



# Combating Newborn Pain Utilizing Skin to Skin Contact and Breastfeeding-What Does the Evidence Say?

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# Presenters

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# Air Force Lt. Col. Jeanette Anderson, M.S.N., R.N.C.-OB



Air Force Lt. Colonel Jeanette Anderson graduated from Cedarville University, in Cedarville, Ohio, with a Bachelor of Science degree in Nursing. Following graduation, her Air Force career began as a student in the Nurse Transition Program at Lackland Air Force Base (AFB) in San Antonio, Texas. When Lt. Col. Anderson completed the Nurse Transition Program she entered her first of two clinical assignments in obstetrics and aeromedical staging. Additional prestigious positions and achievements held by Lt. Col. Anderson include: the Perinatal Nursing Consultant to the Air Force Surgeon General and the Principal Investigator for an ongoing research study. Lt. Col. Anderson is a published author in *Nursing for Women's Health*, a practice journal of The Association of Women's Health, Obstetrics and Neonatal Nurses (AWHONN). Additionally, she has been instrumental in the development of the new Nursing Practice (Peer) Review process where she co-authored seven bundles. Lt. Col. Anderson has served as a Perinatal Clinical Nurse Specialist, in the Maternal Child Flight Labor and Delivery (L&D) Unit at Travis AFB, California and is currently serving as the Director of Clinical Investigations at Wright Patterson Air Force Base, in Dayton, Ohio.

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# Air Force Maj. Lorraine Walters, M.S.N., R.N.C.-OB



Air Force Major Lorraine Walters graduated from the University of Texas Medical Branch in Galveston, Texas and received a direct commission to the United States Air Force Nurse Corps in 2003. Her career began as a student in the Nurse Transition Program at Lackland Air Force Base (AFB), Texas, where she was subsequently assigned to the Hauth Birthing Center formerly located at Wilford Hall Medical Center on Lackland, AFB. As a Registered Nurse (RN), she has dedicated over eighteen years to obstetrical nursing at multiple inpatient maternal-child care units, working primarily in direct patient care as well as in various flight leadership roles. She deployed to Joint Operations Base in Balad, Iraq in support of Operation Iraqi Freedom and Operation Enduring Freedom. Prior to her current position, she served as the Flight Commander of the Maternal-Child Flight, Labor and Delivery Unit in the 99th Inpatient Operations Squadron, at Nellis AFB, Nevada. Maj. Walters is currently serving as a Perinatal Clinical Nurse Specialist in the 673d Inpatient Operations Squadron at Joint Base Elmendorf- Richardson, Alaska.

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# Air Force Capt. Dawn M. Morales, M.S.N., W.H.N.P.-B.C



Air Force Captain Dawn M. Morales entered the United States Air Force in October 1998 and attended Basic Military Training at Lackland Air Force Base (AFB), in San Antonio, Texas. After twelve years, she was accepted to the Nurse Enlisted Commissioning Program for the Air Force in 2010. Following her commission, Capt. Morales graduated from the University of South Florida, in Tampa, Florida with a Bachelor of Science degree in Nursing. Her nursing career began as a student in the Nurse Transition Program with a subsequent clinical assignment to the Family Birthing Center at Keesler AFB, in Biloxi, Mississippi. As a Registered Nurse, she dedicated over nine years of service to inpatient obstetric care and was assigned to the Maternal Child Flight Labor and Delivery (L&D) Unit at Travis AFB. In 2017 Capt. Morales returned to school to obtain her advanced practice degree in women's health. Capt. Morales is now serving as a Women's Health Nurse Practitioner at the 60th Surgical Operations Squadron on Travis, AFB. In this position, she delivers comprehensive obstetric and gynecologic care in the Air Mobility Command's largest women's health clinic servicing Department of Defense beneficiaries.

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# Disclosures

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- Lt Col Jeanette Anderson, Maj. Lorraine Walters, and Capt. Dawn Morales have no relevant financial or non-financial relationships to disclose relating to the content of this activity.
- The views expressed in this presentation are those of the authors and do not necessarily reflect the official policy or position of the Department of Defense, or the U.S. Government.
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# Learning Objectives

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At the conclusion of this activity, participants will be able to:

1. List minimally invasive procedures that newborns routinely undergo.
2. Identify two benefits of performing skin contact or breastfeeding during minimally invasive procedures.
3. Summarize the phased approach used for implementation.



