

## Infant Swaddling Backgrounder for Public Health Staff

### SUMMARY

This review summarizes the benefits and risks of infant swaddling and alternate methods to address infant crying. Swaddling can be a useful technique to soothe for painful procedures, to calm and reduce crying, and may be protective for infants sleeping supine; however, negative effects associated with swaddling remain a concern. Swaddling may increase the risk of SIDS by overheating, covering the mouth and nose, and for infants put to sleep on their side or prone, or who roll into the prone position. Swaddling has been associated with reduced maternal-infant bonding, less effective breastfeeding and weight loss in the first week of life, respiratory infections, and hip dysplasia. Other measures to maintain body temperature and to soothe are recommended as first-line approaches, with swaddling used only in specific circumstances and following specific safety guidelines.

### Swaddling Benefits

#### *Pain Relief*

A review of systematic reviews on pain interventions in hospitalized infants selected 11 high quality reviews of 1,469 potential reviews. Swaddling was one of several non-pharmacological strategies that were effective for procedural pain.<sup>1</sup> One of these systematic reviews showed swaddling generally has a positive impact on behavioural and/or physiological pain indicators however study results are somewhat contradictory, and effectiveness appears to vary with gestational age and other factors.<sup>2</sup> Swaddling has also been shown to be an effective measure post-immunization, in combination with an approach named the 5 S's (swaddling, side/stomach position, shushing, swinging, and sucking; also known as The Happiest Baby method); this approach was not improved with the addition of sucrose.<sup>3</sup>

#### *Weighing*

When preterm infants (mean gestational age 32 weeks) were weighed either swaddled or unswaddled, swaddled infants showed reduced physiological distress, improved motor organization and more effective self-regulatory ability.<sup>4</sup>

#### *Excessive Crying*

One of the more common reasons to swaddle is to soothe excessive crying. Researchers of colic and shaken baby syndrome have developed a program to help parents (and professionals) understand normal crying patterns. The Period of PURPLE crying materials teach that crying in early infancy has a **P**eaK, is **U**nexpected and unpredictable, is **R**esistant to soothing, the infant may have a **P**ain-like expression, the bouts of crying are **L**ong, and clustered in the **E**vening ([www.purplecrying.info](http://www.purplecrying.info)). The normal crying curve begins to rise at 2-3 weeks of age, peaks at 6-8 weeks, and lasts until 3-4 months of age. Some infants cry more and some cry less, but most infants follow this pattern. Crying is a developmental stage and will occur regardless of the soothing methods used, so it is important for parents to understand this and have coping methods to use when

they become frustrated. Specific interventions to address and reduce crying are suggested, however it is emphasized that nothing works all the time, and this is normal.

The Period of PURPLE crying program has been evaluated in a number of settings. In British Columbia, mothers of newborns randomized to receive PURPLE program materials (vs. injury prevention materials)<sup>5</sup> at public health home visits showed greater crying knowledge, shared crying information and strategies with other caregivers, and were more likely to walk away during episodes of inconsolable crying. In Washington State, mothers of newborns randomized to receive the PURPLE program materials (vs. injury prevention materials) through prenatal classes, maternity wards, and pediatric practices showed higher crying and shaken baby knowledge and were more likely to share information with other caregivers about walking away if frustrated and the dangers of shaking.<sup>6</sup> In Japan, mothers of newborns were randomized to receive the DVD and booklet by mail within 2 weeks of birth, or materials on infant safety.<sup>7</sup> Crying knowledge, sharing of walk away information with others and walking away from the infant when crying was unsoothable were higher for those who received intervention than control materials. In a home visiting study of young high risk first-time mothers, crying knowledge, behavioral responses to infant crying and sharing information with other caregivers was improved after exposure to the program.<sup>8</sup>

Researchers and public health practitioners in the Netherlands use an infant soothing approach that includes “regularity and uniformity”, which establishes a routine for excessively crying infants in a quiet environment. After sleeping the infant is fed, followed by cuddling/playing with the caregiver, then quiet time alone. When signs of tiredness appear the infant is placed to bed, awake but tired. Use of the same sleeping and playing locations are encouraged (e.g. crib, playpen), and external stimuli such as TV, radio and other noise are reduced, as well as overstimulation with toys, outings, and visitors. This approach is thought to encourage self-regulation, improved sleep/wake rhythm, leads to less stimulation and overtiredness, and greater attention to infant cues. 496 excessively crying infants were randomized to this approach, with or without swaddling. All infants showed a dramatic reduction in crying in the first week (42%), contrary to the expected increase (normal crying curve), with continued reductions in the following weeks. Swaddling provided a small additional benefit in reducing excessive crying (10 minutes per day) but this effect was only significant for children less than eight weeks of age.<sup>9</sup>

