Clinical question.

In patients with ROSC after cardiac arrest (P), does the routine use of PCI (I), compared with standard management (without PCI) (C), improve outcomes (eg. TBD survival/re-arrest/etc) (O)? ACS Taskforce WS#11

Is this question addressing an intervention/therapy, prognosis or diagnosis? Intervention/therapy in a selected group of post-cardiac arrest patients: Cardiac catheterization and percutaneous coronary intervention (PCI) within hours of ROSC in post-arrest patients with or without evidence of STEMI.

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 conflicts

Search strategy (including electronic databases searched).

PUBMED: Searched 1) 04 May 2008 and updated search 2) 09 November 2009 and 3) 28 January 2010

Search terms:
Cardiac arrest AND PCI: ("heart arrest"[MeSH Terms] OR ("heart"[All Fields] AND "arrest"[All Fields]) OR "heart arrest"[All Fields] OR ("cardiac"[All Fields] AND "arrest"[All Fields]) OR "cardiac arrest"[All Fields]) AND PCI[All Fields]:
Search 1) 63 articles Search 2) 93 articles Search 3) 101 articles

Cardiac arrest AND cardiac catheterization: ("heart arrest"[MeSH Terms] OR ("heart"[All Fields] AND "arrest"[All Fields]) OR "heart arrest"[All Fields] OR ("cardiac"[All Fields] AND "arrest"[All Fields]) OR "cardiac arrest"[All Fields]) AND ("cardiac catheterisation"[All Fields] OR "heart catheterisation"[MeSH Terms] OR ("heart"[All Fields] AND "catheterisation"[All Fields]) OR "heart catheterisation"[All Fields] OR ("cardiac"[All Fields] AND "catheterisation"[All Fields]) OR "cardiac catheterisation"[All Fields])
Search 1) 507 articles Search 2) 1177 articles Search 3) 1192 articles

Cardiac arrest survivor AND cardiac catheterization: ("heart arrest"[MeSH Terms] OR ("heart"[All Fields] AND "arrest"[All Fields]) OR "heart arrest"[All Fields] OR ("cardiac"[All Fields] AND "arrest"[All Fields]) OR "cardiac arrest"[All Fields]) AND ("survivors"[MeSH Terms] OR "survivors"[All Fields] OR "survivor"[All Fields]) AND ("cardiac catheterisation"[All Fields] OR "heart catheterisation"[MeSH Terms] OR ("heart"[All Fields] AND "catheterisation"[All Fields]) OR "heart catheterisation"[All Fields] OR ("cardiac"[All Fields] AND "catheterisation"[All Fields]) OR "cardiac catheterisation"[All Fields])
Search 1) 8 articles Search 2) 73 articles Search 3) 73 articles
**Other search strategies:**
Cochrane library search
Google scholar of publications citing Spaulding 1997, using words cardiac arrest and PCI (98 articles 09Nov)
Reviews used as additional search of literature:
--Rocky Mountain Critical Care Conference focus on Management following Resuscitation from Cardiac Arrest; Can J Anesth 2005 52:3, pp 309-322
--Reperfusion therapy for OHCA review by Keuper et al; Resuscitation 2007 73, pp 189-201.
--ACC and ESC Guidelines for NSTEMI care (2007)
--Post-cardiac arrest syndrome: epidemiology, pathophysiology, treatment, and prognostication. A consensus statement from the International Liasion Committee on Resuscitation; Circulation 2008 118, pp 2452-83.

**Discussions:**
ACS Taskforce Presentations in Ghent, represented in Orlando 2009
Personal communication with Christian Spaulding November 2009

<table>
<thead>
<tr>
<th>State inclusion and exclusion criteria</th>
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<tr>
<td>Includes only ; Human Subjects, 19+</td>
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<td>Excludes case reports and reviews</td>
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**Number of articles/sources meeting criteria for further review:**

--Excluded hundreds of articles that study PCI for AMI patients. Few of these studies include or focus on post-cardiac arrest patients.
--Excluded studies of cardiac arrest that occur during PCI
--1 study of cardiac catheterization in a series of 142 cardiac arrest survivors, although larger series outcomes were reported in only a subset of patients that went on to nuclear imaging (Borger van der Burg 2003; Am J Cardiol 91: 785-789).
--Excluded articles that compared PCI to thrombolytics (e.g. Richling et al 2007 Am J Emerg Med 25: 545-50)

**19 Articles Finally Evaluated**

**LOE 3:** Sunde 2007 p73

## Summary of evidence

### Evidence Supporting Clinical Question

<table>
<thead>
<tr>
<th>Level of evidence</th>
<th>Evidence Supporting Clinical Question</th>
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<tbody>
<tr>
<td>Good</td>
<td>Reynolds 2009-179 C,D Spaulding 1997-1629 C</td>
</tr>
<tr>
<td>Poor</td>
<td>Kahn 1995-1069 C,D</td>
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### Level of evidence

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

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

<table>
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<tr>
<th>Good</th>
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<tr>
<td>Fair</td>
<td>Anyfantakis 2009-312 C,D</td>
<td>Gorjup 2007-379 C,D</td>
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**Italics** = Animal studies

### Evidence Opposing Clinical Question

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

There is overwhelming evidence that non-cardiac arrest patients with ST elevation myocardial infarction (STEMI) are best managed with a strategy that includes cardiac catheterization and primary percutaneous coronary intervention (PCI) when it can be provided in a timely manner by an experienced clinician. However, there are no prospective randomized studies comparing a strategy of immediate angiography and percutaneous intervention in patients with return of spontaneous circulation (ROSC) following out of hospital cardiac arrest (OHCA) versus usual care including thrombolysis or PCI where clinically indicated.

