



Retrospective Internal Validation of the HEART Score as an Objective Predictor of a Major Adverse Cardiac Event

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Introduction

Every year, millions of people present to U.S. emergency departments with the common chief complaint of chest pain. Significant difficulty lies in determining the severity of the complaint, estimating the cardiovascular risk, and deciding if a patient can be safely discharged. The HEART score is a scoring system originally developed by co-authors Barbara Backus, MD, PhD and Jacob Six, MD in 2008 to help ED physicians in the Netherlands risk-stratify chest pain patients. It predicts the 6-week risk of a Major Adverse Cardiac Event (MACE) based on five categories: History, EKG, Age, Risk Factors, and initial Troponin. A score of 0, 1, or 2 is allocated to each category and the categories are summed for a total score. Patients are deemed "low risk" if they have a HEART score of 0-3 and have a 0.9 - 1.7% risk of a MACE occurring. Based on the HEART score criteria, these patients are discharged. The original literature is largely European in base. Therefore, the rationale for ascertaining an internal validation of the HEART score in the Scottsdale, Arizona region is to provide these emergency physicians with a superior risk stratification tool in the assessment of the acute chest pain patient.

Data Collection: Only those who were discharged and not admitted following initial evaluation were considered. These patient charts were then reviewed and assessed based on the HEART score criteria: History, EKG, Age, Risk Factors, Troponin (*table 1*). The data was then compiled and calculated for each patient's risk of a 6 week MACE. If a patient's HEART Score was ≤ 3 they were included for follow up.

Components of the Heart Score		Value N=64
History of Present Illness (n, %)		
0		26 (40.6)
1		38 (59.4)
EKG (n, %)		
0		57 (89.1)
1		7 (10.9)
Age (n, %)		
0		31 (48.4)
1		30 (46.9)
2		3 (4.7)
Risk Factors (n, %)		
0		24 (37.5)
1		36 (56.3)
2		4 (6.3)
Troponin (n, %)		
0		64 (100)
1		0
Heart Score (n, %)		
0		3 (4.69)
1		20 (31.3)
2		19 (29.7)
3		22 (34.4)

Table 1: Numerical Breakdown of HEART Score Components (N=64)

Patient Follow Up: Patient follow up was needed in order to determine if those chest pain patients discharged had a major adverse cardiac event within 6 weeks of their discharge. Information was gathered via individual patient phone call and recorded without using any patient identifiers. Following completion, the data was split into two categorical outcomes for comparison.

1. The number of chest pain patients who were discharged based upon the HEART score and DID NOT have a MACE
2. The number of chest pain patients who were discharged based upon the HEART score but DID have a MACE.

Power and Sample Size: The primary outcome for this power and sample size calculation is the difference in percentage of MACE events between our current study vs the gold standard during the 6 week follow up period among patients who were discharged.

Results

Of the 117 patients who were deemed eligible and received a phone interview follow up, 53 were unable to be reached and were therefore lost to follow up (*figure 1*). Data comparison of the two categorical outcomes were compared. Analysis showed that out of a total of 64 chest pain patients that were discharged based upon HEART score criteria, 63 of them experienced no MACE within six weeks of discharge. While out of these same 64 patients who were discharged based upon HEART score criteria, 1 patient did experience a MACE within six weeks of discharge, a 1.57% occurrence (*figure 1*).

