UAMS EM Journal Club
January 2020 Summary
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HEART score prognostic accuracy in prediction of short-term major adverse cardiac events in patients presenting to the Emergency Department with chest pain.

Clinical Bottom Line:
The HEART score has been validated in several independent studies around the world since it was first developed in Europe and is an appropriate primary clinical decision instrument for risk-stratification of patients presenting to the ED with chest pain.

PICO Question: In low-risk patients presenting to the ED with chest pain, is the HEART score (compared to placebo) effective at ruling out short-term major adverse cardiac events (MACE).

Background:
Chest pain is one of the most common patient presentations in the Emergency Department. It is important for clinicians to identify low-risk chest pain patients appropriate for discharge and to avoid unnecessary invasive testing and utilization of resources. The HEART score was developed and validated in Europe in order to help identify which ED patients presenting with chest pain were at low-risk for short-term MACE. Since the HEART score was initially validated there have been several independently validated studies around the world, including the U.S, that give us a better understanding of the prognostic accuracy of this tool.

Trial 1:
Fernando, et al. "Prognostic Accuracy of the HEART Score for Prediction of Major Adverse Cardiac Events in Patients Presenting with Chest Pain: A Systematic Review and Meta-analysis" *Acad Emerg Med.* 2019 Feb;26(2):140-151

Link:
https://www.ncbi.nlm.nih.gov/pubmed/30375097

Validity Rating:
Low risk of bias

The Basics:
Systematic Review in accordance with PRISMA (preferred Reporting Items for Systematic Reviews and Meta-Analysis) and meta-analysis of diagnostic test accuracy used by clinicians to rule out major adverse cardiac events (MACE) in low-risk patients. Data sources included MEDLINE, PubMed, EMBASE, Scopus, Web of Science, and the Cochrane Database of Systematic Reviews. Studies were screened using Covidence software and specific terms including "HEART score". Two reviewers selected studies by a systematic approach. 30 studies were included in the final analysis and all of them evaluated the prognostic accuracy of the HEART score using a low-risk threshold.

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Inclusion Criteria:
Studies were included in the meta-analysis if they enrolled patients ages greater than or equal to 16 years with suspected ACS, were conducted in the ED, applied the HEART score for prediction of short-term MACE (in-hospital, 28-day, 30-day, 6-week, or 3-month). Studies were also required to have a 2x2 table of true-positive, true-negative, false-positive, and false-negative counts for at least the low-risk threshold.

Exclusion Criteria:
Studies were excluded if they observed MACE over a longer or unspecified period of time. Case reports, case series, and studies that evaluated the prognostic accuracy of a modified HEART score were also excluded. Conference abstracts were excluded due to inconsistency of data.

Primary Outcome:
The short-term (30-day or 6-week) incidence of MACE.

Secondary Outcome:
Prognostic accuracy of the HEART-score for prediction of mortality and myocardial infarction

Results:
Prediction of short-term MACE has a sensitivity of 95.9 % for a HEART score greater than or equal to 4 (95% confidence interval [CI] =93.3%-97.5%) and the specificity was 44.6% (95% CI = 38.8%-50.5%). This was compared to TIMI score greater than or equal to 2, which had a sensitivity of 87.8% (95% CI = 80.2%-92.8%) and a specificity of 48.1% (95% CI = 38.9%-50.5%). For a high-risk HEART score (7-10) the sensitivity of MACE was 39.5% (95% CI= 31.6%-41.8%) and a specificity of 95.0% (95% CI= 92.6%-96.6%). This was compared to high-risk TIMI score (6-7), which had a sensitivity of 2.8% (95% CI= 0.8%-9.6%) and specificity of 99.6% (95% CI= 98.5%-99.9%).

Limitations/Bias:
1. Some studies may have inappropriately excluded low-risk patients.
2. None of the included studies compared accuracy of the HEART score to clinician gestalt.
3. Minimal evidence in the included studies pertaining to the impact of the HEART score on resource utilization.

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Trial 2:
Sharp, A., et al. "The HEART Score for Suspected Acute Coronary Syndrome in U.S. Emergency Departments" J Am Coll Cardiol. 2018;72(15):1875-1877.

Link:
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6237086/pdf/nihms-992594.pdf

Validity Rating:
Low risk of bias

The Basics:
Authors prospectively evaluated the HEART score correlation with patient outcomes for patients presenting to the Emergency Department (ED) with suspected acute coronary syndrome (ACS). The study sites included a total of 15 community hospitals in the Kaiser Permanente Southern California (KPSC) system which used an integrated health system with support for HEART score capture. Only Kaiser members were included in the dataset to allow for follow-up, resulting in a total of 29,196 total ED encounters. Rates of primary outcome and secondary outcomes were calculated with accompanying 95% confidence internals (CI). Additionally, the degree to which the HEART score can accurately predict the primary and secondary outcomes was evaluated using C-statistics.

Inclusion Criteria:
Study participants were Kaiser members with suspected ACS who had a prospective HEART score documented by the treating emergency physician.

Exclusion Criteria:
Excluded patients were < 18 years of age, died in the ED, were transferred to another facility, had DNR/hospice orders or had a diagnosis of acute myocardial infarction.

Primary Outcome:
30-day all-cause mortality or acute MI

Secondary Outcome:
6-week major adverse cardiac event rates, including any coronary revascularization procedures

Results:
Of the 29,196 encounter that met study criteria, 59% (n = 16,703) had low-risk HEART scores (0 to 3). Rates of death or MI within 30 days was 0.6% overall. Rates of primary events was 0.2% (95% CI: 0.1-0.3) in low-risk patients, while moderate risk (4 to 6) and high-risk (7 to 10) patients had rates of 1.0% (95% CI: 0.8 to 1.2) and 3.0% (95% CI: 2.1 to 4.0), respectively. The HEART score's ability to predict the primary outcome yielded a C-statistic of 0.76 (95% CI: 0.72 to 0.79). Inclusion of patients presenting with an acute MI yield a C-statistic of 0.88 (95% CI: 0.87 to 0.89). The rate of secondary outcomes was

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1.5% overall, with revascularization accounting for 52.2% of cases. Overall, patients with a HEART score ≤ 5 accounted for 89% of ED encounters and had approximately 1% risk of death or MI at 30 days.

Limitations/Bias:

- The ability to arrange outpatient follow up varies between facilities
- No patient demographics were presented to evaluate for generalizability of patient populations