An assessment tool for infants requiring nasal continuous positive airway pressure

Most neonatal intensive care units use nasal continuous positive airway pressure (nCPAP) to achieve non-invasive ventilation. Although offering decreased lung damage and reduced rates of bronchopulmonary dysplasia (BPD), there are potential complications of nCPAP, specifically trauma to the nares. This article discusses an assessment tool for the early detection of trauma and prevention of injury in neonates.

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Key points
1. Nasal CPAP is an important means of oxygen supplementation but can cause trauma to the nares.
2. Healthcare providers should be aware of the potential complications of CPAP.
3. Use of an assessment tool enables early detection of any trauma to the nares.
4. A comprehensive and up-to-date approach for caring for an infant receiving nCPAP via a mask and/or prongs is discussed.

Educational guidelines
Nurses caring for infants receiving nCPAP work through a competency plan. The Practice Development and Respiratory teams at Southmead Hospital devised a set of guidelines that include a CPAP competency and a CPAP care plan. In accordance with the Department of Health’s Toolkit for High Quality Neonatal Services, staff undergo training to achieve these competencies.
Each manufacturer provides a tool or template with directions for measuring the infant’s nares and head to determine the appropriate size prongs, mask and hat. One major challenge is obtaining a good fitting hat and prongs/mask to maintain airway pressure. The following components need to be examined to ensure a good fit is present:

- Do the straps fit securely but not too tight?
- Is the mask pressing up against the nares and occluding them?
- Is the nasal interface component twisted because of tension on the tubing?
- Is there any blanching of the skin around the nares?

CPAP devices have the potential to cause nasal excoriation and scarring if inappropriately applied or infrequently monitored. Nasal prongs will tend to cause nasal wall and septal breakdown whereas the masks tend to cause breakdown low on the septum at the base of the philtrum and high on the bridge of the nose. As such, trauma related to nasal prongs tends to be maximum around the medial aspect of the nasal septum and the columella (the fleshy external end of the nasal septum), whereas trauma related to nasal masks is more often seen at the junction of the nasal septum and philtrum and at the glabella (the skin between the eyebrows and above the nose). As nasal masks and prongs can cause nasal trauma in differing distribution, the interface used is often alternated. Prevention of skin breakdown in a neonate on nCPAP is paramount. If skin damage does occur, the caregiver needs to assess the degree of damage and try to relieve pressure at this point.

In some cases, surgical repair to nasal defects due to nCPAP trauma may be necessary and this is usually conducted when the infant is older and compliant. The surgery will involve using small local flaps of nasal tissue to repair the damage caused by a CPAP device.

<table>
<thead>
<tr>
<th>Signs</th>
<th>Score</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nares appear healthy</td>
<td>0</td>
<td>No action required</td>
</tr>
<tr>
<td>Slight redness noted around nares</td>
<td>1</td>
<td>Ensure the baby is wearing the correct size hat/mask/prong as per NICU guidelines and that all are correctly positioned. Assess/discuss with senior nurse/registrar/consultant if a change in mask/prongs is needed or consider a change of device. Document on NICU care chart and in notes.</td>
</tr>
<tr>
<td>Area appears painful to touch</td>
<td>1</td>
<td>Call senior nurse/registrar/consultant</td>
</tr>
<tr>
<td>Some indentation noted</td>
<td>1</td>
<td>Remove mask/prongs immediately ensuring baby’s breathing remains supported. Decide on appropriate alternative respiratory support. Document on NICU care chart, in notes and complete AIMS form.</td>
</tr>
<tr>
<td>Any of the following evident:</td>
<td>2</td>
<td>Doctor to refer to plastic surgeons and obtain medical imaging</td>
</tr>
<tr>
<td>• Marked indentation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Painful to touch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Tissue breakdown</td>
<td></td>
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</tbody>
</table>

**FIGURE 1** A score chart for a baby receiving nCPAP.

**FIGURE 2** The CPAP competency (left) and care plans used at Southmead Hospital.
External complications from nCPAP, especially columellar necrosis, can be difficult to repair surgically and adverse cosmetic results may ensue.

**An assessment tool**

To try to prevent nasal scarring and excoriation the nCPAP score chart was introduced within Southmead NICU in 2008; this score chart has since been updated (FIGURE 1). Staff are encouraged to effectively use the nCPAP score chart. Six months after implementation an audit took place to permit quality improvement and help improve outcomes for patients. The following areas were audited:

- documentation of nasal score on NICU chart – 100% completion and the nasal score corresponded with the actual condition of the babies’ nares at that time.
- size of prongs/mask documented on NICU chart – 100% completion.

The audit revealed that the score chart had been implemented within this NICU successfully and that the nurses understood the need for the score chart, how to use it and why it was being used.

Using an instrument that predicts and ultimately prevents skin breakdown could help to:

- alleviate pain, reduce an infant’s discomfort and improve developmental outcomes
- decrease the risk of morbidity
- reduce re-intubation rates
- reduce sepsis
- decrease prolonged hospital stays in the NICU and the associated costs
- lessen complaints from parents and potential litigation costs.

**Current practice**

Specific CPAP care and competency plans (FIGURE 2) are now in use within Southmead NICU. The nasal score chart and CPAP care plan allow a systematic approach so that all aspects of the care an infant requires while on CPAP are not overlooked. The nasal score chart is integrated within the unit’s NICU care chart (FIGURE 3). On an hourly basis, an infant’s nares are assessed and scored and any evidence of skin breakdown is identified quickly and managed appropriately. FIGURE 4 provides photographic examples of nasal scores 0, 1 and 2.

Close collaboration between NICU staff and the manufacturers of the ventilation equipment has enabled better working partnerships with enhanced feedback and organised study days.

Since the introduction of the nasal assessment tool, there has been a marked reduction in the number of nasal injuries and the extent of damage. In the past 12 months, just one infant received nasal trauma at score 2, as per the assessment tool. The nurse caring for the infant promptly identified the nasal injury, the attending consultant was notified, the injury was documented concisely in the infant’s notes and the parents were informed. The nasal prongs were removed and the infant received nCPAP from a mask initially before commencing low flow oxygen therapy and later ambient oxygen via the incubator. The infant was referred to the plastic surgery team and, in accordance with North Bristol NHS Trust guidelines on reporting incidences, an accidents, incidents and near misses (AIMS) form was completed. This incident was investigated by the NICU risk management team. Unfortunately, the infant developed a *Staphylococcus aureus* infection a few days later and was re-intubated.

Nasal high flow therapy (nHF) is also now widely used within Southmead NICU and from 1 January 2013 to 31 April 2014, there were 666 days of nHF with a total of 106 infants receiving this mode of supplemental oxygen administration. Although nasal trauma is reduced in nHF when compared to nCPAP, an infant’s nares still require vigilance while on nHF.
For this reason, the nasal score chart is used for all infants receiving nHF and accordingly, a nHF competency plan has been developed by the Practice Development team.

Since the introduction of this assessment tool, the nasal score forms part of the nurse-to-nurse handover process and it is felt that referral to the plastic surgery team has decreased (actual data are unavailable). Staff are more vigilant in the prompt assessment of an infant’s nares and any necessary action.

**Conclusion**

The assessment tool is a simple staging system that, when used together with the nCPAP competency, nHF competency and nCPAP care plans, serves as a strategy for prevention and treatment to this iatrogenic cutaneous event.

Current practice at Southmead Hospital has improved awareness of the use of nCPAP and nHF and the safety issues that are involved when caring for infants receiving these therapies.

**Acknowledgement**

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**References**