

**Undifferentiated, Low Risk Chest Pain Patients**

# Background

- 8-10 million patient visits annually
- Estimated cost of \$10-13 billion
- < 10% have ACS

Mahler SA et al. The HEART Pathway Randomized Trial Identifying Emergency Department Patients With Acute Chest Pain for Early Discharge. *Circulation: Cardiovascular Quality and Outcomes*. March 2015; 8 (2): 195 – 203.

# The Status Quo

Clinicians want to avoid missing a diagnosis of ACS → **admit** patients to observation units or monitored beds for cardiac investigations.

Provocative/objective cardiac testing leads to **significant amount of unnecessary downstream procedures, exposing patients to potential harms** from the testing and treatment, and **increased cost due to false positive tests**.

Backus BE, Six AJ, Kelder JC, et al. Chest pain in the emergency room: a multicenter validation of the HEART Score. Crit Pathways in Cardiol. 2010;9:164-9.

# Risk Stratification Score Not Ideal for ED

**Framingham Criteria** can predict future risk but do not aid in risk stratifying patients who present to the ED. It does not measure current risk.

**TIMI Score or GRACE Score** were not designed to assess ED chest pain patients presenting with ACS symptoms. These were designed to risk stratify patients once ACS diagnosed.

# HEART Score

Utilizes 5 Components:

History

EKG

Age

Risk factors

Troponin

# HEART Score

| POINTS |                                                                                                |                           |
|--------|------------------------------------------------------------------------------------------------|---------------------------|
| 0      | Slightly suspicious                                                                            | History                   |
| 1      | Moderately suspicious                                                                          |                           |
| 2      | Highly suspicious                                                                              |                           |
| 0      | Normal/presence of single known anomaly without ST-T abnormalities or confounding ECG patterns | ECG                       |
| 1      | Any anomaly not included in the previous category                                              |                           |
| 2      | ST depression and T wave changes                                                               |                           |
| 0      | <45 years                                                                                      | Age                       |
| 1      | 45-65 years                                                                                    |                           |
| 2      | ≥65 years                                                                                      |                           |
| 0      | No risk factors known                                                                          | Risk Factors              |
| 1      | 1 or 2 risk factors known                                                                      |                           |
| 2      | ≥ 3 risk factors or history of atherosclerotic disease                                         |                           |
| 0      | ≤14 ng/L                                                                                       | High sensitivity Troponin |
| 1      | > 15 ≤ 42 ng/L                                                                                 |                           |
| 2      | ≥ 42 ng/L                                                                                      |                           |

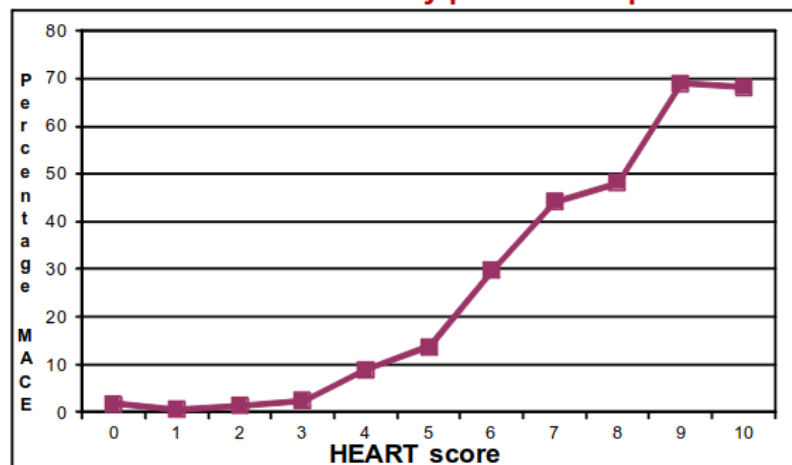
## Risk Factors:

- Hypercholesterolemia
- Hypertension
- Diabetes Mellitus
- Cigarette Smoking
- Obesity (defined as BMI>30)
- Family history of CAD in a 1st degree relative at age 55 or younger

**Risk Factors** = 2 points in patients with prior MI, PCI/CABG, CVA/TIA, history of atherosclerotic disease or peripheral arterial disease

# HEART Score

HEART score reliably predicts endpoints



| HEART | ~ % pts | MACE/n   | MACE | Death | Proposed Policy              |
|-------|---------|----------|------|-------|------------------------------|
| 0-3   | 32%     | 38/1993  | 1.9% | 0.05% | Discharge                    |
| 4-6   | 51%     | 413/3136 | 13%  | 1.3%  | Observation, risk management |
| 7-10  | 17%     | 518/1045 | 50%  | 2.8%  | Observation, treatment, CAG  |

