Critical Review Form
Clinical Prediction or Decision Rule

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Citation: Backus BE at al. **Chest pain in the emergency room: a multicenter validation of the HEART Score**. Crit Pathw Cardiol. 2010 Sep; 9(3):164-9.

Guide		Comments
	What is being studied?	HEART score validation
1.	**Study Objective**	To test the hypothesis that the HEART score predicts MACE
2.	**Study Design**	Retrospective analysis of patients presenting to 4 separate hospitals in the Netherlands
3.	**Inclusion Criteria**	Any patient admitted to the ER because of chest pain irrespective of age; prehospital assumptions; and previous medical treatment.
4.	**Exclusion Criteria**	Patients with pre-hospital STEMI
5.	**Outcome Measures**	Primary endpoint was a composite of AMI, PCI, CABG, Death within 6 weeks of presentation called major adverse cardiac events (MACE)
I.	***Is this a newly derived instrument*** **(Level IV)?**	Yes, in this article it was still new
A.	Was validation restricted to the retrospective use of statistical techniques on the original database? (If so, this is a Level IV rule & is not ready for clinical application).	No, although it was retrospective and it examined a similar population, a new database was used from a greater number of sites
II.	**Has the instrument been validated? (Level II or III). If so, consider the following:**	This was the first article to try and validate the HEART score
1a	Were all important predictors included in the derivation process?	This was not a derivation study but an attempt to validate a previously derived score
1b	Were all important predictors present in significant proportion of the study population?	N/A
1c	Does the rule make clinical sense?	Yes, The HEART score includes components that are commonly used to assess risk for cardiac events.
2	Did validation include prospective studies on several different populations from that used to derive it (II) or was it restricted to a single	No. This validation study was retrospective and restricted to a similar patient population (almost all

	population (III)?	Caucasian) used to derive the rule (III) but different databases were used
3	*How well did the validation study meet the following criteria?*	
3a	Did the patients represent a wide spectrum of severity of disease?	Yes, both low risk and high-risk patients were represented.
3b	Was there a blinded assessment of the gold standard?	No
3c	Was there an explicit and accurate interpretation of the predictor variables & the actual rule without knowledge of the outcome?	Yes, the predictor variables could be individually scored by a blinded observer
3d	Did the results of the assessment of the variables or of the rule influence the decision to perform the gold standard?	Not in this article as it was a retrospective assessment of HEART score.
4	How powerful is the rule (in terms of sensitivity & specificity; likelihood ratios; proportions with alternative outcomes; or relative risks or absolute outcome rates)?	Not discussed in this article, but addressed in the others Results: A total of 158 patients (17.95%) had a MACE within 6 Weeks The average HEART score in the no end point group was 3.8 +/- 1.9 and in the patients with at least one MACE end point was 7.2 _ 1.7 (P _ 0.0001). In case of a HEART score of 7 to 10 points, 107 of 164 patients (65.2%) had a MACE. The HEART score was 3.8 _ 1.9 in the group with no catheterization in the first 6 weeks and 6.9 _ 1.8 in the group with a catheterization in the first 6 weeks (P _ 0.001). A nonsuspicious patient history (H _ 0) has a negative predictive value of 95.8% (296/309), whereas a suspicious patient history (H _ 2) goes with a positive predictive value of only 44.4% (107/241).
III.	**Has an impact analysis demonstrated change in clinical behavior or patient outcomes as a result of using the instrument? (Level I). If so, consider the following:**	Not yet
1	How well did the study guard against bias in	Not well. It was retrospective.

	terms of differences at the start (concealed randomization, adjustment in analysis) or as the study proceeded (blinding, co-intervention, loss to follow-up)?	Historical components and documentation of history are often subject to bias. No standardized form for history or separate individuals assessing history. They had 2 assessors reviewing history but do not report on their kappa score regarding agreement of historical factors. They do not report on BMI on Table 2 though they apparently included it.
2	What was the impact on clinician behavior and patient-important outcomes?	As a retrospective trial this study was not used to assess impact on clinical outcomes.

Limitations:

1. Retrospective study
2. No standardization for historical data (interpretation bias)
3. Did not provide sensitivity analyses with CI's only standard deviations
4. Patient population primarily white male Norwegians

Comments:

I thoroughly enjoyed the articles assigned for this month's journal club. It was especially informative to learn how clinical decision rules are formulated and then tested. I was not aware that the same population was used to both derive and initially validate the HEART score. This was obviously a practical decision by the original authors and does not distract from its current validity as it has been tested by different authors and in different populations.

I am both pleased with and intrigued by the discussion of the RCT. The authors found that the HEART pathway can be used safely to reduce unnecessary objective cardiac testing and ED length of stay. As well as increase the number of early discharges without any MACE at 30 days. Despite its' apparent advantages, clinicians were non-adherent with the strategy in up to 29% of low risk patients. The authors demonstrated that full adherence would have led to even more impressive reductions in healthcare utilization.

I hope that these articles inspire both residents and senior physicians to rethink how we evaluate and manage chest pain in the ED. There is still work to be done on this topic and more evidence is needed to make it universally applicable but we have an opportunity to change old habits and develop new practice patterns. We all need to think carefully about how we can reduce healthcare costs and add value to our practice. Early adoption and adherence with the HEART pathway appears to be an easy, clinically validated way to accomplish both.