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Infant Assessment and Reduction of Sudden Unexpected Postnatal Collapse Risk During Skin-to-Skin Contact

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Abstract and Introduction

Abstract

To encourage use of skin-to-skin contact with all healthy term infants during the first two hours of life and throughout their mothers' postpartum hospitalization, an easy, rapid newborn assessment tool, the "RAPP", has been developed to enhance labor and delivery and mother-baby nurses' ability to swiftly and accurately assess newborn physiologic condition. The "RAPP" assessment (respiratory activity, perfusion, and position) tool is being proposed as a way to swiftly evaluate infants' physiologic condition and position. Position of the infant is a key factor in minimizing risk of Sudden Unexpected Postnatal Collapse (SUPC). SUPC is an emerging complication of skin-to-skin contact and breastfeeding in the first hours and days post-birth. The "RAPP" assessment parameters and flow sheet are discussed, risk factors for SUPC are enumerated, and a checklist to prevent SUPC is presented so skin-to-skin contact can be safely provided.

Introduction

Skin-to-skin contact, also known as Kangaroo Care, has been recommended for all healthy term newborns by the American Academy of Pediatrics,[1] the American College of Obstetricians and Gynecologists,[2] the Centers for Disease Control and Prevention,[3] and the Academy of Breastfeeding Medicine[4] because of its numerous positive effects on infants and their families.[5] Skin-to-skin contact's (SSC) ability to regulate the infant's temperature and prevent hypothermia and hypoglycemia has earned SSC recognition in the Neonatal Resuscitation Program as the first step for all healthy term infants who do not require resuscitation.[6] The Neonatal Resuscitation Program guidelines state that "term infants who have good muscle tone and cry or breathe spontaneously should not be separated from the mother, but should be dried and placed in skin-to-skin contact with the mother, with both of them covered with dry linen." (6, p. S910).

Other profound and undisputed effects of SSC are improvement in initiation, duration, and exclusivity of breastfeeding and enhanced milk production.[7] Because of these lactation effects, provision of SSC immediately after birth until the first feeding at the breast is finished has been identified as the essential first step for meeting Healthy People 2020 breastfeeding goals,[8] for meeting the Association of Women's Health, Obstetric and Neonatal Nurses' perinatal core measures for excellent care,[9] and for meeting the new Joint Commission mandate that all healthy term infants born in hospitals delivering 1100 or more infants/year are exclusively breast milk fed by discharge.[10,11] Continuing SSC throughout postpartum may yield exclusive breast milk feedings at discharge.[1,12] Despite these recommendations and the Joint Commission mandate, the practice of SSC at birth is not widespread.[13–15] Reasons for slow adoption of SSC at birth are lack of knowledge/education about skin-to-skin at birth,[15,16] no standardized method or uniform practice for skin-to-skin contact,[16,17] occasional unfamiliarity with how to assess the newborn, unfamiliarity about how to position the infant for safety, discomfort with being responsible for newborn wellness – especially the infant's physiologic condition, and how to minimize risk of infant complications that can occur when infants go to breast.[18] The purposes of the manuscript are to share with maternity nursing staff how to conduct an easy newborn assessment that helps the nurse identify immediate newborn physiologic condition and to share nursing interventions designed to minimize the risk of the newly-emerging complication called Sudden Unexpected Postnatal Collapse (SUPC).[19] Assessment and documentation tools are presented that can facilitate comfort, comprehensiveness, and competence in assessing infants and ensuring their safety during SSC.

The Skin-to-Skin Contact Newborn Assessment

The Neonatal Resuscitation Program (NRP)[20] recommends health professionals observe infant breathing, activity, color and tone in each newborn infant. The infant's assessment should be ongoing and continue throughout the recovery period in the labor/delivery unit. Because monitoring of the infant's head, neck, nose, and mouth is critical for prevention of SUPC and should continue after resuscitation has been completed, a simplified and rapid newborn assessment tool that incorporates safe position

requirements was developed. The assessment tool is called the **R**espiratory, **A**ctivity, **P**erfusion, and **P**osition tool (RAPP)[21] and is explained below.

