

## QUESTION

Should Tracheal intubation (TI) or supraglottic airway placement (SGA) vs. Bag mask ventilation only (BMV). TI and SGA were also compared with each other.[comparison] be used for : Infants and children (aged 0 – 18 years) in cardiac arrest; neonatal resuscitation was excluded[health problem and/or population]?

**POPULATION:** Infants and children (aged 0 – 18 years) in cardiac arrest; neonatal resuscitation was excluded.

**INTERVENTION:** Tracheal intubation (TI) or supraglottic airway placement (SGA)

**COMPARISON:** Bag mask ventilation only (BMV). TI and SGA were also compared with each other.

**MAIN OUTCOMES:**

**SETTING:** any setting

**PERSPECTIVE:**

**BACKGROUND:**

**CONFLICT OF INTERESTS:**

## ASSESSMENT

### Problem

Is the problem a priority?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
<input type="radio"/> No <input type="radio"/> Probably no <input type="radio"/> Probably yes <input checked="" type="radio"/> Yes <input type="radio"/> Varies <input type="radio"/> Don't know	Airway management is central in paediatric resuscitation, especially since respiratory conditions are a frequent cause of paediatric cardiac arrest. Placement of an advanced airway (AAW) device may allow more effective resuscitation but might equally induce significant harm e.g. misplacement, impact on CPR quality, inducing hypo- or hyperventilation. The resources needed for training are substantial.	

### Desirable Effects

How substantial are the desirable anticipated effects?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
<input type="radio"/> Trivial <input type="radio"/> Small <input checked="" type="radio"/> Moderate <input type="radio"/> Large <input type="radio"/> Varies <input type="radio"/> Don't know	Overall, based on current evidence the SR results suggest with low to very low certainty that TI-based resuscitation is not superior to BMV-based resuscitation for cardiac arrest in children for the critically important outcomes of survival to hospital discharge and survival to hospital discharge with good neurologic outcomes. Moreover, three propensity-adjusted cohort studies, including 3,855 children with in-hospital cardiac arrest (IHCA) or OHCA reported reduced survival with good neurologic outcome associated with the TI intervention (49 fewer survivors per 1,000 resuscitations; CI: 77 fewer to 21 fewer) and reduced survival to discharge with TI when compared to BMV (53 fewer survivors per 1,000 patients; CI: 86 fewer to 20 fewer).	Although the size of effect from the studies is small, the impact on the amount of survivors on a global scale, particularly in resource-limited environments, could be large.

### Undesirable Effects

How substantial are the undesirable anticipated effects?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul style="list-style-type: none"> <li><input type="radio"/> Large</li> <li><input type="radio"/> Moderate</li> <li><input checked="" type="radio"/> Small</li> <li><input type="radio"/> Trivial</li> <li><input type="radio"/> Varies</li> <li><input type="radio"/> Don't know</li> </ul>	<p>Overall, based on current evidence the SR results suggest with low to very low certainty that TI-based resuscitation is not superior to BMV-based resuscitation for cardiac arrest in children for the critically important outcomes of survival to hospital discharge and survival to hospital discharge with good neurologic outcomes. Moreover, three propensity-adjusted cohort studies, including 3,855 children with in-hospital cardiac arrest (IHCA) or OHCA reported reduced survival with good neurologic outcome associated with the TI intervention (49 fewer survivors per 1,000 resuscitations; CI: 77 fewer to 21 fewer) and reduced survival to discharge with TI when compared to BMV (53 fewer survivors per 1,000 patients; CI: 86 fewer to 20 fewer).</p>	<p>There might be specific subgroups where the presumed desired effects do not uphold and where an unidentified benefit of advanced airway management exists. For example, we might think about long distance transportation, prolonged resuscitation situations, with highly experienced airway operators, if AAW placement is only attempted in specific situations.</p> <p>Advanced airway programs require significant investments in equipment, training/retraining, and quality control programs. However, it is unclear whether these investments can be avoided, as advanced airway capabilities are needed for other purposes, including management of respiratory arrest, post-resuscitation care, and surgery. However, those who need to be able to perform advanced airway management outside CPR practice might differ from those who would only do this as part of advanced CPR.</p>

