Clinical question.

In adult and pediatric patients with presumed cardiac arrest (pre-hospital or in-hospital) (P), are there any factors/characteristics (I) that increase the likelihood of differentiating between a sudden cardiac arrest (i.e. VF) from other aetiologies (e.g. drowning, acute airway obstruction) (O)?

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

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).

<table>
<thead>
<tr>
<th>Medline/Embase/Scopus/Ovid</th>
<th>UPDATED SEARCH JUNE - AUGUST 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>(aetiology OR cause) AND (heart arrest OR cardiac arrest): 3 results - none relevant</td>
<td>47 papers scanned – none relevant</td>
</tr>
<tr>
<td>(aetiology OR cause) AND (heart arrest OR cardiac arrest) AND diagnosis: 0 results</td>
<td>6 papers scanned – none relevant</td>
</tr>
<tr>
<td>(heart arrest OR cardiac arrest) AND diagnosis: 2 results - neither relevant</td>
<td>73 papers scanned – none relevant</td>
</tr>
<tr>
<td>(heart arrest OR cardiac arrest) AND causes: 2 results - neither relevant</td>
<td>19 papers scanned – none relevant</td>
</tr>
<tr>
<td>diagnosis AND ventricular fibrillation: 3 results - none relevant</td>
<td>43 papers scanned – none relevant</td>
</tr>
<tr>
<td>diagnosis AND non-ventricular fibrillation: 2 results - neither relevant</td>
<td>0 papers scanned</td>
</tr>
<tr>
<td>diagnosis AND drowning: 2 results - neither relevant</td>
<td>5 papers scanned – none relevant</td>
</tr>
<tr>
<td>diagnosis AND asphyxia: 4 results - none relevant</td>
<td>13 papers scanned – none relevant</td>
</tr>
<tr>
<td>(heart arrest OR cardiac arrest) AND asphyxia: 4 results - none relevant</td>
<td>0 papers found</td>
</tr>
<tr>
<td>(heart arrest OR cardiac arrest) AND non-cardiac: 102 results – 3 relevant</td>
<td>0 papers found</td>
</tr>
<tr>
<td>(heart arrest OR cardiac arrest) AND characteristics: 184 results – 3 relevant</td>
<td>28 papers scanned – none relevant</td>
</tr>
</tbody>
</table>

Cochrane database: 0 results

Follow-up of references: 1 relevant

References cited via Scopus: 2 relevant

• State inclusion and exclusion criteria

Inclusion: Human studies; adult and paediatric; prospective clinical diagnosis of cardiac versus non-cardiac cardiac arrest; in-hospital and out-of-hospital cardiac arrest

Exclusion: Non-human studies; only retrospective or non-clinical diagnosis of aetiology of cardiac arrest

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

9 articles identified as relevant to the question – sources as above.
### Summary of evidence

#### Evidence Supporting Clinical Question

<table>
<thead>
<tr>
<th>Good</th>
<th>Ong, 2006, 335 E</th>
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</table>
| Fair          | Claesson, 2008, 381 E  
               | Engdahl, 2003, 33 E 
               | Herlitz, 2007, 1025 E 
               | Weston 1997, 227 E |
| Poor          | D1               |
|               | D2               |
|               | D3               |
|               | D4               |
|               | D5               |

#### Level of evidence

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

*Italics = Animal studies*
### Evidence Neutral to Clinical question

<table>
<thead>
<tr>
<th></th>
<th>Good</th>
<th>Ong, 2007, 26 E</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fair</td>
<td>Kuisma, 1997, 1122 E</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kürkciyan, 1998, 766 E</td>
</tr>
<tr>
<td></td>
<td>Poor</td>
<td>D1</td>
</tr>
</tbody>
</table>

**Level of evidence**

A = Return of spontaneous circulation  
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*Italics = Animal studies*

### Evidence Opposing Clinical Question

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<td>Fair</td>
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<td>Poor</td>
<td>D1</td>
<td>D2</td>
<td>D3</td>
<td>D4</td>
</tr>
</tbody>
</table>

**Level of evidence**

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

*Italics = Animal studies*
REVIEWER'S FINAL COMMENTS AND ASSESSMENT OF BENEFIT / RISK:

It is assumed that the question of whether there are any factors or characteristics that increase the likelihood of differentiating between a sudden cardiac arrest from aetiologies other than cardiac refers to prospective, clinical features, rather than post mortem findings.

The studies that were found either relate the victim’s age to the aetiology (cardiac or non-cardiac) of cardiac arrest or show inaccurate correlation between clinical diagnosis of cause and later confirmation.

