**WORKSHEET for Evidence-Based Review of Science for Emergency Cardiac Care**

**Worksheet author(s)**

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**Clinical question.**

In neonates receiving respiratory support does the use of face mask interface versus, nasopharyngeal prong or nasal cannulae improve outcome?

**Is this question addressing an intervention/therapy, prognosis or diagnosis?** Interventions

**State if this is a proposed new topic or revision of existing worksheet:** New topic

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**Conflict of interest specific to this question**

Do any of the authors listed above have conflict of interest disclosures relevant to this worksheet?

No, although I have done research on different face masks and face mask leak and am an author on several papers. Fisher and Paykel gave me a set of golf clubs when I retired.

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**Search strategy (including electronic databases searched).**

Search of PubMed, Embase and Cochrane Reviews for the combination in all fields of: Infant, newborn, resuscitation, devices or face mask, nasal prongs or nasal cannulae in place of devices.

- **State inclusion and exclusion criteria**

  **Inclusion:** Infant, newborn; resuscitation; mask; nasal prongs; nasal cannulae; devices.

  **Exclusion:** I tried CPAP and laryngeal masks but in the end I did not use them.

- **Number of articles/sources meeting criteria for further review:**

  PubMed search: infant, newborn; resuscitation; mask found 203 papers. Only 15 were relevant to this review

  Embase search: infant, newborn; resuscitation; mask. 21 papers found. None were new.

  Embase search: infant, newborn; resuscitation; nasal. 12 found. None were new.


  An Embase search added no extra references.

  There are no Cochrane reviews on this topic.
## Summary of evidence

### Evidence Supporting Clinical Question

<table>
<thead>
<tr>
<th>Level of evidence</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
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<td></td>
<td>Palme 1985 e Hoskyns 1987 e</td>
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### Level of evidence

- **A** = Return of spontaneous circulation
- **B** = Survival of event
- **C** = Survival to hospital discharge
- **D** = Intact neurological survival
- **E** = Other endpoint
- *Italics = Animal studies*
### Evidence Neutral to Clinical question

| Good | | | | | |
|------|---|---|---|---|
| Fair | | | | | |
| Poor | | | | | |
| 1    | 2 | 3 | 4 | 5 |

**Level of evidence**

- **A** = Return of spontaneous circulation
- **B** = Survival of event
- **C** = Survival to hospital discharge
- **D** = Intact neurological survival
- **E** = Other endpoint

*Italics = Animal studies*

### Evidence Opposing Clinical Question

| Good | | | | | |
|------|---|---|---|---|
| Fair | | | | | |
| Poor | | | | | |
| 1    | 2 | 3 | 4 | 5 |

**Level of evidence**

- **A** = Return of spontaneous circulation
- **B** = Survival of event
- **C** = Survival to hospital discharge
- **D** = Intact neurological survival
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*Italics = Animal studies*
### REVIEWER'S FINAL COMMENTS AND ASSESSMENT OF BENEFIT / RISK:

<table>
<thead>
<tr>
<th>Comparison of face mask with an endotracheal tube</th>
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<tr>
<td>Milner’s observational study suggests that ventilating with a face mask is not as effective as through an endotracheal tube.</td>
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<tr>
<th>Comparison of face mask and binasal prongs</th>
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<tr>
<td>There is very little evidence to provide definitive answers to these questions. Probably the best evidence is the randomized controlled trial of Capasso, where 617 newly born infants were randomized to ventilation with a self-inflating bag using either a face mask or short binasal prongs. This showed more effective ventilation with short bilateral nasal prongs than the face mask. Significantly more infants in the group resuscitated by bag and face mask required chest compressions (8% vs. 2%) and/or intubation (6% vs. &lt;1%). This strongly suggests that bilateral short nasal prongs are more effective than a face mask. However, a major caveat on this is that the face mask they used is one that has been shown to be the least effective at ventilation during neonatal resuscitation and is now not commonly used. It is therefore possible that the prongs appeared better simply because the mask was very unsatisfactory. This area needs more research but nasal prongs could be now be considered as an alternative to a face mask for neonatal ventilation during initial resuscitation.</td>
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<tr>
<th>Comparison of face mask and single nasopharyngeal tube</th>
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<td>The only study investigating face mask and a single nasopharyngeal tube is a historical cohort study by Linder where other parameters were also changed. CPAP was given early, early intubation was resisted and there was improved thermal control. However, it suggested that a single nasopharyngeal prong may be more effective than a face mask.</td>
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<th>Comparison of face mask and high flow nasal cannulae</th>
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<tr>
<td>There are no studies comparing face mask ventilation with bilateral high flow nasal cannulae during neonatal resuscitation.</td>
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<th>Comparison of different face masks</th>
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<td>Round face masks (Laerdal) may be more effective than the old Rendell-Baker masks. There is little difference between anatomically shaped triangular masks and the round Laerdal mask.</td>
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</table>