## Is the risk too high?

The HEART Score examined > 13,000 patients and demonstrated a **high negative predictive value for major adverse cardiac events (MACE) at 6 weeks exceeding 98%.**

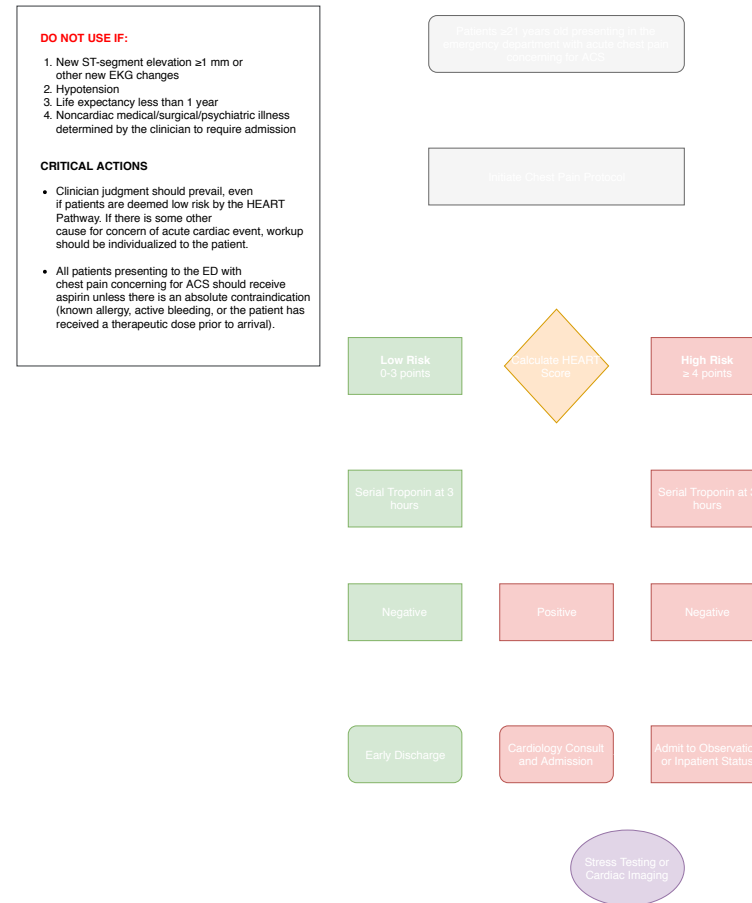
For many clinicians, a 2% risk is still too high.

Can we decrease that risk even further?

# HEART Pathway

The **HEART Pathway** is a combination of the **HEART score AND 0 and 3 hour cardiac troponin** testing.

This is a recently developed decision aid used to identify patients in the emergency department (ED) that are safe for early discharge.



# HEART Pathway

There have been several observational studies that have shown using the HEART score can classify >20% of patients with acute chest pain appropriate for early discharge while maintaining a negative predictive value (NPV) for major adverse cardiac events (MACE) rate of >99% at 30 days.

There have been no real-time, randomized trials comparing the HEART Pathway versus the ACC/AHA recommendations (i.e. usual care), **until now**.

Six, A. J, Backus, B.E., Kelder, J.C. Chest pain in the emergency room: value of the HEART score. Netherlands Heart Journal, Volume 16, Number 6, June 2008

# Clinical Question

**Does the HEART Pathway identify ED patients with acute chest pain who are safe for early ED discharge without objective cardiac testing?**

Mahler et al conducted a randomized controlled single-center clinical trial funded by the American Heart Association from 9/2012 - 2/2014. All participants were randomized to the HEART Pathway or usual care strategies.

In the HEART Pathway arm, ED attending physicians used the HEART Pathway to guide testing and disposition decisions. In the usual care arm, providers were encouraged to follow American College of Cardiology guidelines which recommend serial cardiac biomarkers and objective cardiac testing before discharge.