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# Poll Question

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Q: Following the delivery of a healthy newborn, on average, how many painful, minimally invasive procedures will they undergo before being discharged home?

- A) None
- B) 1-2
- C) 3-4



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# Clinical Inquiry

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- Newborns can detect, process, and respond to painful stimuli
  - Experience pain more intensely than adults
    - ✓ 2015 Oxford study revealed that infants' brains showed the same level of response as adults' to pain when exposed to a stimulus one-fourth as strong
  - Historic beliefs/practices
    - ✓ Newborns couldn't interpret pain due to their inability to create memories
    - ✓ Fear of anesthesia side effects
    - ✓ Procedures such as circumcisions performed without analgesia until the 1990s
- Pre-term infants
  - More hypersensitive to pain
  - Greater risk for pain due to immature pain inhibition mechanisms at birth



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# Clinical Inquiry, continued

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- What can be done to reduce newborn pain with minimally invasive procedures?
  - Medication is frequently given with major procedures
  - This Evidence-based Practice (EBP) will focus specifically on minimally invasive procedures
- Labor & Delivery (L&D) frequently performs painful procedures on newborns
  - Injections
    - ✓ Routinely administer Vitamin K and initial Hepatitis B Vaccination
  - Heel sticks
    - ✓ Metabolic screening
    - ✓ Glucose screening
    - ✓ Lab work
  - Venipuncture
  - Circumcision



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# Clinical Inquiry, continued

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- Challenges to managing neonatal pain
  - Clinician unfamiliar with conducting blood draw/injection while newborn is breastfeeding or skin to skin can find the procedure
    - ✓ Uncomfortable
    - ✓ Awkward
  - Lack of time
  - Lack of knowledge



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# Clinical Inquiry, continued

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- The American Academy of Pediatrics (2016) states that preventing or minimizing pain in neonates should be the goal of healthcare professionals who care for neonates
- There are increased stress-related markers and elevated free radicals after even simple procedures such as routine heel sticks or tape removal
- Procedure related painful stimulus → infant is sensitive to subsequent stimuli
- Early exposure to repeated painful stimuli has short- and long-term adverse sequelae
  - Physiologic instability
  - Altered brain development
  - Abnormal neurodevelopment, somatosensory and stress response systems, which can persist into childhood

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# Clinical Inquiry, continued

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- More than 100,000 live births occur across the Military Health System (MHS) annually.
  - In Fiscal Year (FY) 2020:
    - ✓ Approximately 30 percent of births occurred in direct, or military medical treatment facility (MTF)-based care
    - ✓ Nearly 70 percent of births occurred through private sector care



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# Step 1: PICOT Question

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- In newborns, how does current practice compared to best strategies for minimally invasive procedures affect pain.
- P – Newborns
- I – Current Practice
- C – Best Strategies for minimally invasive procedures
- O – Pain
- T – n/a



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## Step 2: Search Strategy

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- Databases: PubMed, Cochrane, CINAHL, EBSCO Host
- Keywords: pain, infant, neonate, newborn, strategies, injection, immunization, heel stick, heel lance, heel prick, minimally invasive procedure
- Exclusions: no study of pain related to injections, age greater than 28 days of life, preterm
- Time range: 2008-2020
- Legend : Agency for Healthcare Research and Quality (AHRQ, 2016):
  - Newborn: birth to 28 days of life
  - Neonate: birth to 28 days of life
  - Infant: birth to 1 year of age



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# Step 3: Evaluation/Synthesis-Skin to Skin Care (SSC)

	1	2	3	4	5	6	7
Level I: Systematic review or meta-analysis	X						
Level II: Randomized controlled trial		X	X			X	X
Level III: Controlled trial without randomization (Quasi-experimental)							
Level IV: Case-control or cohort study (Non- experimental design)							
Level V: Systematic review of qualitative or descriptive studies							
Level VI: Qualitative or descriptive study, Clinical Practice Guideline, Quality Improvement or EBP Project				X			
Level VII: Expert opinion or consensus					X		

