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

**Worksheet author(s)**
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**Clinical question.**
In patients with suspected ACS in various settings (eg. prehospital or emergency) (P), does the use of prehospital or emergency 12 lead ECG (I), compared with standard diagnostic techniques (C), increase sensitivity and specificity of diagnosis of ACS/MI (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:** revision

**Conflict of interest specific to this question**
No conflicts of interest

**Search strategy (including electronic databases searched).**
- PubMed: Emergency medical services (MESH) AND (chest pain as MESH or acute coronary syndrome as MESH) AND (electrocardiography as MESH or electrocardiogram)
- EMBASE: Emergency medical services (MESH) and electrocardiogram
- Period: until 1/7/2009

- **State inclusion and exclusion criteria**
  - **Inclusion:** Chest pain prehospital or emergency department, acute coronary syndrome.
  - **Exclusion:** Exercise testing, prognosis, cardiac imaging, biomarkers, continuous ECG, non cardiac chest pain, vectorcardiography, *effect of prehospital ECG on initiation of reperfusion therapy or on triage.*

- **Number of articles/sources meeting criteria for further review:**
  - 350 articles from Pubmed and 120 articles from Embase manually reviewed, **finally 14 included.**
## Summary of evidence

### Evidence Supporting Clinical Question

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**Level of evidence**
### Evidence Neutral to Clinical Question

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### Evidence Opposing Clinical Question

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<td><em>(Masoudi, Magid et al. 2006)</em></td>
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ECG abnormalities are an early manifestation of acute coronary syndromes and can be identified by prehospital ECG. The value of prehospital ECG has been studied already in the eighties of the previous century and has been implemented in EMS systems since the nineties. The registration of an ECG leads to a time delay of approximately 2 minutes. Based upon a good meta-analysis of 11 studies including 7508 (LOE D1, Ioannidis, 2001, p461), pre-hospital ECG had a sensitivity of 76% (95% CI 54-89) and a specificity of 88% (95% CI 67-96) for diagnosing acute cardiac ischemia. For diagnosing AMI, prehospital ECG had a sensitivity of 68% (95% CI, 59% to 76%) and specificity of 97% (95% CI, 89% to 92%). The sensitivity can be improved by repeating ECG on arrival in the ED (up to 20% of AMI patients have a normal or non-specified initial ECG) or by serial measuring of cardiac markers (good cohort study LOE D1, Kudenchuk 1998, p17 and good cohort study LOE D1, Hedges, 1992, p 1445).

Failure to identify high-risk ECG findings in patients with chest pain has been encountered in daily practice in 12% and resulted in lower-quality care in ED (good cohort study LOE D1 Masoudi, 2006, 1565). This finding emphasizes the importance to properly training ED physicians in interpreting ECG and/or to install systems for wireless transmission of ECG to qualified physician and/or apply computer based algorithms that allow ECG diagnosis with a comparable accuracy. These measures should diminish misinterpretations of initial electrocardiogram. Computer-interpreted electrocardiography to detect ST elevation myocardial infarction had better specificity (98% vs. 95%) with reduced sensitivity (52% vs. 66%) compared with physician interpretation. (good cohort study LOE D1, Kudenchuk, 1991, 148). In geographic regions with reliable wireless network coverage, wireless transmission of prehospital ECG for physician interpretation has been shown to be feasible and reliable (fairly good study, LOEI D1, Dhruva, 2007, 509).

Acknowledgements:

Citation List


**level 1, fair quality (adequately sized study population, use of reference standard regardless of test result). positive results:** ST elevation on ED 12-lead ECG were in the majority of the patients adequately interpreted as STEMI. In rare 6% situations ST elevation did not occur in the setting of an acute myocardial infarction.


**level 1, fair quality (small sample size), positive results.** Wireless transmission of ECG is feasible and provides good ECG


**level 1, good quality (adequately sized study population, independent evaluation, use of reference standard regardless of test result). negative results:** Study highlights the shortcomings of ECG in diagnosing NonSTEMI, even with serial ECG’s


**level 1, good quality (meta-analysis with selection of 11 good qualified studies, adequately sized study population, use of reference standard regardless of test result). positive results:** Prehospital 12-lead ECG has excellent diagnostic performance for AMI and good performance of acute cardiac ischemia.


**level 1, good quality (adequately sized study population, independent evaluation, use of reference standard regardless of test result). positive results:** Computer ECG is highly accurate to make the diagnosis of STEMI.


**level 1, good quality (adequately sized study population, independent evaluation, use of reference standard regardless of test result). positive results:** Overall good accuracy of prehospital ECG to diagnose acute coronary syndromes, serial ECG may increase sensitivity but at the cost of some what lower specificity.


**level 1, fair quality (independent evaluation, use of reference standard regardless of test, small sample size). positive results:** Overall good accuracy of prehospital ECG to diagnose AMI as compared to clinical symptoms, early cardiac enzymes.


**level 1, good quality (independent evaluation, use of reference standard regardless of test, adequate sample size). negative results:** High risk ECG were misinterpreted in 12% of the patients. Those patients tended to have a higher mortality and received lower-quality care in ED.

level 1, fair  quality (independent evaluation, use of reference standard regardless of test, small sample size)
positive results: overall good accuracy of prehospital ECG to diagnose AMI as compared to clinical symptoms, early cardiac enzymes.


level 2, exploratory study, good quality (independent evaluation, use of reference standard regardless of test, adequate sample size) positive results: ED ECG is good predictor of myocardial damage


level 1, fair  quality (independent evaluation, use of reference standard regardless of test, relative small sample size)
neutral results: moderate accuracy (cf relative low sensitivity) of prehospital ECG to diagnose AMI. Accuracy was not improved by adding cardiac enzymes in the early phase. as compared to clinical symptoms, early cardiac enzymes.