There are several case series demonstrating that acute coronary-artery occlusion is frequent in survivors of out-of-hospital cardiac arrest (approximately 30-50%). Spaulding et al showed that in 84 consecutive patients successful angioplasty was an independent predictor of survival. The study also suggested clinical and electrocardiographic findings, such as the occurrence of chest pain and the presence of ST-segment elevation, were poor predictors of acute coronary-artery occlusion.

There is also evidence from case series and registries of OHCA that in-hospital and long-term prognosis is favorable in selected patients after successful out-of-hospital CPR and STEMI treated with primary PCI. Patients who regain consciousness prior to PCI after ROSC and undergo primary PCI achieve comparable outcomes to patients without cardiac arrest. In all comers with suspected acute infarction and OHCA with ROSC survival to hospital discharge was approximately 50-60%. The strategies used to select patients for angiography and intervention were clinical suspicion of an acute coronary syndrome, age 30-75 and ST elevation on the electrocardiograph.

One study of patients with ROSC after OHCA demonstrated that a standardized post-cardiac arrest protocol that included PCI where clinically indicated, was associated with a significantly better discharge rate from hospital, neurological outcome and 1-year survival when compared with historical controls (Sunde et al).

Assessment of risk /benefit:
Immediate angiography and percutaneous intervention should be considered in patients with ROSC following OHCA when it can be provided in a timely manner by an experienced clinician. The therapy should be considered where there is a clinical suspicion of an acute coronary syndrome and/or ST elevation on the electrocardiograph. The clinician should recognize that clinical and electrocardiographic findings, such as the occurrence of chest pain and the presence of ST-segment elevation may be poor predictors of acute coronary-artery occlusion in this patient group. Standardized post resuscitation protocols should include PCI where clinically indicated as part of the strategy to improve survival and neurological outcomes in this patient group.

Acknowledgements:

Darren Walters, Co-Authored Companion Worksheet on this topic
ACS Taskforce Members who reviewed this worksheet presentation
Citation List

   LOE 4 (Fair) Neutral

   LOE 4 (Fair) Supportive
   COMMENTS:
   • ROSC after OHCA, ECG with STEMI (Did not include LBBB)
   • Excluded patients down for > 10 min
     --Over 90% of pts in VF
     --90% of pts were unconscious prior to PCI

   LOE 4 (Fair) Supportive

   LOE 4 (Fair) Supportive

   LOE 4 (Fair) Neutral
   COMMENTS:
   • In the subset of cardiac arrest patients with ROSC + STEMI, who regained consciousness, PCI was associated with hospital survival rates similar to STEMI patients without cardiac arrest.
   • Therapeutic hypothermia was used in 35% of comatose survivors.
   • Only 29% of the comatose cardiac arrest patients who survived to hospital discharge were neurologically intact (CPC 1, 2).

   LOE 4 (Poor) Supportive

LOE 4 (Fair) Supportive


LOE 4 (Fair) Supportive

COMMENTS:
• ROSC after OHCA, ECG with STEMI, 88% VF, 9% asystole
• 90% of OHCA pts were stented, 80% achieved TIMI 3 flow
• 12/37 OHCA pts with GCS 3 were cooled
• 22% of OHCA pts required IABP
• Independent risk factors for death: asystole, cardiogenic shock, EMS call to CPR start time, GCS


LOE 4 (Fair) Supportive


LOE 4 (Fair) Supportive


LOE 4 (Fair) Supportive


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LOE 4 (Fair) Supportive

LOE 4 (Fair) Supportive


LOE 4 (Fair) Supportive


LOE 4 (Good) Supportive

COMMENTS:
• ROSC after OHCA, ECG with STEMI or LBBB, but included other rhythms
• 4/15 STEMI patients not taken to cath due to poor neurologic status
• 54.2% of patients receiving a cath experienced a good clinical outcome versus 24.8% not receiving a cath


LOE 4 (Good) Supportive

COMMENTS: Initial ECG findings of post-ROSC patients were poor predictors of later cardiac catheterization findings. Initial ECG findings:

- ST segment elevation: 42%
- ST segment depression: 9%
- LBBB: 21%
- RBBB: 2%
- Nonspecific ST,T: 12%
- Normal ST sgmt and T: 13%


LOE 3 (Fair) Supportive

COMMENTS:
PCI was not tested alone. Multiple interventions including PCI, intra-aortic balloon pump, glucose control etc. were studied.