: learning from data for improvement. San Francisco, CA: Jossey-Bass; 2011.
- [16] Zhang SH, Yip WK, Lim PFC, et al. Evidence utilization project. *Int J Evid Based Healthc* 2014;12:142–50. <https://doi.org/10.1097/XEB.0000000000000009>.
- [17] DiMenna L. Considerations for implementation of a neonatal kangaroo care protocol. *Neonatal Netw* 2006;25:405–12. <https://doi.org/10.1891/0730-0832.25.6.405>.

- [18] Penn S. Overcoming the barriers to using kangaroo care in neonatal settings. *Nurs Child Young People* 2015;27:22–7. <https://doi.org/10.7748/ncyp.27.5.22.e596>.
- [19] Gershon RRM, Stone PW, Bakken S, et al. Measurement of organizational culture and climate in healthcare. *J Nurs Adm* 2004;34:33–40. <https://doi.org/10.1097/00005110-200401000-00008>.
- [20] Kimball B. Cultural transformation in health care: a white paper that describes the complex nature of organizational culture and its role in health care organizations. Princeton, NJ: Robert Wood Johnson Foundation; 2005.
- [21] White M, Butterworth T, Wells JS. Healthcare quality improvement and “work engagement”; concluding results from a national, longitudinal, cross-sectional study of the “productive ward-releasing time to care” programme. *BMC Health Serv Res* 2017;17(510). <https://doi.org/10.1186/s12913-017-2446-2>.
- [22] Azevedo VMG de O, Xavier CC, Gontijo F de O. Safety of kangaroo mother care in intubated neonates under 1500 g. *J Trop Pediatr* 2012;58:38–42. <https://doi.org/10.1093/tropej/fmr03>.
- [23] Lorenz L, Dawson JA, Jones H, et al. Skin-to-skin care in preterm infants receiving respiratory support does not lead to physiological instability. *Arch Dis Child Fetal Neonatal Ed* 2017;102:F339–44. <https://doi.org/10.1136/archdischild-2016-311752>.
- [24] Swinith JY, Anderson GC, Hadeed AJ. Kangaroo (skin-to-skin) care with a preterm infant before, during, and after mechanical ventilation. *Neonatal Netw* 2003;22:33–8. <https://doi.org/10.1891/0730-0832.22.6.33>.
- [25] Ludington-Hoe SM, Ferreira C, Swinith J, et al. Safe criteria and procedure for kangaroo care with intubated preterm infants. *J Obstet Gynecol Neonatal Nurs* 2003;32:579–88. <https://doi.org/10.1177/0884217503257618>.
- [26] Harrison TM, Ludington-Hoe S. A case study of infant physiologic response to Skinto-skin contact after surgery for complex congenital heart disease. *J Cardiovasc Nurs* 2015;30:506–16. <https://doi.org/10.1097/JCN.0000000000000202>.
- [27] Harrison TM, Brown R. Autonomic nervous system function after a skin-to-skin contact intervention in infants with congenital heart disease. *J Cardiovasc Nurs* 2017;32:E1–13. <https://doi.org/10.1097/JCN.0000000000000397>.
- [28] Raval MV, Bentrem DJ, Eskandari MK, et al. The role of surgical champions in the American College of Surgeons National Surgical Quality Improvement Program—a national survey. *J Surg Res* 2011;166:e15–25. <https://doi.org/10.1016/j.jss.2010.10.036>.
- [29] Gharib S, Fletcher M, Tucker R, et al. Effect of dedicated lactation support services on breastfeeding outcomes in extremely-low-birth-weight neonates. *J Hum Lact* 2017. <https://doi.org/10.1177/0890334417741304>.