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# Critical Appraisal-Skin to Skin Care (SSC)

Citation	Design/Method	Sample/Setting	Major Variables Studied and Their Definitions	Outcome Measurement	Data Analysis	Findings	Level of Evidence	Quality of Evidence: Critical Worth to Practice
1-Skin to Skin care for Procedural Pain in Neonates (2017)	Meta-analysis	25 studies	SSC f/pain from medical or nsg proc in nbns vs no intervention, sucrose, or other analgesics	Physiological and behavioral indicators (HR, crying time, etc)	Mean diff w/95% CI, fixed effect model	SSC appears to be effective and safe for a single painful procedure	I	High quality evidence with low risk of bias. Blinding was not possible. Replicable.
2-Skin-to-skin contact and/or oral 25% dextrose for procedural pain relief for term newborn Infants (2009)	RCT (partially blinded)	n=640 healthy, term nbns at 12-72 hrs of life	4 gps: -routine-no analgesia -oral 25% dextrose 2min b4 inject -SSC 2m in b4 inject -combination of SSC + oral 25% dextrose	NIPS  Neonatal Facial Coding System  PIPS	MANOVA	-Oral 25% dextrose tx reduced duration of pain, SSC decreased injection pain AND duration. -SSC was superior to 25% dextrose in decreasing pain. Combination of both more effective than either separately.	II	Replicable (term, healthy nbns)
3-Skin-to-skin contact diminishes pain from hepatitis B vaccine injection in healthy full-term neonates (2013)	RCT	n=36	2 gps: -routine care (rest in nsy b4/after inject) -SSC b4/during/after inject	Cry time (CT), behavioral state (BSt)-Anderson Behavioral State Scale and HR	RM-ANOVA  t-tests	SSC nbns cried less, reached BSts sooner, and trended toward more rapid HR decrease	II	Replicable, high level of reliability. Only 3 RNs administered Hep B/utilized BSt and recorded CT and HR.
4-Ergonomic procedure for heel sticks and shots in Kangaroo Care (skin-to-skin) position (2013)	Qualitative survey	n=56	Comfort of clinicians performing procedure	Specific statements from surveys (staff and maternal)	Not listed	Using an adjustable stool/step by step procedure for heel sticks and injections has increased staff comfort.	VI	Replicable, but low quality of evidence. Quality Improvement study.

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# Critical Appraisal-Skin to Skin Care (SSC), continued

Citation	Design/Method	Sample/Setting	Major Variables Studied and Their Definitions	Outcome Measurement	Data Analysis	Findings	Level of Evidence	Quality of Evidence: Critical Worth to Practice
5-Prevention and Management of Procedural Pain in the Neonate: An Update (2016)	n/a	n/a					VII	American Academy of Pediatrics position statement.
6-Interventions on Term Newborns Undergoing Heel Lance (2020)	RCT	n=226 (236 were considered with 10 excluded when they did not meet inclusion criteria) Term nbns at 24-48 hrs of life	5 groups: -routine/no analgesia -oral sucrose -SSC -breastfeeding -non-nutritive sucking Compared duration of crying and time required to complete the heel lance procedure	NPASS	REDCap (Research Electronic Data Capture)	Compared to control group, significant decrease in mean NPASS for all other groups. Oral sucrose was most effective; non-nutritive sucking was superior to SSC; no significant difference when breastfeeding was compared to SSC or non-nutritive sucking.	II	Replicable, high level of reliability. Only 2 RNs observed study participants. Limitations: the control arm was not recruited or randomized at the same time as the other groups. A larger sample size (n) would have yielded a stronger study.
7-Analgesia with breastfeeding in addition to skin-to-skin contact during heel prick (2013)	RCT	n=136 term nbns	4 groups: -BF with SSC -Sucrose with SSC -SSC only -Sucrose only	NIPS	$\chi^2$ test, Fisher test, non-parametric ANOVA, Kruskal-Wallis, Analysis of Variance test, Bonferroni test, SPSS software V.14.0. package	BF+SSC Group had significant lower median NIPS score (value=1) compared with other groups (value=2, 4, 4, respectively). Percentage of NB with moderate-to-severe pain was also lower in the BF+SSC Group. Both groups BF+SSC & Sucrose+SSC achieved a significant lower percentage of crying compared with SSC Group	II	Replicable, high level of reliability. Videotaped/3 observers (one neonatologist and two pediatricians) viewed video recording that included pulse oximetry monitoring. NIPS score completed at three time points (2 min before heel prick, during heel prick; 2 min after heel prick).