The authors and nurses using this approach recommend starting with the regularity, uniformity and quiet environment approach. The method is taught to parents, an infant behaviour/activity diary is started, and telephone follow-up is provided at day 2 and 5. If there is still excessive crying at 5 days, swaddling is discussed with the family. If there is no improvement after 2 more days, a pediatrician is consulted. It is important to note that crying typically increases on the first day of the new routine for infants who are not swaddled, so if a family is very stressed, swaddling is not delayed. Safety recommendations and contraindications to swaddling are described by the authors. This approach has formed the basis for a national guideline in maternal/infant care in the Netherlands.

A randomized controlled trial of a behavioural intervention to prevent excessive crying (The Happiest Baby method) documented that infants of families shown a videotape with instructions involving swaddling, side positioning, white noise, jiggling, and sucking had the same crying and sleep patterns as infants of families shown a video about normal newborn care. In contrast to the Netherlands approach, these were normal healthy newborns, rather than older infants with excessive crying, and the intervention did not address daily routine (consistency and uniformity) and excessive environmental stimuli. In addition, intervention families were not compliant with swaddling, which is the foundation of this method.<sup>10</sup>

### ***Sleep***

Many sleep studies have been published examining the effects of swaddling on sleep patterns and physiologic responses to swaddling. Infants who are swaddled sleep longer, have increased sleep continuity, decreased arousals, and increase in total daytime sleep, less startles, fewer spontaneous awakenings, and lower heart rate variability.<sup>11,12,13,14</sup>

Swaddling may encourage sleeping in the supine position, which has led some authors to recommend swaddling for infants who are resistant to supine sleeping, and whose parents may therefore choose the prone position. In one study, infant prone sleepers were found to be largely accepting (78%) of supine sleeping if they were swaddled supine.<sup>15</sup>

A failure to arouse from sleep has been linked with SIDS and with swaddling, and provides a theoretical basis for caution in recommending swaddling. One study documented that infants with decreased cortical arousals in a sleep study later died as a result of SIDS (Kato 2003).<sup>16</sup> In a study comparing routinely swaddled infants and infants who are not routinely swaddled, the infants naïve to swaddling were more difficult to arouse from quiet sleep at 3 months of age.<sup>17</sup> These infants also had decreased full arousal in active sleep. Both of these results were only significant for the infants who were naïve to swaddling, and were replicated in another study.<sup>18</sup> These sleep study findings are similar to infants new to prone sleeping, a major risk factor for SIDS, and suggest that infants naïve to swaddling may have an increased risk of SIDS when swaddled.

### **Disadvantages and Risks of Swaddling**

#### ***Maternal-Infant Bonding and Breastfeeding***

In a study of mother-baby interaction, skin-to-skin contact and early breastfeeding were found to be positive predictors of maternal-infant interaction one year later.<sup>19</sup> Skin-to-skin contact is not possible with swaddling, which was found to lead to a reduction in the mother's responsiveness and involvement with the infant, and several measures of maternal-child interaction and bonding. In this study, babies were reported to be swaddled up to 1.5 to 3.0 months at home. In a similar study, infants who were swaddled and separated from their mothers for 2 hours after birth had less favorable mother-infant interaction at day 4 of life.<sup>20</sup>

Infants swaddled in the first few hours after birth show delayed establishment of effective breastfeeding.<sup>21</sup> Swaddling in the first few days after birth is linked to a delay in initial breastfeeding, less successful suckling at the breast, reduced intake of mother's milk and more infant weight loss.<sup>22</sup> Infants swaddled and in the nursery were also colder than unswaddled infants.