R Stands for Respiratory Effort

Is the infant breathing easily? Easy breathing means the respiratory rate is normal (40–60 breaths per minute), respirations are regular (not irregular, no apnea), and that there are no signs of increased work of breathing (no grunting, nasal flaring, nor retractions). Tachypnea, irregular breathing, grunting, nasal flaring, and/or retractions indicate that breathing is not easy and that there is abnormally increased work of breathing. If the answer to the question posed above is "Yes, the infant is breathing easily," continue to the next assessment parameter in the RAPP tool. If the answer is "No, the infant is not breathing easily," proceed with current NRP procedure as taught in your NRP certification training. Documentation should be either "easy breathing" or "increased work of breathing."

A Stands for Activity

Activity refers to what the infant is doing and in which state ("asleep," "quiet alert," "active alert," "crying," the infant is.[22] Healthy infants generally move about, alternating movements with rest periods in which movements cease for up to ten minutes.[23] If the infant has his eyes closed, the infant is 'asleep' or resting and resting lasts a short time (about five to ten minutes) each time it occurs in the first two hours post-birth.[24] When an infant is 'quietly alert', the 'quiet' means no gross body movements are occurring and 'alert' means eyes are open and appear attentive.[25] When the infant is in the 'active alert' state, his extremities, head or trunk are moving and his eyes are attending to the environment. Infant movements may be slow and dull or quick and sharp. The highest state is 'crying' and can vary from a whimper to a lusty cry. Breastfeeding is an infant behavior accompanying an awake state. If a 'quiet' infant does not respond to tactile stimulation by movements, arousal, or change in physiology, the infant is "non-responsive," which is an ominous sign. If an unresponsive infant is found, the nurse should initiate resuscitation measures immediately. Documentation options in the Activity category are "asleep," "quiet alert," "active alert," "crying," "breastfeeding," or "non-responsive."

The First P Stands for Perfusion

Perfusion represents oxygenation which can be described using the color of the skin. So, perfusion in the RAPP tool refers to the infant's skin color. The ideal color is pink, but many infants appear mottled (spotty pink and pale segments of the skin), indicating that the infant may be cold due to peripheral vasoconstriction or the infant may have decreased oxygen saturation due to delayed transition to extra-uterine life or underlying illness, i.e., congenital heart defect. If the infant is in SSC, check that the infant's chest is in full contact with the mother's chest, because any separation of the infant's skin from the mother's skin will prevent maternal conductance of heat to the infant[26] and the infant's peripheral temperature will drop.[27] If the infant's skin appears pale, gray, dusky, or blue (cyanotic) – all of which suggest impaired circulation or perfusion – and if color does not improve rapidly, the infant should be removed from SSC, and taken to a radiant warmer for a comprehensive evaluation. Documentation options for the Perfusion category are "pink," "acrocyanosis," "pale," "dusky," "gray," or "cyanotic/blue."

P Stands for Position

The second "p" stands for 'position.' Position of the head (should be upright and turned to one side), neck (should be erect in midline, not bent), nares and mouth (both should be uncovered and visible) and extremities (extremities should be well flexed when infant is lying prone on his/her abdomen). If any extremity is not flexed, extend and release it quickly, watching for spontaneous recoil. Spontaneous recoil is a good sign and means that infant tone is satisfactory. If spontaneous recoil is not seen, the limb is described as being "limp" or "flaccid"; flaccidity of a limb or whole body is an ominous sign suggesting poor oxygenation of the brain.[28] Position also refers to the mother's position as she holds her infant to her breast or in SSC. The mother should be semi-upright and supported by three to four pillows. The upright position provides gravitational assistance for infant respirations.[29,30] Documentation options for the Position category are "head upright and turned to one side," "neck erect in midline," "nares and mouth visible," "well flexed," and "limp, flaccid."

Whenever you observe the infant, do the "RAPP" assessment. The following "RAPP" flow sheet can be added to your electronic medical record to serve as a reminder and facilitate swift documentation of "RAPP" results (Figure 1). Documenting your observations will reassure you when the infant is well and make you acutely aware when the infant's condition is less than optimal.

Criteria Birth time_____ Into SSC_____	Date____ Time____	Date____ Time____	Date____ Time____	Date____ Time____	Date____ Time____	Date____ Time____
Respirations						
Easy						
Grunting/Flaring						
Retractions						
Tachypneic						
Activity						
Sleep						
Quiet Alert						
Active alert						
Crying						
Breastfeeding						
Non-responsive						
Perfusion						
Pink						
Acrocyanosis						
Pale						
Dusky						
Position/Tone						
Head turned to one side						
Neck straight						
Nares/mouth visible						
Well flexed						
Some flexion						
Limp/flaccid						
No recoil						
RN Action*						
Continue SSC						
Stop SSC; to Radiant Warmer						
Time KC ends						
Duration of SSC **_____	RN____	RN____	RN____	RN____	RN____	RN____

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Figure 1.