There are a number of studies showing that face masks can be difficult to use because it can be difficult to obtain a good seal between the mask and the face and this causes a large and variable leak and loss of tidal volume.

Face mask leaks may be reduced if the operator can see the amount of leak on a monitor.

A T-piece device, is more satisfactory than self inflating bags and anesthetic bags for delivering consistent peak inflating pressure, PEEP, CPAP and a prolonged inflation.

In countries with few resources mouth to mask ventilation appears to be as effective as bag and mask ventilation.

### Acknowledgements:

### Citation List


*Conclusions: A T-piece device delivers the most precise and consistent pressures but is slower to change inflating pressures than an SIB or a FIB. SIB was poor at delivering PEEP.*

**Conclusions:** This was a large RCT comparing ventilation through a Rendell-Baker mask with ventilation through binasal prongs. It showed that intubation and chest compression were both reduced with ventilation through binasal prongs and there was a trend to a lower mortality, less infants admitted to an NICU and less air leaks. Nasal prongs were not associated with adverse events. Major caveat: Rendell-Baker mask not as good for ventilation as other masks and so this may have been one reason why the prongs appeared to be better (see Palme 1985 and Yamashita 1986).


Conclusions: *In rural India bag and mask resuscitation appears to be superior to mouth-to-mouth resuscitation and tube-mask resuscitation.*


Conclusions: *Experienced operators were better at using anesthetic bags. The Neopuff is better than anesthetic bags at delivering set airway pressures and prolonged inflations.*


Conclusion: *A T-piece device with finger occlusion providing inflation was at least as effective for ventilation during neonatal resuscitation as a bag and mask system.*


Conclusions. *This study suggests ventilation through a nasopharyngeal tube followed by CPAP is more effective than bag and mask ventilation followed by early intubation. It restricts intubation and ventilation to those infants who ultimately needed it, without increasing morbidity or mortality.*


Conclusions: *There were no significant differences in outcome for babies resuscitated with mouth to mask and bag and mask ventilation and so mouth-to-mask ventilation is an alternative to assisted ventilation when no bag and mask is available. The ventilation rate should be kept within the normal range.*

Conclusions: Bag and mask ventilation resulted in much smaller expired tidal volumes that with intubation and ventilation because of mask leak. Successful bag and mask resuscitation depended on stimulating the baby to make his own respiratory efforts.


Conclusion: During face mask ventilation of a neonatal resuscitation manikin there were large and variable leaks at the face mask. There was no significant difference in leak between the round and anatomical shaped masks.


Conclusions: This is an old study but mask design has changed little since then. The measure of mask leak was indirect by using the peak pressure that could be achieved. The masks were held by medical students. Also there can be a large leak from a mask if there is a high gas flow into the mask even though the peak pressure is being maintained. However, this study suggests that the round Laerdal mask leaked less than the Rendall-Baker mask.


Conclusion: Face mask leak is a large and variable and that there is no significant difference between these two mask designs


Conclusion: Written instruction and demonstration of the optimal technique of mask placement and hold for the different masks resulted in significantly reduced face mask leak.


Conclusion: A display of pressures, tidal volume and mask leak can improve mask ventilation during resuscitation training.


This study is in Japanese and I have not got a copy or translation.