TITLE: Impedance Threshold Devices for Adult Patients Requiring Cardiopulmonary Resuscitation: Clinical Effectiveness and Guidelines

DATE: 07 April 2015

RESEARCH QUESTIONS

1. What is the clinical effectiveness of impedance threshold devices during cardiopulmonary resuscitation of adult patients in cardiac arrest?

2. What are the evidence-based guidelines regarding the use of impedance threshold devices during cardiopulmonary resuscitation of adult patients in cardiac arrest?

KEY FINDINGS

Three systematic reviews, five randomized controlled trials, one non-randomized study, and one evidence-based guideline were identified regarding impedance threshold devices for adult patients requiring cardiopulmonary resuscitation.

METHODS

A limited literature search was conducted on key resources including PubMed, The Cochrane Library (2015, Issue 3), University of York Centre for Reviews and Dissemination (CRD) databases, Canadian and major international health technology agencies, as well as a focused Internet search. No filters were applied to limit the retrieval by study type. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2005 and March 25, 2015. Internet links were provided, where available.

The summary of findings was prepared from the abstracts of the relevant information. Please note that data contained in abstracts may not always be an accurate reflection of the data contained within the full article.
**SELECTION CRITERIA**

One reviewer screened citations and selected studies based on the inclusion criteria presented in Table 1.

<table>
<thead>
<tr>
<th>Table 1: Selection Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
</tr>
<tr>
<td>Intervention</td>
</tr>
<tr>
<td>Comparator</td>
</tr>
<tr>
<td>Outcomes</td>
</tr>
<tr>
<td>Study Designs</td>
</tr>
</tbody>
</table>

**RESULTS**

Rapid Response reports are organized so that the higher quality evidence is presented first. Therefore, health technology assessment reports, systematic reviews, and meta-analyses are presented first. These are followed by randomized controlled trials, non-randomized studies, and evidence-based guidelines.

Three systematic reviews, five randomized controlled trials, one non-randomized study, and one evidence-based guideline were identified regarding impedance threshold devices for adult patients requiring cardiopulmonary resuscitation. No relevant health technology assessments were identified.

Additional references of potential interest are provided in the appendix.

**OVERALL SUMMARY OF FINDINGS**

Three systematic reviews\(^1-3\) were identified regarding the use of impedance threshold devices (ITDs) during cardiopulmonary resuscitation (CPR) of adult patients in cardiac arrest. One systematic review\(^4\) reported no significant difference in the return of spontaneous circulation, favourable neurological outcome, or survival at hospital discharge with the use of an ITD plus CPR compared with active compression-decompression resuscitation. However, after adjusting for two prognostic factors (witnessed status and response time), the use of an ITD improved return of spontaneous circulation.\(^1\) Likelihood of long-term survival, rate of return of spontaneous circulation, and odds of favourable neurological outcome were increased with the use of an ITD with active compression-decompression in an exploratory analysis reported by another systematic review.\(^5\) A third systematic review\(^6\) reported that ITD use significantly improved early survival, return to spontaneous circulation, and favourable neurological outcomes; however, no effect was reported for favourable neurological outcomes in survivors, or for survival at the longest follow up time.

Five randomized controlled trials\(^4-8\) were identified regarding the use of ITDs during CPR of adult patients in cardiac arrest. Compared with standard CPR, CPR plus ITD improved odds of survival to hospital discharge with favourable neurological outcome and one-year survival.\(^4,6\) The reported rate of adverse events did not significantly differ between CPR plus ITD and
standard CPR, \(^4,^6\) however, one randomized controlled trial\(^6\) reported more patients in the CPR plus ITD group with pulmonary edema. Three randomized controlled trials\(^5,^7,^8\) compared an active ITD plus CPR to sham ITD plus CPR. One randomized controlled trial\(^5\) reported no statistically significant difference in survival with satisfactory function, return of spontaneous circulation, survival to hospital admission, or survival to hospital discharge between patients receiving sham ITD plus CPR and those receiving active ITD plus CPR. Another randomized controlled trial\(^7\) reported an increase in the number of intensive care unit admissions for those with pulseless electrical activity who received active ITD plus CPR compared with sham ITD plus CPR; however, overall intensive care unit admission was not statistically significant. Adverse events and complication rates were similar between those in the active ITD and sham ITD groups.\(^7\) Systolic blood pressure was significantly increased for patients receiving active ITD treatment in another randomized controlled trial,\(^8\) which also reported no significant adverse events related to ITD use.

One non-randomized study\(^9\) was identified regarding the use of an ITD during CPR of adult patients in cardiac arrest. Survival to emergency department admission was significantly improved for patients receiving ITD intervention compared with historical controls.\(^9\)

One evidence-based guideline\(^10\) was identified regarding the use of ITDs during CPR of adult patients in cardiac arrest. The guideline\(^10\) states that there is limited and uncertain evidence to suggest that ITDs may be considered for use by trained personnel as an adjunct to CPR in adults experiencing cardiac arrest.
REFERENCES SUMMARIZED

Health Technology Assessments
No literature identified.

Systematic Reviews and Meta-analyses


Randomized Controlled Trials


Non-Randomized Studies


Guidelines and Recommendations

See: Impedance Threshold Device, page S722

PREPARED BY:
Canadian Agency for Drugs and Technologies in Health
Tel: 1-866-898-8439
www.cadth.ca
APPENDIX – FURTHER INFORMATION:

Randomized Controlled Trials – Alternate Outcome


Non-Randomized Studies

Alternate Outcomes


Additional Interventions


Review Articles


Additional References – Horizon Scan