**Clinical question.**
In adult cardiac arrest (prehospital [OHCA], in-hospital [IHCA]) (P), does the use of supraglottic devices (I) compared with bag-valve-mask alone for airway management (C), improve any outcomes (e.g. ventilation, oxygenation, reduce hands-off time, allow for continuous compressions and/or improves survival) (O).

| Is this question addressing an intervention/therapy, prognosis or diagnosis? intervention |
| State if this is a proposed new topic or revision of existing worksheet: new |

| Conflict of interest specific to this question |
| Do any of the authors listed above have conflict of interest disclosures relevant to this worksheet? No |

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

**Cochrane library:** Supraglottic airway or bag mask ventilation in CPR/resuscitation, Laryngeal mask airway/LMA and bag mask ventilation, LMA and bag mask, laryngeal mask and mask ventilation and CPR, bag mask and supraglottic airway and CPR/resuscitation, bag-valve-mask and LMA

**Embase:** laryngeal mask and bag mask ventilation and resuscitation, supraglottic airway and bag mask ventilation and resuscitation, laryngeal mask and resuscitation, supraglottic airway and resuscitation

**Pubmed:** laryngeal mask [MESH] and heart arrest [MESH] or cardiopulmonary resuscitation [MESH]; ventilation and cardiac arrest or cardiopulmonary resuscitation [MESH] or CPR; supraglottic airway and cardiac arrest or heart arrest[MESH] or cardiopulmonary resuscitation [MESH] or CPR; laryngeal mask and cardiac arrest or cardiopulmonary resuscitation [MESH] or heart arrest[MESH] or CPR; airway and cardiac arrest or CPR or cardiopulmonary resuscitation[MESH] or heart arrest[MESH]; bag-mask-ventilation and cardiac arrest or cardiopulmonary resuscitation [MESH] or heart arrest[MESH] or CPR

I also reviewed all the references initially selected for worksheet 79A for potential inclusion in this worksheet.

A review of the previous worksheet "Is the bag-valve mask as safe and effective as tracheal intubation for ventilation during cardiac arrest? (W57-Nolan)"

| *State inclusion and exclusion criteria* |

The following studies were excluded:
- studies not involving or simulating cardiac arrest or cardiac arrest models
- reviews that did not include LOE studies as part of the review

The following studies were included: animal studies, human studies, and mannequin studies involving mask
ventilation and/or use of a supraglottic airway during cardiac arrest, simulated cardiac arrest, or cardiac arrest model.

Date range of articles: 1997-2009

| Number of articles/sources meeting criteria for further review: |
| 14 references met criteria and were included in the final review. |
## Summary of evidence

### Evidence Supporting Clinical Question

<table>
<thead>
<tr>
<th>Good</th>
<th>Evidence Supporting Clinical Question</th>
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<tr>
<td></td>
<td>#2 Doerges 1999 p. 31-37 *G</td>
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<td>#3 Dorges 2001 p.90-94*G</td>
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<td>#7 Kurola 2004 * F, G</td>
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<td>#14 Wiese 2009 *E</td>
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<td>#1 Doerges 1999 p. 63-69 *G</td>
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<td>#13 Wiese 2008 p. 4*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  
F = Time to ventilation  
G = Successful ventilation  
* = Simulated arrest model (ICU or anesthetized patients)  
* Italics = Animal studies
## Evidence Neutral to Clinical question

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* Italics = Animal studies

A = Return of spontaneous circulation
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F = Time to ventilation
G = Successful ventilation

* = Simulated arrest model (ICU or anesthetized patients)
## Evidence Opposing Clinical Question

<table>
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<tr>
<th>Good</th>
<th>#3 Dorges 2001 p.90-94*F</th>
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<td>#4 Dorges 2003 p. 800-4 G</td>
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<td>#5 Garcia-Guasch 2001*F</td>
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* = Simulated arrest model (ICU or anesthetized patients)  
*italics* = Animal studies
Two LOE 2 studies were found that compared the use of a supraglottic airway to bag-valve mask ventilation in cardiac arrest patients. A study by Morimura as part of the SOS-KANTO study group (#8, Morimura 2009, p.490) compared arterial blood gas analyses in witnessed out of hospital VF/VT patients after ventilation with either a laryngeal mask (n=173) or bag-valve mask (n=200). The authors found no difference in arterial oxygen (PaO2 64.6 vs. 71.9, p=0.56) or carbon dioxide (PaCO2 52.9 vs. 55.3, p=0.06) levels. A prospective randomized study by Rumball et al. (#10, Rumball 1997, p.1) found similar blood gas results when comparing the use of the Combitube, Pharyngeal Tracheal Lumen Airway, Laryngeal mask, and bag mask ventilation with an oral airway in 470 cardiac arrest patients. Rumball’s study also found no difference in short term survival or aspiration rates between the supraglottic airway groups and the bag mask ventilation group.