Legend: nsg=nursing, proc=procedure, nbn=newborn, HR=heart rate, CI=confidence interval, RCT=randomized control trial, hr=hour, gp=group, min=minute, b4=before, inject=injection, SSC=skin to skin care, NIPS=neonatal and infant pain score, tx=treatment, PIPS=psychological inflexibility in pain scale, nsy=nursery

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# Step 3: Evaluation/Synthesis-Breastfeeding

	1	2	3	4	5	6
Level I: Systematic review or meta-analysis	X					
Level II: Randomized controlled trial		X	X	X	X	
Level III: Controlled trial without randomization (Quasi-experimental)						X
Level IV: Case-control or cohort study (Non- experimental design)						
Level V: Systematic review of qualitative or descriptive studies						
Level VI: Qualitative or descriptive study, Clinical Practice Guideline, Quality Improvement or EBP Project						
Level VII: Expert opinion or consensus						

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# Critical Appraisal-Breastfeeding

Citation	Design/Method	Sample/Setting	Major Variables Studied and Their Definitions	Outcome Measurement	Data Analysis	Findings	Level of Evidence	Quality of Evidence: Critical Worth to Practice
1-Bfdbg or breast milk for procedural pain in neonates (2012)	Meta-analysis	20 studies	Bfdbg or supplemental BM (BM placed on tongue or via tube) prior to or during the painful proc vs placebo, no tx, sucrose, glucose, pacifiers, or positioning.	PIPP, DAN, NIPS, NFCS, cry variables, physiological parameters (HR, RR, O2%, BP)	Mean diff w/95% CI, fixed effect model	Nbns undergoing single painful procedure should be provided bfdbg for analgesia when possible, compared to positioning/pacifier/holding + swaddling. If it is not available or feasible to give breastfeeding, alternatives such as glucose or sucrose should be considered.	I	High quality evidence, applicable to lg population, replicable.  Limitations-unable to blind study to mothers.
2-Breastmilk for neonatal vaccination pain (2018)	Prospective double blinded, randomized, experimental study.	n=145  Tertiary care hospital	Use of EBM + FT before/during inject of bacillus calmetteguarone vaccine	NIPS, RR, HR, O2%		Mean pain level for EBM gp was 3.089/and control group was 3.6. The median crying time was 53.511 sec in EBM at p<0.001.	II	Replicable, EBM/FT decreases pain level.
3-Efficacy of Breastfeeding on Babies' Pain During Vaccinations (2017)	RCT	n=100	Bfdbg 5min before/during after vaccine inject vs. Routine care	NIPS, Crying time, HR levels, O2 saturation levels	chi2 Mann-Whitney U test  t test	Control group babies experienced severe pain compared to moderate pain for babies in experimental group (p=<0..05)  Bfdbg gp had lower NIPS and HR and higher O2 levels during inject.	II	Replicable, high level of evidence. Bfdbg is effective, convenient and safe to implement.

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# Critical Appraisal-Breastfeeding, continued