The RAPP™ Assessment. Any markings in the "shaded areas" are unfavorable findings and require action by RN. * RN actions could be: repositioned head/neck, uncovered mouth/nares; inclined mother, removed head covering, told Dad to watch, etc. ** Calculate the minutes of time infant spent in SSC and record here. (© KL Morgan, 2013).

Sudden Unexpected Postnatal Collapse (SUPC)

Sudden Unexpected Postnatal Collapse is a condition in which a previously vigorous, spontaneously breathing infant who had a five-minute Apgar of 8 or more, unexpectedly becomes apneic, often necessitating full resuscitation.[19] Sudden collapse has also been defined as acute cyanosis/pallor and unconsciousness, requiring bagging, intubation and/or cardiac compressions[31] and has been found to commonly occur with breastfeeding of the newborn.[32] Actual incidence of SUPC in presumably healthy infants varies between 2.6/100,000[31] and 38/100,000.[19] Herlenius and Kuhn[33] reported one-third of SUPCs occur during the first two hours post-birth, another one-third between two and twenty-four hours post-birth, and the last third between one and seven days post-birth. An earlier study reported that 73% of SUPCs occurred in the first two hours post-birth.[34]

Because many SUPCs occur within the first few hours of birth, labor and delivery nurses, as well as newborn/postpartum/couplet care nurses and families, need to take steps to minimize the risk of SUPC.[19,31] During the first two hours post-birth, continuous surveillance is recommended.[31,32,35–38] Infants who have suffered from SUPC have been found prone at the mother's breast, prone on the mother's chest or abdomen, swaddled and supine in the mother's arms, swaddled and being held supine by the father or grandmother, lying beside a parent on the parent's bed, prone or supine or on their sides in their own cots, and in various other places and positions.[31,34,39] Infants in SSC are less likely to have problems than infants placed prone elsewhere.[40–42] Some infants who have experienced SUPC have had no negative sequelae, but others have had severe adverse neurologic outcomes or death as a result[31,33] Assessment of risk factors and implementation of strategies to minimize risk of SUPC are a nurse's responsibility.[36,43,44] Prevention of SUPC may be possible because SUPC occurs when "multiple factors act simultaneously to result in these unexpected events. The baby must have an intrinsic vulnerability, possibly blunting of the arousal response…but in the early neonatal period (the infant) also may have increased vulnerability due to post-delivery stress, presence of narcotics or magnesium sulfate given to the mother… and thirdly, there must be an additional exogenous stressor (e.g. prone position, nose in breast, covers over face with carbon dioxide retention, etc."(36, p. 22). Thus, minimization of risk is the goal.

Multiple factors have been identified as potential risks for SUPC. The factors are presented in . Staff should be educated to identify couplets who present high risk for SUPC, such as mothers who are sedated by narcotic or magnesium sulfate, or are very fatigued, are primiparous, obese, and intermittently observed, and infants who have required some resuscitation,[36] because high-risk patients require closer monitoring. Health personnel need to remember that SUPC most commonly occurs in primiparous mothers, mothers who have had a long labor, are tired, have their infant prone for SSC and/or breastfeeding, and fall asleep without anyone watching the mother-infant dyad. Goldsmith,[36] on behalf of the American Academy of Pediatrics Committee on Medical Liability and Risk Management, has recommended that "babies should be monitored by a hospital employee (not a relative) or electronically if no appropriately trained person can be in the room continuously"(p. 22). But, family members are often with the mother-infant dyad continuously during the first few hours post-birth and can be helpful adjunct observers. In fact, having parents monitor an infant's airway, breathing, and color has been recommended, too.[34,45]

Table 1. Sudden Unexpected Postnatal Collapse: Documented Risk Factors.

