# WORKSHEET for Evidence-Based Review of Science for Emergency Cardiac Care

## Worksheet author(s)
Tom P. Aufderheide, M.D.  
Peter Morley

**Date Submitted for review:** Feb 7 2010, Revised March 6 2010

## Clinical question.
BLS-017A: In adult and pediatric patients in cardiac arrest (prehospital [OHCA], in-hospital [IHCA]) (P), does the use of alternative methods of manual CPR (eg. cough CPR, precordial thump, fist-pacing) (I) compared with standard CPR (C), improve any outcomes (eg. ROSC, 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).
**Electronic data bases:**
- OVID MEDLINE
- AMED
- BIOSIS
- Global Health
- NASW Clinical Register
- Google

Search terms: cough CPR, Bezold Jarisch Reflex, cough cardiopulmonary resuscitation, precordial thump, chest thump, commotio cordis, fist pacing, percussion pacing, cardiac percussion

## State inclusion and exclusion criteria
- Included years 1975-2009
- English language
- Animal and human studies
- Pediatric and adult

## Number of articles/sources meeting criteria for further review:
36
## Summary of evidence

### Evidence Supporting Clinical Question

<table>
<thead>
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<th>Good</th>
<th>Fair</th>
<th>Poor</th>
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<td>(Keeble; 2008; 4B; CCPR) (Petelenz; 1998; 4B; CCPR) (Rieser; 1992; 4B; CCPR) (Dale; 2007; 4B; PT) (Chan; 2002; 4B; PP) (Dowdle; 1996; 4B; PP) (Zeh, 1978; 4E; PT and PP) (Rahner, 1978; 4E; PT) (Bornemann, 1969; 4E; PT) (DeMaio, 2001; 4B, C, E; PT) (Pennington, 1970; 4E; PT) (Eich, 2007; 4B; PP) (Eich, 2005; 4B; PP) (Iseri; 1987; 4B; PP) (Tucker; 1995; 4B; PP) (Criley; 1976; 4A; CCPR) (Girsky; 2006; 4A; CCPR) (Saba; 1996; 4C, B; CCPR) (Wei; 1980; 4E; CCPR) (Pellis; 2009; 4A, B, C, E; PT)</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 = Termination of a fatal rhythm  
F = Initiation of a fatal rhythm  

*Italics = Animal studies*  
PT = Precordial Thump  
PP = Percussion Pacing  
CCPR = Cough CPR
Evidence Neutral to Clinical question

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<tr>
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<td>(Volkmann;1990;4A;PT)</td>
<td>(Befeler;1978;5E;PT) (Gertsch;1989;5A,B,E; PT)</td>
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<td>(Befeler;1977;4E; PT)</td>
<td>(Gertsch;1989;4E; PT)</td>
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<td>(Caldwell; 1985; 4A,B,C,E; PT and CCPR)</td>
<td>(Morgens; 1979; 4A; PT)</td>
<td>(B. Miller;1989; 5E; CCPR) (Patros;1983;5B,E;PT)</td>
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1 2 3 4 5

Level of evidence

A = Return of spontaneous circulation C = Survival to hospital discharge E = Termination of a fatal rhythm
B = Survival of event D = Intact neurological survival F = Initiation of a fatal rhythm

Italics = Animal studies

PT = Precordial Thump

Evidence Opposing Clinical Question

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<tr>
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<td>(Amir;2007; 4B,E; PT) (Haman;2009;4A,E; PT)</td>
<td>(Li;2006;2B;PT)</td>
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<td>(Muller;1992; 4B,F; PT) (J.Miller;1984;4B,E,F; PT)</td>
<td>(J. Miller;1985; 4A,E; PT)</td>
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<td>(Ahmar;2007;4B; PT)</td>
<td>(Cayla;2007;5E; PT)</td>
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1 2 3 4 5

Level of evidence

A = Return of spontaneous circulation C = Survival to hospital discharge E = Termination of a fatal rhythm
B = Survival of event D = Intact neurological survival F = Initiation of a fatal rhythm

Italics = Animal studies

PT = Precordial Thump

PP = Percussion Pacing

CCPR = Cough CPR
REVIEWER’S FINAL COMMENTS AND ASSESSMENT OF BENEFIT / RISK:


Cough CPR appears effective only in a controlled, monitored hospital setting prior to electrophysiology testing with patient instruction prior to the onset of cardiac arrest. (Criley, 1976, 1246; Girsky, 2006, e530; Keeble, 2008, E239; Miller, 1989, 168; Petelenz, 1998, 326; Rieser, 1992, 291; Saba, 1996, 47; Wei, 1980, 174) Consciousness can be maintained for only seconds to minutes. (Criley, 1976, 1246; Girsky, 2006, e530; Keeble, 2008, E239; Miller, 1989, 168; Petelenz, 1998, 326; Rieser, 1992, 291; Saba, 1996, 47; Wei, 1980, 174)

