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

**Worksheet author(s)**
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### Clinical question.

ALS-CPR&A-010B  "In adult and pediatric patients in cardiac arrest (prehospital [OHCA], in-hospital [IHCA]) and who have advanced airways in place (P), does the use of automatic ventilators (I) compared with manual ventilation (C), improve outcome (eg. 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?**

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

**Conflict of interest specific to this question**

Do any of the authors listed above have conflict of interest disclosures relevant to this worksheet?  No conflict of interest for this worksheet.

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

PubMed; Cochrane Systematic Reviews; DARE and AHA EndNote database:  (Heart Arrest[Majr] OR Cardiopulmonary Resuscitation[Majr]) AND (Ventilators, Mechanical[Majr] OR Respiration, Artificial[Majr])

ISI Web of Science Cited Reference Search for major study previously cited (Johannigman 1995 Acad Emerg Med)

### Inclusion and exclusion criteria

- **Inclusion criteria** were studies specifically comparing automatic mechanical ventilation with manual bag-valve ventilation in the setting of cardiac arrest. Excluded studies were those that were abstract only, not peer reviewed and those that did not address the question, such as, those of patients not in cardiac arrest and patients not having endotracheal tube or alternative artificial airway (LMA, Combitube, etc)

### Number of articles/sources meeting criteria for further review:

- PubMed: 280 initial articles found and surveyed, reduced to 24 having relevance, 6 directly addressing topic reviewed in depth with 2 addressing topic
- Cochrane: 0
- DARE: 0
- ISI Web of Science Cited Reference Search on Johannigman 1995: 0 not found on PubMed

Search repeated on 11-9-09 and yielded 15 new articles that were surveyed and found to be of no relevance.
### Summary of evidence

**Evidence Supporting Clinical Question**

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<th>Level of Evidence</th>
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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

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**Level of evidence**

A = Return of spontaneous circulation  
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E = Other endpoint  

*Italics = Animal studies*

### Evidence Opposing Clinical Question

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A = Return of spontaneous circulation  
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REVIEWER'S FINAL COMMENTS AND ASSESSMENT OF BENEFIT / RISK:

Only two studies compared manual ventilation with transport ventilator in cardiac arrest patients. Both were in adult patients only and both primarily compared ventilation modes via endotracheal tubes although the Johannigman study had a few patients with esophageal obturator airway (EOA). In Johannigman (1995, 719), 122 of 160 patients in a non-randomized convenience sample were in cardiac arrest. 44 of 46 manually ventilated patients were intubated and all 64 transport ventilated patients were intubated. Survival was not different between groups (6.5% vs. 4.7%). None of the 12 patients with EOA and manual ventilation survived. Less than half the patients had blood gas data but there was no difference in the manual ventilation and transport ventilator groups in any blood gas parameter. Given the lack of true controls and missing physiologic data, there is significant potential for bias in this study. In Weiss (2005, 970), the EMS system was assigned manual ventilation or transport ventilator for intubated patients for a 24-hour period based on a list of random numbers. Of the 28 patients enrolled in the study (14 in each ventilation group), 21 were in cardiac arrest but it is not possible to verify how many CPR patients were in each ventilation group. Outcome data was subjective questionnaire of paramedics following admission to hospital plus subjective assessment of some physiologic data during transport (pulse ox, end-tidal CO2, heart rate, respirations). There were no significant differences in the EMS perception of ease of use, time of setup, expedition of transport or overall patient care. There were significant differences in favor of the transport ventilator in ability to accomplish additional tasks, ability to document, and ability to provide patient care. The subjectivity of the study design and soft endpoints leaves significant potential for bias in this study.

Conclusion

KNOWLEDGE GAPS: A specific survival study of bag-valve device vs. automatic transport ventilator with an advanced airway in place is not available. The current literature does not address the frequency of hyperventilation comparing bag-valve manual ventilation with automatic transport ventilator.

Acknowledgements:

Citation List


Notes: LOE 4. Poor. Neutral. This is a non-randomized convenience sample of 160 patients (122 in cardiac arrest) with no difference in survival of cardiac arrest patients ventilated through an ET tube with either BV or transport ventilator. Blood gas analysis was performed on only 52 patients in cardiac arrest who received ventilation via transport ventilator or BV with no differences of any parameter. There is significant potential for bias.


Notes: LOE 2. Poor. Supporting. Very small study with pseudo-randomization and completely subjective endpoints, primarily ease of use and freedom to do other tasks. Study was supported by industry.
Articles Reviewed and not included:


Notes: Manikin study with no advanced airway.


Notes: Animal study comparing CPAP, CPAP with PS, IPPV – No BV ventilation group.


Notes: Intubated and non-intubated anesthetized patients


Notes: Manikin study with no advanced airway.


Notes: Had no manual ventilation comparison group.


Notes: Had no mechanical ventilation comparison group.