Risk Factor	Reference
Obesity in mother	Poets, Steinfeldt, & Poets (2011)[31]
Primiparous, lack of education regarding proper technique and what infant should look like	Herlenius & Kuhn (2013)[33]; Thach (2014)[67]
Analgesia or sedative use in mother	Andres et al (2011)[35]
Post-natal fatigue in mother or infant, Mother falling asleep with infant	Poets, Steinfeldt, & Poets (2011)[31]
Infant sleeping after feeding; infants do not struggle because they are asleep. Sleep reduces the arousal response to airway obstruction	Byard & Burnell (1995)[39]
Possible decrease in sympathetic nervous system activity in infant (decreased response to potential asphyxiating position)	Uvnas-Moberg, Arn, & Magnusson (2005)[50] Poets, Urschitz, Steinfeldt, Poets (2012)[65]

Head totally covered	Blair, Mitchell, Heckstall-Smith, & Fleming (2008)[66]
Occluded position of mouth and nose/bent neck	Andres et al (2011)[35]
Side-lying breastfeeding position	Feldman & Whyte (2013)[51]
Unsupervised breastfeeding	Andres et al (2011)[35]; Herlenius & Kuhn (2013)[33]; Becher, Bhushan, & Lyon (2012)[34]
Mother unobserved by nurse	Herlenius & Kuhn (2013)[33]
Prone position in SSC or up against breast	Herlenius & Kuhn (2013)[33]Becher, Bhushan, & Lyon (2012)[34]
Maternal sedation by narcotics or magnesium sulfate	Goldsmith (2013)[36]
Maternal/parental distractions (I-phone, visitors, TV, etc.)	Pejovic & Herlenius (2013)[19]
Bedsharing	Thach (2014)[67]

Safe Positioning Check List

Several of the risk factors for SUPC are related to positioning.[36,31] Identifying positional factors with each mother-infant dyad enables the nurse to provide vigilant monitoring and assure safety of the infants. A checklist for safe positioning has been developed by the United States Institute for Kangaroo Care.[46] Checklists enhance patient safety,[47] provide a thorough yet simple, succinct, and time-efficient method of documenting findings, and can easily be adapted to an electronic medical record format. Components of a safe positioning checklist should include the following:

1. Mother or provider of SSC is in reclining position, not flat
2. Infant's back is covered and hair is dry
3. Infant is well-flexed on provider's chest
4. Infant's shoulders are flat against provider's chest
5. Infant is chest-to-chest with provider, not over a breast
6. Infant's head is turned to one side
7. Infant's face can be seen
8. Infant's nose and mouth are visible and uncovered
9. Infant's neck is straight, not bent

Any checklist should also include a statement regarding infant sleep in SSC. If the infant and provider fall asleep, both need to be continuously monitored/watched so the mother does not roll onto her infant and the infant does not fall over or out or slip into an unsafe position. The checklist developed by the United States Institute for Kangaroo Care concludes with the following directive: "Moms and babies get very sleepy after feeding times. For safety, someone should be watching you both. If no one can watch, put your baby on his/her back in the baby's own firm bed." This statement allows the practice of skin-to-skin contact to be consistent with safe sleeping practices admonished by the American Academy of Pediatrics.[48]

Falling asleep is a common occurrence in SSC because oxytocin is released in the mother's and infant's brains as soon as SSC starts, making both relaxed and sleepy.[49,50] In addition to SSC-induced sleepiness, the oxytocin that is released during breastfeeding augments sleepiness; soon mother and infant succumb to oxytocin effects and drift off to sleep. As the infant falls asleep, he/she can easily embed his/her face in breast tissue or assume a position in which the head slips below the breast. When the infant's head is below the breast, the overlying breast tissue can cover the nose and mouth, inducing SUPC and/or suffocation. SUPC has also occurred in the side-lying breastfeeding position,[51] but alternative positions, such as the Koala Hold,[52] provide safe skin-to-skin, chest-to-chest opportunities for breastfeeding without the possibility of suffocation at the breast. Sleeping in SSC is not bad, though. Sleeping in SSC provides the infant with a very high quality organized sleep

pattern[53] that promotes brain development and maturation[54] and decreases infant stress,[55] unlike sleep that occurs when not in SSC. Thus, when continuous observation of the dyad is possible and, only when continuous observation occurs, sleep in SSC can be allowed so that the neuropromotional benefits of SSC can be experienced.

