

# REVIEW

## Pulse Oximetry Monitoring of Infants Who Require Prone Position For Sleep – Is There Evidence That This Practice Reduces SIDS?

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### Abstract

At the IWK Health Centre infants with special medical or developmental needs who require prone and/or side-lying positions for sleep are currently monitored by pulse oximetry to presumably reduce the risk of SIDS. The aim of this paper was to determine if there is any evidence in the literature demonstrating that pulse oximetry monitoring of infants who sleep in the prone position has any effect on mortality from SIDS. A review of the literature was conducted and no studies were found that specifically address this question. Since medical practices should be based on evidence and there is currently none for this protocol, we believe it may be doing more harm than good.

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Sudden Infant Death Syndrome (SIDS), defined as the sudden death of an infant before one year of age that remains unexplained following a clinical history, examination of the death scene, and autopsy,<sup>1-3</sup> is the leading cause of post-neonatal infant death in the developed world.<sup>4,5</sup> SIDS most commonly occurs in the time period between one and six months of age.<sup>6,7</sup> Although the cause of SIDS is still unknown and believed to be multifactorial, the ‘Triple Risk’ hypothesis, which was first proposed almost 20 years ago, is the most widely accepted model to explain its pathophysiology.<sup>8</sup> In this model SIDS results from the presence of three simultaneous risk factors: 1) a vulnerable infant (such as prematurity or low birth weight), 2) a critical period during the development of homeostatic control mechanisms, and 3) an exogenous stressor.<sup>8</sup> There is an abundance of evidence suggesting that sleep in the prone as opposed to the supine position is one of the major exogenous stressors associated with SIDS.<sup>9-14</sup> Since 1992 the American Academy of Pediatrics (AAP) has recommended that infants be placed in the supine position for sleep in order to reduce the risk of SIDS,<sup>2</sup> and implementation of the ‘Back to Sleep’ program has reduced the incidence of SIDS deaths by over 50% worldwide.<sup>15</sup> In 1992 the rate of SIDS was 1.2/1,000 live births and only 13% of infants slept on their backs, whereas in 2006 the rate of SIDS dropped to 0.55/1,000 live births and more than 75% of infants slept supine.<sup>15</sup>

There is still some debate as to whether prone position is superior to supine in infants with gastro-esophageal reflux disease (GERD).<sup>16-18</sup> Current AAP guidelines recommend that prone sleep position be considered in special cases where the risk of complications from

GERD is greater than the potential increased risk of SIDS.<sup>19</sup> In 2006, the IWK Health Centre’s Policy on Infant Positioning stated in its protocol for infants with special medical or developmental needs who require prone and/or side-lying positions for sleep, electronic monitoring is required.<sup>20</sup> Electronic monitoring is done by pulse oximetry (SpO<sub>2</sub>), which is a non-invasive way to monitor oxygen-hemoglobin saturation.<sup>21</sup>

We believe that this policy of monitoring otherwise healthy infants, that is those who are not vulnerable to SIDS and who are put to sleep in the prone position, may be problematic for several reasons. First, practice guidelines should be evidence-based, and we are not aware of any evidence demonstrating that pulse oximetry monitoring, of otherwise healthy infants in the hospital, has been shown to reduce their risk of SIDS. Furthermore, pulse oximetry averages the signal obtained over several seconds. This may delay the detection of acute changes in oxygenation by several seconds, consequently delaying the detection of acute hypoxemia.<sup>22</sup> Finally, once these children are discharged from the hospital and will no longer be electronically monitored but still sleeping in the prone position, their parents may be afraid that they will die from SIDS because they are not being monitored.

The purpose of this paper was to determine if there is any evidence in the literature demonstrating that pulse oximetry monitoring of otherwise healthy infants who require prone sleep position reduces SIDS deaths. In the event there is no evidence, this practice of monitoring may be doing more harm than good, as it may be creating unnecessary parental anxiety.

## Methods

All 10 papers cited in the IWK Health Centre's policy<sup>20</sup> were reviewed for evidence that pulse oximetry monitoring of prone infants reduces the incidence of SIDS deaths. None of the citations included any evidence specifically addressing whether electronic monitoring of infants in the prone position for sleep reduced incidence of SIDS.<sup>1,4,5,23-29</sup>

The goal was then to determine if there is evidence in the literature specifically addressing the question: does pulse oximetry monitoring of otherwise healthy infants (i.e. those not at increased risk for SIDS) put to sleep in the prone position reduce the incidence of SIDS? The population of interest was infants sleeping in the prone position. The comparison was pulse oximetry monitoring versus no pulse oximetry monitoring, and the outcome was SIDS deaths.