A single, fair, LOE D2, retrospective, age-related, out-of-hospital, registry study was found (Herlitz 2007, 1025) that updated a previous study (Herlitz, 2003, 309) and demonstrated a significant increase in arrests due to cardiac causes after the age of 35 years. Although there were 5 age groups below 35 years, there were only 3 older groups (36-64 years; 65-79 years; 85 years and above) thus making it difficult to define a clear cut-off age between non-cardiac and cardiac causes. Two, fair, LOE D2, retrospective, all-age, out-of-hospital, registry studies were found (Engdahl, 2003, 33; Weston, 1997, 227) which showed that the chances of cardiac arrest being due to a cardiac cause rises with age, but without clear cut-off ages. One, fair, LOE D2, retrospective, all-age, out-of-hospital, registry study was found (Claesson, 2008, 381) which showed that the mean age of victims of cardiac arrest due to drowning was lower (44 years ± 26) than those of cardiac arrest due to a cardiac aetiology (70 years ± 13). One, good, LOE D2, prospective, paediatric (below age 19 years), out-of-hospital, registry study was found (Ong, 2006, 335) that showed that 83% cardiac arrests under the age of 19 are of non-cardiac origin.

One fair, LOE D2, prospective study (Kuisma, 1997, 1122) and one fair, LOE D3, retrospective study (Kürkciyan, 1998, 766) were found that showed that initial, clinical differentiation between cardiac and non-cardiac causes of cardiac arrest was inaccurate, mainly underestimating non-cardiac causes.

One good, LOE D2, prospective, paediatric (below age 19 years), out-of-hospital, registry study (Ong, 2007, 26) was found that showed that, in a few cases (around 5%), an initial diagnosis of cardiac arrest due to drowning was subsequently proven to be incorrect.

Acknowledgements:
None

Citation List


LOE D2. Fair. Supporting.
Retrospective review of cases of out-of-hospital cardiac arrest due to drowning from the Swedish Cardiac Arrest Registry. Initial diagnosis of cause of cardiac arrest made mainly by paramedics. Comparison made of characteristics of victims of cardiac aetiology and drowning. Mean age of drowning victims 44 years ± 26; mean age of cardiac victims 70 years ± 13.


LOE D2. Fair. Supporting.
Retrospective review of out-of-hospital cardiac arrests in Göteborg, Sweden between 1981 and 2000. Those with a non-cardiac aetiology were more likely to be younger and female, and the cardiac arrest was more likely to be unwitnessed.


Retrospective review of Swedish Cardiac Arrest Registry of out-of-hospital cardiac arrest between 1990 and 1999, looking particularly at different characteristics of the event and outcome according to the age of the victim. Cause of cardiac arrest determined by paramedics involved. A cardiac aetiology was more likely in older victims (<65 years = 59.8%; 65-75 years = 81%; >75 years =82.5%). Conversely, intoxication, accidents, suffocation, suicide, and drowning were all more common among younger victims (Updated in Herlitz, 2007, 1025).

LOE D2. Fair. Supporting.
Retrospective review of Swedish Cardiac Arrest Registry of out-of-hospital cardiac arrest between 1990 and 2005, comparing characteristics of victims according to their age. More age groups than the 2003 study. Relatively stable cardiac aetiology of cardiac arrest up to age 35 (11-20%) compared with 61-79% in victims aged 36->80 years.


Prospective cohort study of out-of-hospital cardiac arrests in Helsinki, Finland in 1994 and 1995 aimed at determining epidemiology and outcome of those of non-cardiac origin. Initial diagnoses of cause of cardiac arrest compared with final diagnosis. Of the 34.1% cases (276 patients) verified as of non-cardiac origin, incorrect cause diagnosed in 36.2% cases. No indication of how many (if any) of non-cardiac origin were diagnosed as of cardiac origin.


Retrospective review of patients with cardiac arrest admitted to the Department of Emergency Medicine, university Hospital of Vienna between 1991 and 1995. Purpose of study was to determine the accuracy of initial physician diagnosis of the aetiology of the arrest compared with the later definitive diagnosis, including autopsy where performed. Presumed cause of arrest correct in 89% of cases (wrong in 11%). Cardiac aetiology: Specificity of initial diagnosis 76.5%; sensitivity 94.8%. Non-cardiac aetiology: Specificity of initial diagnosis 97.7%- 100%; sensitivity 57.7-100%. Particularly frequently missed was exsanguination as a cause.


LOE D2. Good. Supporting.
Prospective, cohort study of paediatric deaths due to out-of-hospital cardiac arrest within 21 communities in Ontario, Canada from 1992 to 2002. Definitive diagnosis if aetiology of cardiac arrest from autopsy and coroners’ inquests. Of the 236 cases of death due to ‘natural causes’ (including drowning) 17% were due to cardiovascular causes. No details of initial/ clinical diagnoses.


LOE D2. Good. Neutral.
Prospective, cohort study of paediatric deaths due to out-of-hospital cardiac arrest within 21 communities in Ontario, Canada from 1992 to 2002. Definitive diagnosis if aetiology of cardiac arrest from autopsy and coroners’ inquests compared with initial, clinical diagnoses. Inaccurate clinical diagnoses included around 5% drownings not subsequently confirmed.


LOE D2. Fair. Supporting.
Retrospective analysis of out-of-hospital cardiac arrests occurring between July 1989 and April 1992 in South Glamorgan, Wales. Definitive diagnosis of cause include autopsy and coroners’ evidence where available. Mean age of those with a cardiac origin was 68.1 years (IR 62-76) and with a non-cardiac cause was 55.0 years (IR 40-74). No details of initial/clinical diagnoses.