Stategies to Minimize SUPC Risk

In conclusion, nurses need to apply strategies that can minimize SUPC. First and foremost of these strategies is education of health personnel[36,56] and family members about safe positioning. Safe positioning education needs to be addressed on a regular and routine basis for staff. A free webinar on the topic is already available.[57] Education for every newly admitted woman and family to labor/delivery is also needed. Using a safe positioning checklist can help education efforts. The United States Institute for Kangaroo Care has developed index cards and posters that demonstrate safe positioning of a newborn on the left and a check list of the safe positioning components on the right (Fig. 2). Some hospitals have attached the safe positioning picture and checklist to a wall (with Velcro) in each delivery and postpartum room so it can be pulled from the wall, taken to the mother, and each item reviewed with her and any other person present about safe positioning to minimize the risk of SUPC. When finished with the teaching opportunity, the poster is returned to the wall until needed again. Parents and other visitors need to be informed that someone should be watching the mother and infant closely after birth because both can be tired from a long labor, and the oxytocin released during SSC and breastfeeding make sleep inevitable. Fathers and friends who attend the delivery should be made aware of the possibility of SUPC, shown a safe positioning checklist, and be told that their job is to protect the mother and newborn by making sure the infant's position is good at all times. Reinforce family and visitor's knowledge that whenever sleepiness ensues or is expected and no one will be present to constantly monitor for unsafe positioning, the infant should be placed on his/her back in his/her own cot. Parental knowledge about breathing, color, and activity in the infant is important, too, because many SUPCs occur in the first two hours post-birth and in the postpartum unit where the mother-infant dyad will be alone for some time. Remind everyone that SUPC can occur at home, too.[32] Thus, family members need to be educated (put information in parental admission kits and place educational posters in all rooms) and practiced (have health personnel review simple assessment and safe positioning checklist with parents) in establishing safe positioning and watching infant condition.

Figure 2.

United States Institute for Kangaroo Care Safe Positioning Poster. © United States Institute for Kangaroo Care, 2012. Permission to reproduce granted by United States Institute for Kangaroo Care 7/12/2013.

A second strategy is for nurses to model each item on the safe positioning checklist because each item, per se, is a strategy to prevent SUPC. A third strategy is that maternity unit personnel need to learn about risk factors, especially the high risk factors, for SUPC and vigilantly screen for these with all patients. Two screening tools to predict unexpected deaths in healthy newborns published about 30 years ago may be of use now.[58,59] Fourth, staff need to consistently and competently use RAPP assessment parameters to minimize risk and enable early detection of SUPC. Fifth, provisions need to be made for continuous monitoring of the dyad during SSC and breastfeeding in the labor/delivery[36] and postpartum units. Task forces of all stakeholders, including hospital risk management personnel, need to collaboratively identify strategies that are institutionally-acceptable to minimize the "triple risks" contributing to SUPC, i.e., intrinsic infant risk factors (intrinsic vulnerability of the infant's brain,[60] post-delivery stress or possible sepsis, narcotics/magnesium sulfate given to mother, infant of diabetic mother, macrosomia/microsomia), maternal risk factors (fatigue, sedation, primiparous, distraction, on narcotic meds, history of smoking, obese/pendulous breasts), and environmental (breastfeeding, intermittent observation, unsafe and/or prone positioning, failure to model and reinforce safe sleep practices) risk factors. In relation to environmental factors, the AAP has recommended that in high risk situations "babies should be monitored by a hospital employee (not a relative) or electronically if no appropriately trained person can be in the room continuously" (36, pg. 22). This recommendation implies a costly increase in manpower so that a health professional is assigned to each patient throughout their labor/delivery unit stay and during SSC and breastfeeding throughout postpartum. Continuous presence of a health professional may also be seen as an invasion of privacy and have

unknown impact on family development during the first few hours post-birth, a critical time for optimal attachment and emerging family responsibilities.[16,61] Perhaps units will require electronic cardio-respiratory monitoring of the infant for someone to centrally observe and, when alarming, respond. Electronic monitoring will contribute to monitoring fatigue[62] and be subject to monitoring/alarming issues that plague busy intensive care units.[63] The goal of keeping the mother and infant close but separate during un-observed maternal sleep might be facilitated by use of a bassinet that swivels towards the mother's bed.[64] Plans should be made in anticipation of comments and recommendations from other health care agencies such as the Joint Commission Patient Safety Group, and professional associations like the American Academy of Pediatrics' Committee on Fetus and Newborn and the Association of Women's Health, Obstetric, and Neonatal Nurses.

In summary, adequate education of health personnel and families in relation to accurate newborn physiologic assessment and safe positioning, along with appropriate surveillance during the first days of newborn life, especially in high-risk families, can save hundreds of lives.[33]

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