Clinical question.
In rescuers performing CPR on adult or paediatric patients with cardiac arrest (prehospital [OHCA], in-hospital [IHCA]) (P), does the use of any specific method for locating recommended hand position (I) compared with standard care (e.g. "placement of the rescuer’s hands in the middle of the chest") (C), improve outcome (e.g. time to commence CPR, decreased hands off time, 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? Author of one of the studies quoted. None else.

Search strategy (including electronic databases searched).
Medline/Embase/Scopus

{Heart arrest OR chest compressions OR Cardiopulmonary resuscitation} AND hand position

Follow-up of cited references

• State inclusion and exclusion criteria
Include: Studies that address comparison of simple hand placement (‘hand in centre of chest’) with other methods (‘landmark techniques’)

Exclude: abstract only studies; non-peer reviewed articles; studies that only address question of where hands should be placed rather than method of finding the correct place

• Number of articles/sources meeting criteria for further review:
194 papers retrieved using search strategies above; 13 papers were reviewed; 6 papers met the inclusion criteria.

Search re-run 9 September 2009: Articles limited to those in past 12 months since initial search
Medline / Embase / Scopus 14 papers retrieved; none relevant
Follow-up of cited reference (Handley 2002, 53) – No new references
## Summary of evidence

### Evidence Supporting Clinical Question

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Clements 2000, 43 E

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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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<td>Shin 2007, 305 E</td>
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<td>Woollard 2003, 123 E</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 = Other endpoint  
*Italic = Animal studies*

**Evidence Opposing Clinical Question**

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<td>Smith 2004, 41 E **</td>
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<td>Kusunoki 2009, 1175 E</td>
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**Level of evidence**
A = Return of spontaneous circulation  
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**Good studies, but only fair in the context of this worksheet**
No human studies were found.

A single, manikin study (LOE 5: Handley, 2002, 53) directly compared a simple method for locating the recommended hand position on an adult (‘Place the heel of your hand in the centre of the chest with the other hand on top’) with the previous (Guidelines 2000) method that required location of the rib margins and xiphisternum, then sliding a hand down the sternum. There was no significant difference in accuracy between the two methods, but using the ‘standard’ method resulted in significantly less hands-off time for ventilation. The author emphasized that instruction in this method should be accompanied by a demonstration of placing the hands in the middle of the lower half of the sternum and subsequent corrective practice.

A series of studies (LOE 5: Assar, 2000, 7; Chamberlain, 2001, 21; Smith, 2004, 41) reported the results of a randomized, controlled manikin study to compare conventional with staged teaching of adult CPR. Volunteers in the staged group were initially taught compression-only CPR and were instructed simply to place their hands in the centre of the chest. This led to significantly less delay to first compression, but there was no differentiation between the effects of no ventilation and simpler hand placement. Immediately after training there was an insignificant difference in accuracy of hand placement. Six-months later hand placement was significantly better for those taught in stages, but at 12 months this difference was again insignificant.

A randomized, controlled, adult, manikin study (LOE 5: Woollard, 2003, 123) compared the time to first compression and the number of compressions given per minute when volunteers received standard dispatcher protocol instructions or simplified instructions. The simplified instructions did not include ventilation, and placement of the hands on the chest consisted of ‘place your hands in the middle of her/his chest’. Significantly more compressions were given with significantly less delay with the simplified instructions, but there was no differentiation between the effects of no ventilation and simpler hand placement. Hand placement was less accurate after the simplified instructions.

A good study (LOE 5: Shin 2007, 305) of CT scans showed that the inter-nipple line is 3cm superior to the lower third of the sternum.

A fair, simulation study (LOE 5: Kusunoki 2009 1175) measured the sternal length and position of the inter-nipple line of 1000 male and female surgical patients, and compared these with the hand width of 100 hospital volunteers (both lay and healthcare). Validation was carried out on 100 anaethetised surgical volunteers. Hand deviation to or beyond the xiphisternum occurred in nearly half the cases, and sometimes into the epigastrium when the patient was short-statured or elderly female, and the rescuer male.

A single, paediatric (infant) study (LOE 5: Clements, 2000, 43) mapped the position of adult fingers when placed on a representation of an average infant’s chest in accordance with the AHA and ERC Guidelines. The authors concluded that if the compression had been for real it would have resulted in compression being exerted over the xiphisternum or abdomen, and recommended ‘changing the method of locating finger position, to one using sternal anatomy’.

No studies addressing other aspects of outcome (e.g. ROSC or survival) were found.

Acknowledgements:

Citation List


Level 5. Fair. Opposing.
Randomized, controlled manikin study to compare conventional with staged teaching of adult CPR. Reduced pauses between compression sequences when standard (hands in centre of chest) compression and no ventilation.


Level 5. Fair. Supporting.
Simulated infant study, using the recommended method for chest compression (two fingers placed one-finger-breadth below the inter-nipple line), resulted in fingers being placed too low. Recommended that a ‘sternal-anatomy’ method should be used instead.

Level 5. Good. Opposing.
Comparison of standard (hands in centre of chest) method with identifying anatomical landmarks. No difference in accuracy, but significant less hands-off time with standard method.


Level 5. Fair. Opposing.
Randomized, controlled manikin study to compare conventional with staged teaching of adult CPR. Reduced pauses between compression sequences when standard (hands in centre of chest) compression and no ventilation.


Level 5. Fair. Opposing.
The sternal length and position of the inter-nipple line of 1000 male and female surgical patients were measured and compared with the hand width of 100 hospital volunteers (both lay and healthcare). Validation was carried out on 100 anaesthetised surgical volunteers. Hand deviation to or beyond the xiphisternum occurred in nearly half the cases, and sometimes into the epigastrium when the patient was short-statured or elderly female, and the rescuer male.


Level 5, good, neutral
Human CT images show that compressing the chest 3 cm caudal to the inter-nipple lines results in greater LV compression and may decrease work and increase intrathoracic pressure. Imaging study only: nothing related to teaching and no outcome data.


Level 5. Fair. Opposing.
Randomized, controlled manikin study to compare conventional with staged teaching of adult CPR. Reduced pauses between compression sequences when standard (hands in centre of chest) compression and no ventilation.


Level 5. Fair. Neutral.
Randomized, controlled, adult, manikin study of dispatcher instructions. Use of standard (hands in centre of chest) chest compression instruction and no ventilation resulted in significantly more compressions with less delay, but hand placement was less accurate.