Citation	Design/Method	Sample/Setting	Major Variables Studied and Their Definitions	Outcome Measurement	Data Analysis	Findings	Level of Evidence	Quality of Evidence: Critical Worth to Practice
4-Bfdg and pain relief in full-term neonates during immunization inject a clinical randomized trial (2013)	RCT	n=130 nbns Hospital setting	IV=breastfeeding during inject + not breastfeeding during inject DV=nbns pain	DAN pain scale (facial expressions, limb move., vocal expression)	chi <sup>2</sup> test + t test	Decreased pain scores with nbns who breastfed during injections p=<0.001	II	Quality evidence, replicable, unable to blind study to mothers.
5-Analgesia with breastfeeding in addition to skin-to-skin contact during heel prick (2013)	RCT	n=136 term nbns	4 groups: -BF with SSC -Sucrose with SSC -SSC only -Sucrose only	NIPS	χ <sup>2</sup> test, Fisher test, non-parametric A NOVA, Kruskal-Wallis, Analysis of Variance test, Bonferroni test, SPSS software V.14.0. package	BF+SSC Group had significant lower median NIPS score (value=1) compared with other groups (value=2, 4, 4, respectively). Percentage of NB with moderate-to-severe pain was also lower in the BF+SSC Group. Both groups BF+SSC & Sucrose+SSC achieved a significant lower percentage of crying compared with SSC Group	II	Replicable, high level of reliability. Videotaped/3 observers (one neonatologist and two pediatricians) viewed video recording that included pulse oximetry monitoring. NIPS score completed at three time points (2 min before heel prick, during heel prick; 2 min after heel prick).
6-Heel lance in newborn during breastfeeding (2008)	Controlled/Quasi-Experimental	n=200 term nbns	2 groups: 100 NB-control cases (allowed analgesia via caressing and/or pacifier) 100 NB-BF during heel lance for metabolic screen	DAN Scale	χ <sup>2</sup> test and t-Student test	Results with mean DAN score at 2.65 for BF group and 5.15 for control group significantly confirmed the evidence of analgesic effect of breastfeeding during heel puncture	III	Replicable; low level of reliability as multiple trained staff nurses conducted the evaluation. Peer-reviewed older study (2008) completed in Italy. Several uncontrolled/unincluded variables (did not distinguish between caressing vs. pacifier, for example).

Legend: nsq=nursing, proc=procedure, nbns=newborn, HR=heart rate, CI=confidence interval, RCT=randomized control trial, hr=hour, gp=group, min=minute, b4=before, inject=injection, SSC=skin to skin care, NIPS=neonatal and infant pain score, tx=treatment, PIPS=psychological inflexibility in pain scale, nsy=nursery

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# Step 3: Outcomes Synthesis-Skin to Skin Care (SSC)

Outcomes Synthesis Table Template-SSC

	1	2	3	4	5	6	7
Pain Response		↓			↓	↓	↓
Cry Time			↓		↓	↓	↓
Behavior State					↓	↓	↓
HR					↔		↓
SpO2					↑		
Maternal/Staff Satisfaction					↑		

Legend:  
 NSS =Not statistically significant, NR=Not Reported, Green=Positive effect  
 ↓ =Decrease    ↑ =Increase    ↔ =No Change

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# Step 3: Outcomes Synthesis-Breastfeeding

Outcomes Synthesis Table Template-Breastfeeding

	1	2	3	4	5	6
Pain Response	↓	↓	↓	↓	↓	↓
Cry Time	↓	↓	↓		↓	↓
HR			↓		↓	
SpO2			↑			

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Legend:  
 NSS =Not statistically significant, NR=Not Reported, Green=Positive effect  
 ↓ =Decrease    ↑ =Increase    ↔ =No Change

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## Step 4: EBP Change Recommendation

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- Benefits
  - Decreased newborn pain scores
  - Decreased crying time
  - Decreased heart rate (HR)
  - Increased oxygen saturation (SpO2) level trends
- Change current practice to routinely perform minimally invasive procedures while infants have skin to skin contact or are breastfeeding



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## Step 4: EBP Change Recommendation, continued

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- Incremental Roll Out Phase I: Single AF Hospital in California
- Registered Nurse (RN) and Technician champions from EBP group developed training for L&D personnel who administer routine injections on L&D
  - Include at least 10min SSC prior to injection administration
    - ✓ Mother may breastfeed infant if desired while SSC
  - Update Operating Instructions and Electronic Medical Record (EMR) newborn order sets to reflect change in practice in collaboration with Provider champion



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# Step 4: EBP Change Recommendation, continued

## Sample Order Set

▼ 2 Medications						
Verbal	Name	Dose	Route	Frequency	Priority	
	UN HEP B VACC (ENGERIX-B) INJ-- 10MCG/0.5ML *PF*	10 MCG	INTRAMUSCULAR	X1		
	UN PHYTONADIONE (VIT K1) NEO 1MG/0.5ML SYRN	1 MG	INTRAMUSCULAR	X1		