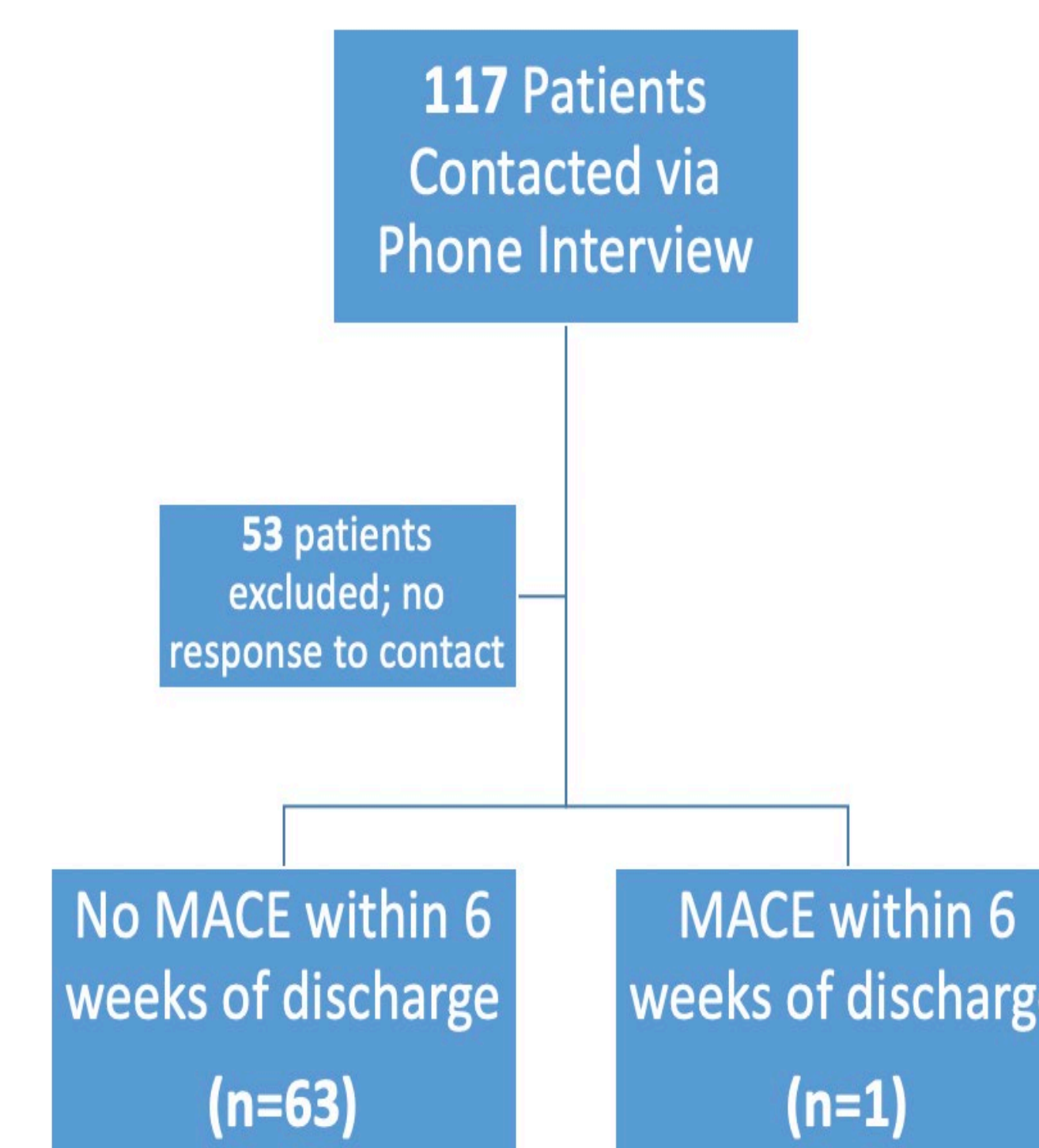


Figure 1: Flow chart of patient selection

The difference in percentage of MACE events between our current study (1.57%) and the gold standard (1.7%) during the 6 week follow up period among patients who were discharged is 0.13 (*figure 2*). The one sample Z-test of proportions resulted in a p-value of 0.93 which is not statistically significant. This p-value indicates there is not a statistically significant difference in results between this study and the original literature (*figure 2*).