### ***Respiratory Infection***

A study of 186 infants in Turkey and China concluded that those routinely swaddled in the first three months had a 4-fold greater likelihood of developing pneumonia (confirmed radiologically) and other upper respiratory infections compared with those not swaddled.<sup>23</sup> Another study demonstrated that as swaddling pressure increased the respiratory rate raised during quiet sleep ( $p < 0.05$ ).<sup>9</sup> Swaddling can constrict chest wall movement, impairing respiratory mechanics, raising respiratory rate, and reducing lung expansion. This may also impair gas exchange, and result in hypoxia or hypercarbia, which are risk factors for apnea in young infants. One study showed lower oxygenation in swaddled supine infants with pneumonia.<sup>24</sup> Therefore swaddling techniques must allow for adequate chest wall excursion.

### ***Developmental Dysplasia of the Hips (DDH)***

Swaddling is a significant risk factor for developmental dysplasia of the hips, with higher rates of dysplasia in swaddled infants and in countries where swaddling is prevalent during the first year of life.<sup>14,25</sup> There appears to be a greater risk of hip dysplasia for infants who are tightly swaddled, restricting hip flexion and abduction. In one study, female swaddled infants were at higher risk for hip dysplasia.<sup>26</sup> Given the strong evidence linking swaddling and hip dysplasia, swaddling techniques must allow for adequate hip flexion and abduction, and tight swaddling should be avoided.

### ***Risk of SIDS***

The New Zealand Cot death study was a large case control study of 393 SIDS cases and 1592 control infants. A reduced risk of SIDS was documented for "firmly tucked" infants sleeping on their back (OR 0.63, 95% CI 0.46-0.86).<sup>27</sup> In this study parents were asked "was your child tucked in firmly or could the child move freely?" so the precise mode of swaddling or tucking was not documented.

In a case control study in the Netherlands with 73 SIDS deaths and 146 controls, a cotton sleep sack was associated with a decreased risk of SIDS whereas a quilted sack was not (OR 0.35, 95% confidence interval 0.15-0.83).<sup>28</sup> The use of a sleeping-sack correlated with placing infants supine ( $r=0.25$ ,  $P < 0.01$ ) and prevented turning to the prone position. A Dutch sleeping sack (illustrated in the publication) has a v-neck, front zipper, does not restrict the arms, and is loose below the arms.

An Australian case-control study comparing 58 babies who died of SIDS to 120 control babies found swaddled babies usually laid prone to sleep had a 12-fold greater risk of SIDS relative to swaddled supine babies.<sup>29</sup> Infants who were prone but not swaddled had a 3-fold increased risk of SIDS. Swaddling was not found to be a significant risk factor in this study if infants did not sleep prone, however it was not protective. Some authors cite

this study as supporting a reduced risk of SIDS in swaddled supine sleepers, however the confidence interval includes 1, meaning that the risk may be reduced but may be increased up to 2.3-fold (OR 0.69, 95% CI 0.21-2.3). In this study, swaddling was defined as wrapping in any type of bedding such as a sheet or light blanket.

Another study using a case-control design found 19% of SIDS infants were swaddled compared to 6% of controls.<sup>30</sup> Here, of the 19 who died, 12 were supine, 4 were side-lying and 3 were prone. There was a 31-fold increase risk with swaddling, but results were not stratified by sleeping position, so the precise estimates of risk for swaddling prone and supine are not available (OR 31.06, 95% confidence interval 4.21-228.94, p = 0.001).

## **Published Recommendations**

### *American Academy of Pediatrics*

AAP safe sleep Policy Statement Technical Report<sup>31</sup>: “Although swaddling may be used as a strategy to calm the infant and encourage use of supine position, there is not enough evidence to recommend it as a strategy for reducing the risk of SIDS. Swaddling must be correctly applied to avoid possible hazards such as hip dysplasia, head covering, and strangulation.”

### *Rourke Baby Record* ([www.rourkebabyrecord.ca](http://www.rourkebabyrecord.ca))

The Rourke baby Record cites the van Sleuwen swaddling systematic review: “Proper swaddling of the infant for the first 6 months of life may promote longer sleep periods but could be associated with adverse events (hyperthermia, SIDS, or development of hip dysplasia) if misapplied. A swaddled infant must always be placed supine with free movement of hips and legs, and the head uncovered.”<sup>32</sup>

## **Recommendations for WRHA Public Health Staff**

### 1. Swaddling for Warmth in the Winter

First, ensure that the room/home temperature is appropriate. The Winnipeg Liveability bylaw requires that residential temperatures be no less than 18°C between 11pm and 7am, and no less than 21°C between 7am and 11pm. If the landlord does not respond to a request to comply with adequate heating, the tenant may contact Environmental Health Inspections by calling 311.