There were 5 case reports or small case series demonstrating efficacy (termination of a fatal rhythm) with use of the precordial thump. (Bornemann, 1969, 83; Dale, 2007, 336; DeMaio, 2001, 602; Pennington, 1970, 1192; Rahner, 1978, 1659) Larger patient samples from 8 case series (one with over 300 patients [Caldwell, 1985, 627]) (Miller, 1989, 168; Befeler, 1978, 832; Caldwell, 1985, 627; Gertsch, 1992, 181; Morgera, 1979, 69; Patros, 1983, 61; Pellis, 2009, 17; Volkmann, 1990, 717) and other case reports (Befeler, 1977, 773) or animal study (Gertsch, 1989, 248) demonstrate variable and substantial incidence of lack of termination of a fatal rhythm with the precordial thump. There are numerous case reports of complications from the precordial thump including sternal fracture (Ahmar, 2007, 540), osteomyelitis (Ahmar, 2007, 540), stroke (Muller, 1992, 12), and worse malignant arrhythmias (Miller, 1984, 791; Muller, 1992, 12) in adults and children. More recently, a large case series found the precordial thump ineffective in 79/80 (98.8%) cases of malignant ventricular arrhythmias. (Amir, 2007, 153) A recent animal study has shown that myocardial ischemia lowers the effectiveness of the precordial thump. (Li, 2006, 179) In 2009, Haman et al found the precordial thump ineffective in terminating ventricular arrhythmias in 153/155 (98.7%) patients. (Haman, 2009, 14)

There is little evidence supporting percussion pacing in cardiac arrest or patients with bradycardia. Evidence to support percussion pacing consists almost exclusively of 6 single case reports (Chan, 2002, 117; Dowdle, 1996, 31; Eich, 2007, 429; Eich, 2005, 465; Iseri, 1987, 1545; Tucker, 1995, 53), although one case series of 50 patients has been reported (Zeh, 1978, 299) with some efficacy.

Acknowledgements:
Citizen List


Comments:


Comments:


Comments:
LOE 5, fair, neutral. Case series of 68 patients with electrical pacing and PT. Mixed results.


Comments:
LOE 4, poor, neutral. Case reports. Mixed results.


Comments:
LOE 4, poor, supporting. Case report


Comments:
LOE 4, poor, neutral. Prospective study of over 300 patients. Mixed results.


Comments:


Comments:
LOE 4, poor, supportive. Case report. Three techniques for pacing (including percussion pacing) demonstrating equivalent hemodynamics with all techniques.


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LOE 4, poor, supportive. Case report. Three techniques for pacing (including percussion pacing) demonstrating equivalent hemodynamics with all techniques.


Comments:
LOE 4, poor, supportive. Case series of 8 patients


Comments:
LOE 4, poor, supportive. Observational case series of CPR only “cardiac arrest” survivors.


Comments:
LOE 4, poor, supportive. Case report. Cardiac percussion.


Comments:


Comments:
LOE 4, poor, supportive. Three case reports demonstrating effective cardiac percussion.


Comments:

Comments:
LOE 5, fair, neutral. Animal study with 5 pigs. 95% success rate, although authors caution application in humans.


Comments:
LOE 4, poor, supportive. Case report


Comments:
LOE 4, good, opposing. Excellent case series of 485 patients in cath lab. PT terminated ventricular arrhythmias in only 2 patients.


Comments:
LOE 4, poor, supportive.


Comments:


Comments:
LOE 5, good, opposing. Good quality animal study. Myocardial ischemia lowers efficacy of precordial thump.


Comments:


Comments:
LOE 4, fair, opposing. Nine patients induced with VT by pacing in lab. 11 PTs failed to convert rhythm.

Comments:
LOE 4, fair, opposing. 50 out-of-hospital cardiac arrests. 3 patients had conversion of rhythm. 12/27 converted to more malignant rhythms


Comments:


Comments:
LOE 4, fair, opposing. Three case reports. Serious complications of the precordial thump in children.


Comments:


Comments:
LOE 4, poor, supporting. In this study PT had no effect on 138 of 144 patients. However, PT caused ROSC in 3 patients with witnessed cardiac arrest due to asystole, (time-to-intervention <3 min), representing one quarter of ROSC among witnessed CA victims.


Comments:
LOE 4, poor, supportive. Case Report


Comments:
LOE 4, poor, supportive. Cough CPR provided short, temporizing intervention.

Comments:
LOE 4, poor, supportive. Case series of 20 patients. Authors conclude: in general a thump should only be performed if ECG is being recorded and backup defibrillation is available. Except from this a precordial thump is recommended in cases of emergency / life threatening arrhythmias if there is no other choice and no time is to be wasted.


Comments:


Comments:
LOE 4, poor, supportive. Case report


Comments:


Comments:
LOE 4, fair, neutral. 47 consecutive cases of PT. Mixed results.


Comments:
LOE 4, poor, supportive. Case report


Comments:
LOE 4, poor, supportive. Cases series of 50 patients with precordial thump or fist pacing. Emphasis on force/pressure to right ventricle with blow to the chest.