## Certainty of evidence

What is the overall certainty of the evidence of effects?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul style="list-style-type: none"> <li><input checked="" type="radio"/> Very low</li> <li><input type="radio"/> Low</li> <li><input type="radio"/> Moderate</li> <li><input type="radio"/> High</li> <li><input type="radio"/> No included studies</li> </ul>	<p><b>For the comparison of tracheal intubation with bag mask ventilation:</b></p> <p><i>Survival with good neurologic function</i> CRITICAL</p> <p>⊕⊕○○ Low</p> <p><i>Survival to hospital discharge</i> CRITICAL</p> <p>⊕⊕○○ Low</p> <p><i>Survival to hospital admission</i> IMPORTANT</p> <p>⊕○○○ Very Low</p> <p><i>Return of spontaneous circulation</i> IMPORTANT</p> <p>⊕○○○ Very Low</p> <p><b>For the comparisons of supraglottic airway with bag mask ventilation and tracheal intubation with supraglottic airway</b></p> <p><i>Survival with good neurologic function</i> CRITICAL</p> <p>⊕○○○ Very Low</p> <p><i>Survival to hospital discharge</i> CRITICAL</p> <p>⊕○○○ Very Low</p> <p><i>Survival to hospital admission</i> IMPORTANT</p> <p>⊕○○○ Very Low</p> <p><i>Return of spontaneous circulation</i> IMPORTANT</p> <p>⊕○○○ Very Low</p>	<p>As for the lack of superiority of advanced airway management during CPR we can identify low certainty evidence. The evidence is of very low certainty when looking at potential harm of AAW.</p>

## Values

**Is there important uncertainty about or variability in how much people value the main outcomes?**

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul style="list-style-type: none"> <li><input type="radio"/> Important uncertainty or variability</li> <li><input type="radio"/> Possibly important uncertainty or variability</li> <li><input checked="" type="radio"/> Probably no important uncertainty or variability</li> <li><input type="radio"/> No important uncertainty or variability</li> </ul>		<p>No important uncertainty or variability exists in the outcomes of survival with good neurologic function and survival to hospital discharge.</p> <p>Possibly important uncertainty or variability exists in the outcomes of survival to hospital admission or return of spontaneous circulation.</p>

**Balance of effects**  
Does the balance between desirable and undesirable effects favor the intervention or the comparison?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul style="list-style-type: none"> <li><input type="radio"/> Favors the comparison</li> <li><input checked="" type="radio"/> Probably favors the comparison</li> <li><input type="radio"/> Does not favor either the intervention or the comparison</li> <li><input type="radio"/> Probably favors the intervention</li> <li><input type="radio"/> Favors the intervention</li> <li><input type="radio"/> Varies</li> <li><input type="radio"/> Don't know</li> </ul>	see above	<p>Acknowledging the very low level of certainty, the current available data suggest, that the critical outcomes of survival with good neurologic outcome and survival to hospital discharge are not significantly better -or even worse- when resuscitation is performed with TI or SGA, compared with BMV alone. Importantly, the benefit or harm associated with AAW-based resuscitation is likely to differ between settings.</p> <p>Paediatric AAW programs require a moderate investment in equipment and a significant investment in training, skills maintenance, and quality control programs to be successful. While TI is supported in essentially all hospital settings in the developed world, and a standard component of care for respiratory arrest and in post-ROSC care, advanced life (ALS) support-capable emergency medical services agencies and IHCA teams will need to maintain this capability as well.</p>

**Acceptability**  
Is the intervention acceptable to key stakeholders?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul style="list-style-type: none"> <li><input type="radio"/> No</li> <li><input type="radio"/> Probably no</li> <li><input type="radio"/> Probably yes</li> <li><input type="radio"/> Yes</li> <li><input checked="" type="radio"/> Varies</li> <li><input type="radio"/> Don't know</li> </ul>		<p>Essentially all hospital resuscitation teams and all ALS-based emergency medical services (EMS) systems already provide advanced airway interventions.</p> <p>It is uncertain whether the removal of advanced airway capabilities would be acceptable to key stakeholders. Accepted practice based on long-held beliefs (unsupported by data) mean these interventions are considered highly beneficial to perform paediatric advanced life support. Some might believe their local system and skills to differ from the population represented in the included studies.</p>

**Feasibility**  
Is the intervention feasible to implement?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul style="list-style-type: none"> <li><input type="radio"/> No</li> <li><input type="radio"/> Probably no</li> <li><input type="radio"/> Probably yes</li> <li><input type="radio"/> Yes</li> <li><input checked="" type="radio"/> Varies</li> <li><input type="radio"/> Don't know</li> </ul>		<p>Varies, and is related to acceptability. Advanced airway interventions are currently offered in hospitals and in EMS systems with ALS capability. This varies by country and region.</p>