If the home is cold, place the crib or bassinette in the warmest room, away from windows, drafts, and exterior walls. Babies should not sleep next to a radiator, heater or fireplace/woodstove, given the risk of overheating. Do not use a hot water bottle or an electric blanket in the crib.

Use a fleece or flannel fitted crib sheet.

Dress the infant in an undershirt and fleece sleeper with feet. Newborns who are small for gestational age or premature may also need a hat. If the room is very cold, older infants may also need a hat.

If the above steps are followed and there is still concern regarding warmth, a small fleece blanket can be used, tucked in on three sides (at the foot of the bed and both sides), with the top of the blanket no higher than the armpits. The blanket should be a crib-sized blanket, large enough to firmly tuck in without loosening, but small enough that it does not create an uneven mattress surface when tucked in. Full-size quilts and comforters should not be placed under or over the infant.

## 2. Swaddling for Soothing

Provide the Crying handout.

Discuss the normal crying curve and the principles that crying in early infancy is a developmental stage and that not all crying can be soothed.

Discuss information about coping strategies for frustration, and assist the parent in developing an action plan, including what to do and who to call if they cannot cope with the crying.

Review tips for soothing crying (see list at [www.purplecrying.info](http://www.purplecrying.info)):

- address infant needs (hunger, diaper change, overheating, overstimulation, fatigue)
- change of position
- kangaroo care/skin to skin contact
- white noise/vibration (fan, dryer, vacuum, car ride)
- carrying/closeness
- do not place the infant on top of a dryer or washing machine due to the risk of falls

If the child meets the criteria for excessive crying (more than 3 hours per day for at least 3 days per week) and there is not an apparent explanation (illness, injury) and no other symptoms suggesting an organic cause, discuss the uniformity/regularity approach, along with reduction of environmental stimuli. If there is concern regarding a physical or medical cause refer the family to their primary care provider. If there is no improvement after 5-7 days, discuss the option of adding swaddling, using the safer swaddling techniques below. If the parent is extremely stressed about the crying, swaddling may be initiated at the first visit, but must be combined with the overall approach, as the behavioural and environmental changes have a greater effect than the swaddling. Swaddling alone is not effective. If there is no improvement after 2 more days, refer the family to their primary care provider or pediatrician.

### 3. Safer Swaddling Techniques

Safer swaddling requires supine positioning in the crib or playpen, careful attention to development (stop when rolling), and techniques which avoid face/mouth covering, tight wrapping of the chest and hips, and which prevent the infant from escaping the swaddle.

- Never swaddle in the prone or side/propped positions
- Use a safe sleep location (crib, bassinette, or playpen; not on a couch, chair, bed, infant chair, swing, stroller, or car seat)
- Stop when rolling over in either direction and with any attempt to turn prone
- Stop if the infant is able to unravel the swaddle
- Do not constrict the chest or hips; allow the hips to flex and abduct
- Do not overheat (dress in a cotton sleeper, one layer, under the swaddle)
- Do not swaddle if the infant has a fever
- Do not swaddle after 6 months of age

### 4. Sleep Sacks and Swaddlers

Health Canada does not recommend the use of any sleep products, and supports only the use of standard infant sleepers and clothing. However some parents may choose to use a sleep sack as an alternate to using a blanket or a swaddle. If a family wishes to use a sleep sack or commercial swaddling bag/clothing (swaddler) there are safety risks that should be considered.

- Closely follow the manufacturer's instructions regarding age, weight and length, as well as safety precautions.
- The fabric should meet Canadian sleepwear flammability guidelines (check the label or manufacturer's website).
- There should be no drawstrings or cords at the neck.
- Check for ribbons, cords, or tight elastic that could cause strangulation or constrict a limb or digit.
- There should be no small parts such as buttons or decorations that could fall off and cause a choking hazard.
- The sack must fit snugly around the upper body and neck so that the fabric does not cover the mouth and nose, and so that the infant cannot wiggle inside the sack, under the collar.
- The sack or swaddler should not be tight around the chest, restricting breathing movements.
- There should be no restrictions at the hip, so that the hips can flex comfortably.
- Caution the parent regarding overheating, and always dress lightly under the sack and/or swaddler.

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