One LOE 4 study by Stone et al. (#11, Stone 1998, p. 3) retrospectively reviewed data on 713 patients who underwent cardiopulmonary resuscitation and found a higher incidence of gastric regurgitation in patients who received bag mask ventilation versus a laryngeal mask airway. Patients ventilated with bag mask ventilation alone or bag mask ventilation followed by endotracheal intubation had a regurgitation rate of 12.4%. Patients who were ventilated with the LMA alone or the LMA followed by endotracheal intubation had a regurgitation rate of 3.5%.

A study by Dorges et al. (#4, Dorges 2003, p. 800) compared the use of a laryngeal mask, cuffed oropharyngeal airway (COPA) or Combitube to use of a face mask by experienced paramedics in anesthetized patients as a simulated cardiac arrest model. Oxygen saturations decreased during placement of two of the supraglottic devices but not with use of the face mask. Tidal volumes were similar with all the devices. Garcia-Guasch et al. (#5, Garcia-Guasch 2001, p. 173) performed a similar study in a mannequin model comparing the COPA and laryngeal mask airway to the face mask and found the face mask to be easier and quicker to use than the supraglottic devices.

Several studies using a mannequin model for cardiac arrest found significantly larger delivered tidal volumes when a supraglottic airway was used compared to bag-mask ventilation ( #1 Doerges 1999, p.63-9, #2 Doerges 1999, p. 31-7, #3 Dorges 2001, p. 90, #6 Genzwuerker 2001, p. 291, #7 Kurola 2004, p. 149, #9 Ocker 2000, p. 7). Five studies in mannequin models also measured gastric insufflation when a supraglottic airway was used versus bag-mask ventilation and found a significant decrease (#1 Doerges 1999, p.63, #3 Dorges 2001 p. 90, #9 Ocker 2000, p. 7) or no gastric insufflation ( #6 Genzwuerker 2001, p. 291) with the use of a supraglottic airway. It is unclear how this data can be extrapolated to a true cardiac arrest patient.

One study in a mannequin model found that time to ventilation was shorter with bag-mask ventilation than with a supraglottic airway (#3 Dorges 2001, p. 90), although tidal volumes were smaller with bag-mask ventilation.

Three LOE 5 studies measured no-flow time in a mannequin cardiac arrest model when a laryngeal tube versus bag mask ventilation was used for airway management (#12 Wiese 2008, p. 589, #13 Wiese 2008, 4, #14 Wiese 2009 ). Both studies found a significant reduction in no-flow time and better adherence to resuscitation protocols when the laryngeal tube was used.

Acknowledgements: None

Citation List

Quality fair (not randomized)
Supportive
Summary: Study comparing LMA and Combitube to bag-mask ventilation in a mannequin cardiac arrest model. High rates of success with both LMA and Combitube, less gastric insufflation seen compared to bag-mask ventilation. Combitube took longer to insert compared to other two methods. Higher tidal volumes were achieved with both the LMA and Combitube compared to bag-mask ventilation.


LOE 5 (mannequin study)
Quality Good
Supportive
Summary: This study compared the tidal volumes achieved in a mannequin cardiac arrest model using either an adult or pediatric self-inflatable bag with a laryngeal mask airway, combitube and bag-valve face mask. Tidal volumes were significantly lower using either sized bag in combination with the bag-valve face mask compared to laryngeal mask airway or the combitube, and were below the European Resuscitation Council recommendations.


LOE 5 (mannequin model)
Good
Supportive
Summary: This study evaluated the use of bag-mask ventilation versus a laryngeal mask or a combitube in a mannequin arrest model by non-experienced house officers. Although the time to first adequate tidal volume was faster with bag-mask ventilation (median 14 seconds) versus the laryngeal mask airway (median 29 seconds) or combitube (61 seconds), significantly more gastric insufflation occurred with bag mask ventilation than the other two devices. Tidal volumes were also significantly greater with the laryngeal mask airway (mean 727 ml) and Combitube (mean 653 ml) than with bag-mask ventilation (mean 271 ml).