**SUMMARY OF JUDGEMENTS**

## JUDGEMENT

<b>PROBLEM</b>	No	Probably no	Probably yes	<b>Yes</b>		Varies	Don't know
<b>DESIRABLE EFFECTS</b>	Trivial	Small	<b>Moderate</b>	Large		Varies	Don't know
<b>UNDESIRABLE EFFECTS</b>	Large	Moderate	<b>Small</b>	Trivial		Varies	Don't know
<b>CERTAINTY OF EVIDENCE</b>	<b>Very low</b>	Low	Moderate	High			No included studies
<b>VALUES</b>	Important uncertainty or variability	Possibly important uncertainty or variability	<b>Probably no important uncertainty or variability</b>	No important uncertainty or variability			
<b>BALANCE OF EFFECTS</b>	Favors the comparison	<b>Probably favors the comparison</b>	Does not favor either the intervention or the comparison	Probably favors the intervention	Favors the intervention	Varies	Don't know
<b>ACCEPTABILITY</b>	No	Probably no	Probably yes	Yes		<b>Varies</b>	Don't know
<b>FEASIBILITY</b>	No	Probably no	Probably yes	Yes		<b>Varies</b>	Don't know

## TYPE OF RECOMMENDATION

Strong recommendation against the intervention  ○	<b>Conditional recommendation against the intervention</b>  ●	Conditional recommendation for either the intervention or the comparison  ○	Conditional recommendation for the intervention  ○	Strong recommendation for the intervention  ○
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## CONCLUSIONS

### Recommendation

We suggest the use of BMV rather than TI or SGA in the management of children during cardiac arrest in the out-of-hospital setting. (weak recommendation, very low certainty evidence).

We can make no recommendation about the use of TI or SGA in the management of children with cardiac arrest in the in-hospital setting because of limited evidence.

### Justification

Advanced airway (AAW) interventions, particularly TI, have been long-established components of the advanced life support bundle of care in adults and children. As a result of inherent limitations in their design and data sources, the available studies, though individually well conducted, can provide only very low certainty evidence about whether attempting AAW placement prior to ROSC improves resuscitation outcomes. The best available data show no benefit from AAW interventions, and some suggested association with harm, for the critical outcomes of survival with good neurologic outcome and survival to hospital discharge. Placement of an AAW appears to be neutral for the short-term resuscitation outcomes of survival to hospital admission and ROSC. While these short-term outcomes do not ultimately benefit the patient, they may benefit the family, albeit at great monetary cost.

Effective BMV, TI, and SGA are all difficult skills that require good initial training, retraining, and quality control to be done consistently, safely, and effectively. Pediatric AAW programs require a moderate investment in equipment and a significant investment in training, skills maintenance, and quality control programs to be successful.

### Subgroup considerations

The benefit or harm associated with AAW-based resuscitation may differ across settings. Importantly, the available data do not inform the questions of whether better outcomes might be achieved by AAW-based strategies in long distance transportation, in prolonged resuscitation situations, with highly experienced airway operators, when AAW placement is only attempted when BMV is difficult, etc. The analyzed data are only relevant to AAW interventions during CPR, and do not pertain to airway management in other critical situations.

## Implementation considerations

Those needed to be able to perform advanced airway management outside CPR practice might differ from those who would do this as part of advanced CPR.

It is uncertain whether the removal of advanced airway capabilities would be acceptable to key stakeholders. Accepted practice based on long-held beliefs (unsupported by data) mean these interventions are considered highly beneficial to perform paediatric advanced life support. Some might believe their local system and skills to differ from the population represented in the included studies.

## Monitoring and evaluation

See below

## Research priorities

The trial by Gausche et al was well designed and executed; the evidence from this trial was downgraded primarily because the trial was conducted in 1994 – 1996, prior to major changes in standard resuscitation practice that emphasize the need to minimize interruptions in chest compressions. No clinical trial addresses airway management during cardiac arrest in the in-hospital setting. Prehospital, ED-based, and in-hospital studies of similar design, ideally comparing TI, SGA, and BMV with planned subgroup analyses based on age and etiology of arrest (trauma vs non-trauma) are ethical, necessary, and critically important.