A literature review was conducted using both the PubMed Clinical Queries and the PubMed database tools (from Jan 1966 - Dec 2011). In the PubMed Clinical Queries database, each available search category (etiology, diagnosis, therapy, prognosis, clinical prediction guides) was used with a broad search scope. The search strategy: 'infant AND prone AND pulse oximetry monitoring AND SIDS' yielded two clinical studies results.<sup>30,31</sup> Removing infant from the search but still including: 'pulse oximetry monitoring AND prone AND SIDS' yielded only the same two papers as before.<sup>30,31</sup> The second search: 'infant AND prone AND pulse oximet\* AND SIDS' resulted in three papers.<sup>30,32,33</sup> Removing infant from the search for 'prone AND pulse oximet\* AND SIDS' yielded the same three results.<sup>30,32,33</sup> Expanding the search to the general PubMed database (not limited to the Clinical Queries section) with the limit of infant (age birth - 23 months) and the search strategy: 'pulse oximetry AND prone AND SIDS' yielded five papers.<sup>30,31,33-35</sup> In summary, a total of six unique papers were identified<sup>30-35</sup> from the literature search which could possibly address the question.

None of the papers identified in the literature search addressed the specific research question. The Sahni et al.<sup>30</sup> study examined low birth weight (LBW) and the Saiki et al.<sup>34</sup> and Poets et al.<sup>32</sup> studies examined premature babies, both of which are populations at increased risk of SIDS<sup>8</sup> and therefore not relevant to our population of interest. The Poets et al. study from 1995<sup>33</sup> also included babies at increased risk of SIDS, either because they were premature, had a sibling who died of SIDS, or had a suspected airway obstruction. Furthermore, Poets et al. found no significant differences in oxygen desaturations measured<sup>32</sup> while

Saiki et al.<sup>34</sup> found no significant differences in oxygen saturation levels between prone or supine position lying infants. The Skadburg et al.<sup>31</sup> study measured oxygen saturation in full term infants who were not at increased risk for SIDS, hence the criteria of our population of interest was met, but the purpose of the study was very specific and not relevant to our search. It was to measure if side-sleeping infants tilted their face to the side when moved to prone position. The testing in this study was terminated once infants had spent three minutes face down, and SIDS outcomes were not directly measured. The Uchigasaki et al. study was only available in Japanese so could not be interpreted.<sup>35</sup> However, information extracted from the abstract revealed that it is only a report on two infants, hence of limited value to the purpose of this literature search.

## Discussion

There is an abundance of evidence demonstrating that infants placed in the supine as opposed to the prone position for sleep have a decreased incidence of SIDS.<sup>9-14</sup> At the IWK Health Centre, infants with special medical or developmental needs who require prone lying position for sleep are currently monitored by pulse oximetry in accordance with the Infant Positioning Policy.<sup>20</sup> The purpose of this paper was to determine if there is any evidence in the literature demonstrating that pulse oximetry monitoring of otherwise healthy infants who require prone sleep position reduces mortality from SIDS. In this literature review, no journal articles were found which directly addressed either our population of interest or our expected outcome of SIDS deaths. We have therefore found no evidence to suggest that electronic monitoring of infants who sleep in the prone position for special considerations has any impact on the incidence of SIDS.

Aside from the lack of evidence behind this protocol, we believe it may also be causing undue distress to parents. Studies show that parent practices at home are strongly influenced by hospital nursery practices when it comes to the topic of SIDS.<sup>27,36,37</sup> Therefore, altering an infant's sleep regimen by removing one component from it, pulse oximetry monitoring, may be unsettling to parents and cause unnecessary anxiety. Since medical protocols should be based in evidence, and there is no evidence behind this protocol, there should be no need to monitor these otherwise healthy infants. The newer generations of pulse oximeters are more accurate but pulse oximetry readings may be unreliable during periods of infant movement.<sup>38-40</sup> They may miss drops in oxygenation if they occur in the absence of bradycardia or central apnea,<sup>21,41</sup> and they are known to produce false alarms.<sup>21,38,39,41</sup>

It should be noted that simply because there is no available evidence demonstrating that electronic monitoring of otherwise healthy infants has any impact on preventing mortality from SIDS does not necessarily mean that this is so. There is a need for further research on this subject including a review of policies in other hospitals. The lack of evidence behind this protocol suggests that it should be discontinued.

### Conclusions

There should be a purpose to each medical intervention and protocols should be based on evidence. In this paper we have concluded that there is currently no evidence demonstrating that the pulse oximetry monitoring of non-vulnerable infants, lying prone for sleep, reduces mortality from SIDS. Until evidence shows otherwise, we believe that the policy of monitoring these infants at the IWK Health Centre may be doing more harm than good.

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