LOE 5 (anesthetized patients as simulated cardiac arrest)
Good
Opposing
Summary: Study using anesthetized patients as a simulated cardiac arrest model. Experienced Paramedics provided ventilation with either a laryngeal mask, Combitube, cuffed oropharyngeal airway (COPA) or a face mask. Oxygen saturation decreased during placement of the Combitube and laryngeal mask but not with the face mask or COPA. Tidal volumes were similar with all four ventilation strategies.

LOE 5
Quality good
Opposing
Summary: Mannequin study comparing placement of LMA and COPA versus bag mask ventilation in both experienced and inexperienced CPR providers. LMA performed better than COPA but face mask ventilation found to be easier and quicker than both devices. The COPA is no longer commercially available in 2008.


LOE 5
Quality fair (not randomized)
Supportive
Summary: The laryngeal tube and endotracheal tube and face mask were compared in a mannequin cardiac arrest model. The laryngeal tube provided superior ventilation than the face mask both with a bag-valve device and an automatic transport ventilator. Gastric insufflation was detected only with the use of the face mask.


LOE 5
Quality good
Supportive
Summary: Study comparing the laryngeal mask, tracheal intubation and bag-mask ventilation in a mannequin cardiac arrest model. The laryngeal tube provided faster ventilation, higher tidal volumes, and higher minute ventilation compared to bag-mask ventilation. Bag-mask ventilation provided inadequate minute ventilation in this study.


Notes:
LOE 2 (non-randomized clinical trial)
Quality good
Neutral
Summary: A prospective multicenter non-randomized clinical trial conducted by the SOS-KANTO study group comparing arterial blood gases after cardiac arrest. Blood gases were compared between patients who were ventilated during resuscitation with a bag-valve-mask versus a laryngeal mask airway (LMA). Average pH values were statistically higher in the LMA group but there was no difference in median PaCO2 or median PaO2.

LOE 5
Quality fair (non randomized mannequin study)
Supportive
Summary: Study comparing Laryngeal mask and Combitube to bag-mask ventilation in mannequin cardiac arrest model. Higher tidal volumes and less gastric insufflation were measured using the laryngeal mask and Combitube versus bag-mask ventilation. No gastric insufflation was detected in the Combitube group.


LOE 2 (crossover study, not truly randomized)
Quality good
Neutral
Summary: Prospective randomized study comparing Combitube, Pharyngeal Tracheal Lumen Airway (PTL) and Laryngeal mask (LM) versus oral airway/bag-valve mask ventilation for airway management in patients with cardiac or respiratory arrest. Results measured included time and ease of insertion, adequacy of ventilation, arterial blood gas analysis upon hospital arrival, and spirometry measurements as compared to tracheal intubation in the same patient. There were no differences in arterial blood gas analysis between the supraglottic airway devices compared to bag-valve mask ventilation with an oral airway. Adequacy of ventilation and spirometry was not recorded in the bag-valve mask group. The survival rates and aspiration rates were similar among all the groups.


LOE 4
Quality fair
Supportive
Summary: This study reviewed records of data prospectively collected on patients undergoing resuscitation. Evidence of regurgitation with bag mask ventilation versus laryngeal mask airway placement was compared. Incidence of regurgitation when the laryngeal mask airway was used as the primary attempt at ventilation was 3.5% compared to bag mask ventilation as the primary ventilation method (12.4%) Of note, 46.7% of patients who regurgitated did so prior to initiation of CPR and airway management.


LOE 5
Quality Good
Supportive
Summary: This was a study performed in a mannequin cardiac arrest model that measured no-flow time during cardiac arrest in order to perform airway management with either bag mask ventilation or
placement of a laryngeal tube suction (LTS). No flow time was significantly shorter using the LTS (average 105 seconds) versus bag mask ventilation (average 150 seconds).


LOE 5
Quality fair (not randomized)
Supportive
Summary: Study comparing no-flow time during resuscitation using the laryngeal tube-suction device versus bag mask ventilation in a mannequin cardiac arrest model. No-flow time was found to be significantly reduced with the use of the laryngeal tube-suction device. Participants also showed better adherence to resuscitation guidelines when the laryngeal tube was placed (96%) then when bag-mask ventilation was used (30%).


LOE 5
Quality Good
Supportive
Summary: This is a more recent randomized prospective mannequin study comparing the no flow time during simulated cardiac arrest when either a laryngeal tube suction device (LTS-D), endotracheal tube, or bag mask ventilation was used for airway management. The no-flow time was significantly reduced with the use of the LTS-D compared to bag mask ventilation. The study also found a higher adherence to protocol guidelines with the use of the LTS-D versus bag mask ventilation.