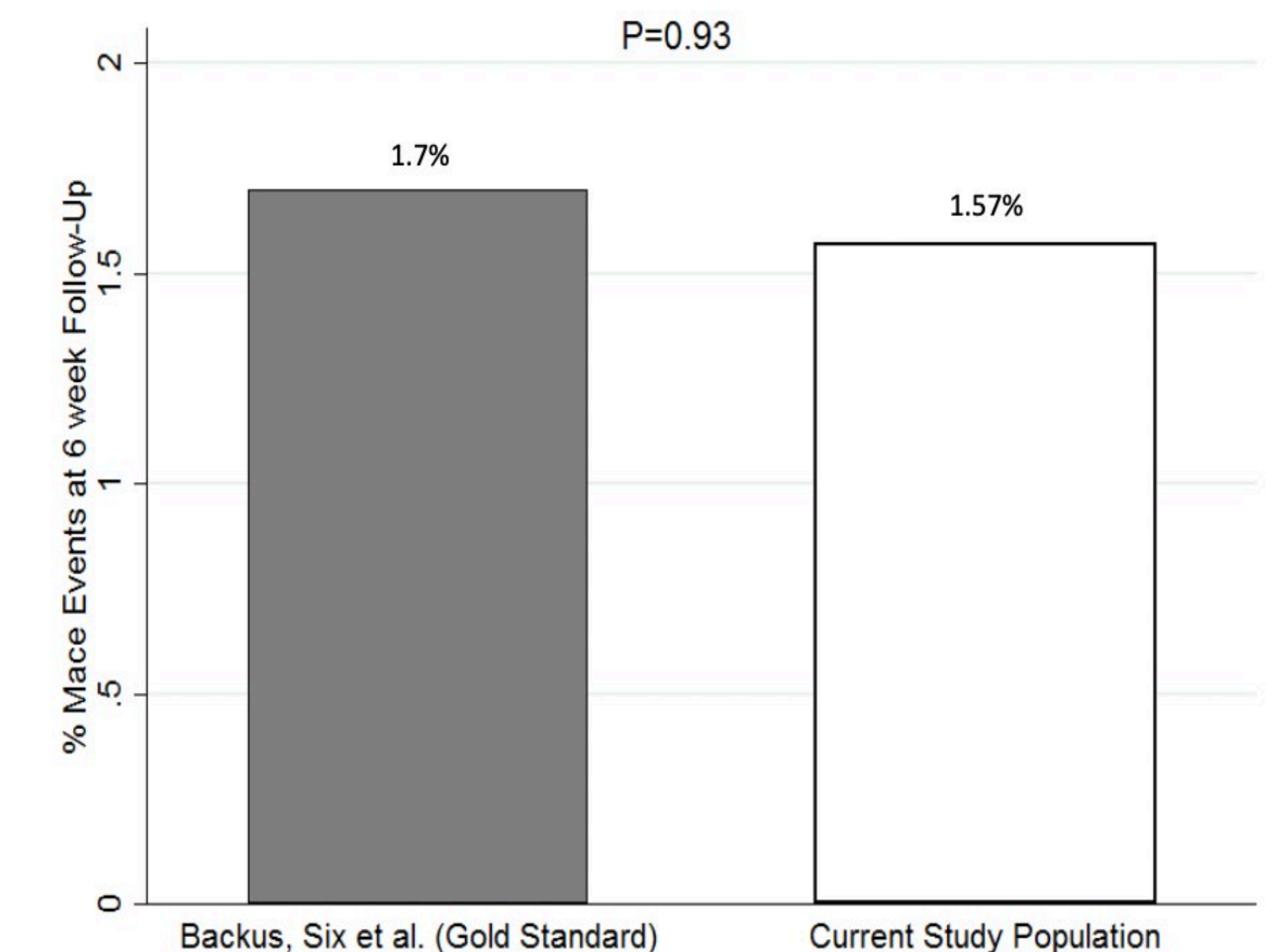


Figure 2: Comparison of MACE within 6 weeks of discharge between original literature guidelines and current study population who met low-risk HEART Score criteria. P-value calculated using the One-Sample Z-test of Proportions.

Conclusion

The data collected from patients who completed the follow up interview show a 1.57% risk of MACE occurring. This value is within the predicted 1.7% put forth by the original study authors. Comparison of percentile MACE occurrence at 6 week follow up between original literature and this retrospective study did not show a statistically significant difference in study results (p-value: 0.93). These results support my hypothesis and the overall goal of this study is fulfilled. It is therefore reasonable to conclude that the HEART score is internally validated as an objective predictor of no MACE occurring within 6 weeks of discharge of a chest pain patient presenting to these Scottsdale Honor Health emergency departments. Furthermore, the HEART Score has the ability to reliably identify patients that can be discharged and not admitted to the hospital.

Summary

- The HEART Score seeks to provide a reliable risk stratification tool in the assessment of the acute chest pain patient.
- This study internally validates the HEART Score as an objective predictor of no MACE occurring within 6 weeks of discharge of a chest pain patient presenting to Scottsdale Honor Health emergency departments.

Acknowledgements

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Research Question

This retrospective study is an internal validation in the Scottsdale, Arizona region of the HEART score as an objective predictor that a major adverse cardiac event (MACE) has a 1.7% or lower chance of occurring within six weeks in the adult patient population presenting to and discharged from the emergency department with acute chest pain.

Materials and Methods

Subjects : Eligible patients for retrospective chart review were those with an initial chief complaint of chest pain, who met the "low risk" classification of the HEART score, and who were appropriately discharged (NOT admitted) from any of the Honor Health Scottsdale Hospitals. Retrospective data was collected on 117 eligible patients in this study to allow for an appropriate statistical power index.