▼ 2 Medications	
Comment	
Administer while newborn skin to skin or breastfeeding (unless parents decline). If mother is HBsAg negative, administer Hepatitis B vaccine 0.5 ml IM to right thigh after birth. May be delayed until after the first bi	
Administer while newborn skin to skin or breastfeeding (unless parents decline). Administer IM to left thigh after birth. May be delayed until after the first breastfeeding. **NEONATAL CONCENTRATION**HIGH AI	

Images retrieved from Essentris®, 2018



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## Step 4: EBP Change Recommendation, continued

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- Incremental Roll Out Phase II: Remaining Air Force Hospitals
  - Designated Clinical Nurse Specialist (CNS) lead for Phase II-Maj. Walters
  - Secured RN and Technician champions from 10 remaining AF Hospitals
  - Met with all champions and provided training slides and instructions on how to implement this practice change within their respective hospitals
    - ✓ Train all L&D personnel who administer routine injections on L&D
    - ✓ Update Standard Operating Instruction(s) (SOI) to reflect change in practice in collaboration with pediatric provider champion/medical director
    - ✓ Submit MHS Genesis Enterprise-Level ticket/proposal for inclusion of EMR newborn order sets to reflect change in practice



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# Positioning/Holding Technique

- Use the cradle hold or a position where parent/newborn are comfortable and injection site is readily accessible
- View injection technique at <https://youtu.be/55tejVjzzwE>
  - Video demonstration is with 6 month old (mo) infant not skin to skin, but positioning is the same for a newborn while skin to skin and/or breastfeeding



L-CHEO Youtube video, <https://youtu.be/55tejVjzzwE>



R-<https://newmumshub.com/breastfeeding-101-part-7/>



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# MTF Video



<https://www.youtube.com/watch?v=4zaSCJ394Xs>

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# Step 5: Measurement Plan

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- Phase I
  - Tracked newborn cry time for routine care (no SSC) for 1 mo (n=30)
  - Implemented practice change + track newborn cry time for SSC care for 1 mo (n=30)
- Phase II-In progress
  - Other AF hospital champions encouraged to utilize a combination of periodic peer review (observation) and patient surveys to track compliance
  - Follow-up meeting(s) with champions to determine implementation status, identify challenges and suggest plans of action based on other unit successes



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# Results

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- Phase I
  - 16 April 2018 to 20 May 2018
  - David Grant Medical Center, Labor and Delivery Unit
  - Injections: Vitamin K or Hepatitis B
  - Routine Care group-25 neonates received injections under the traditional unit warmer or bassinette
  - SSC group-22 neonates received injections while skin to skin (2 were skin to skin AND actively breastfeeding)
  - Cry time:
    - ✓ Routine Care group-12.6 second average
    - ✓ SSC group-8.9 second average



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# Results, continued

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- Phase II-in progress
  - MTF champions pushed out training that includes technique for both injections and heel sticks
  - All 11 AF MTFs with L&D capabilities have implemented (as of December 2021) for injections
  - Eglin AFB has implemented for both injections and heel sticks
- Phase III-in progress
  - Eglin AFB is first to begin to engage the Laboratory and Immunizations clinic



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# Step 6: Dissemination/Sustainment Plan

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- Dissemination
  - Shared on monthly Pediatric Quality Forum
  - Shared with David Grant Medical Center Facebook team
  - Posted on Air Force Leading Practice Management site
  - Presented at '20 AFMS OB Critical Care and Patient Safety Conference, Nursing Breakout Session
  - Submitted poster abstract for '22 TriService Nursing Research Program (TSRNP) Research and EBP Dissemination Course
  - Phase III-Share internally with applicable clinics (Laboratory, Immunization clinic, Family Medicine clinic, Pediatric clinic, Emergency Department) for implementation with routine immunizations and lab work
- Sustainment
  - Included in unit policy and order sets
  - Included in staff unit orientation
  - Included in patient education on admission



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# Key Takeaways

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- Early exposure to repeated painful stimuli has short- and long-term adverse sequelae on infant health and wellbeing
- Skin to skin contact and breastfeeding practices maximize parent involvement and create opportunities for education and improved outcomes in infant care and development
- Patient education and staff buy-in is essential to implement a standard of care across the MHS L & D units regarding the practice of skin to skin contact and breastfeeding education for new mothers



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# Questions?



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