# Study Results

| Outcomes                              | HEART Pathway  | Usual Care | Change                                 |
|---------------------------------------|----------------|------------|----------------------------------------|
| <b>LESS</b> Objective Cardiac Testing | <b>56.7%</b>   | 68.8%      | -12.1%<br>(Absolute testing reduction) |
| <b>MORE</b> Early Discharge Rate      | <b>39.7%</b>   | 18.4%      | +21.3%<br>(Absolute early discharge)   |
| <b>DECREASED</b> Median LOS           | <b>9.9 hrs</b> | 21.9 hrs   | -12 hrs<br>(Absolute median LOS)       |

Total of 282 patients with 141 patients in each arm of the study

**0 patients identified as low risk by HEART Pathway had an index or non-index MACE**

## Take Home Message

It is safe to begin using the **HEART Pathway** (Non-ischemic ECG, HEART Score, and Troponin testing at 0 and 3 hours) in chest pain patients presenting to the emergency department with suspicion of ACS.

### Use of the HEART Pathway significantly:

1. Decreases objective cardiac testing
2. Increases early discharge rates, and
3. Cuts median length of stay with a zero MACE rate at 30 days (Study not powered for MACE).

## The Bottom Line

The HEART pathway can further decrease the miss rate. This pathway uses a HEART score of 0-3 and negative troponins.

Use of this pathway has repeatedly demonstrated ability to risk stratify a large percentage of patients as low risk appropriate for discharge (some studies 40%), with low rate of MACE (< 1%).

In patients with a low HEART score (0-3) and two sets of troponins, 30 day MACE further reduced to <1% .

# HEART Pathway: How Can It Go Wrong?

While the HEART Pathway had shown its utility, there are some pitfalls that should be avoided when using it.

# HEART Pathway: HISTORY

*Most predictive factors of ACS include:*

- diaphoresis with chest pain
- nausea and vomiting
- pain radiation to both arms or shoulder, and exertional pain

Chest wall tenderness, pleuritic chest pain, sharp/stabbing chest pain, positional chest pain, and reproducible chest pain *decrease likelihood*.

## PEARLS

- Up to 1/3 of patients with ACS will present with **dyspnea, fatigue, or nausea**
- Atypical presentations = increased mortality. **Diabetics, older patients, women, and heart failure patients.**
- New onset angina and unstable angina are NOT low risk patients. Beware of patients presenting with pain that by history is consistent with new-onset angina or unstable angina. These are not low risk patients and they are not appropriate for the HEART Pathway.

# HEART Pathway: ECG

The HEART Score categorizes ECG Scores as significant ST depressions, nonspecific repolarization abnormalities, and normal. Dynamic ECG changes with no other points on the HEART score could provide a score of 2, which theoretically would place the patient in the low risk category. A patient with dynamic ECG changes is NOT low risk.

Approximately 8-11% of patients will demonstrate normal initial ECGs, and in patients with STEMI, up to one third will demonstrate findings on ECG by 30 minutes. This is a potential weakness is misinterpretation of the ECG.

## PEARLS

- The ECG must be viewed systematically and thoroughly.
- Comparison with an old ECG if available to look for changes is very important. Do not dismiss T wave changes (such as hyperacute T waves or inversions). T wave changes must be taken seriously.
- **Repeat ECGs are imperative**, since changes may not be present on the initial ECG. **Any dynamic changes, especially from prior or while in the department should be considered high-risk.**

# HEART Pathway: AGE

Patients greater than 65 years receive two points. However, if they receive 0 points in other categories, this results in a score of 2 (low risk based on scoring). Advanced age has consistently proven to be a risk factor for ACS, and these patients may not present with chest pain.

Be wary of the patient with dyspnea, nausea/vomiting, and fatigue in this older population. Also be concerned about the younger patient (such as a 35-year-old) with no risk factors and a story strongly suggestive of ACS. **Your clinical gestalt is more valuable than any scoring tool.**

## PEARLS

Older patients warrant caution. Many do not present with typical symptoms of chest pain, diaphoresis, and vomiting. Dyspnea is more common.

**The key for older patients is atypical equals typical.**

# HEART Pathway: RISK FACTORS

Classically, cardiac risk factors (diabetes, hypertension, smoking, hyperlipidemia, family history) have been used to predict the presence or absence of ACS in chest pain.

The patient may deny medical problems if they never visit a physician or primary care physician. This would potentially give them 0 points, when in fact, they may have chronic medical problems (aka: risk factors) that have not been diagnosed.

## PEARLS

If the patient is hypertensive or has abnormal serum glucose, assume they have these risk factors and score them appropriately.

Obesity is a risk factor in the HEART score, and known cardiac disease, cerebrovascular disease, or prior stroke is automatically 2 points on the risk score.

## HEART Pathway: TROPONIN

An elevated troponin (2 points) with no other points would categorize the patient as low risk on the HEART score. However, troponin elevation should be considered high risk and criteria for admission.

The HEART pathway with troponin elevation takes this into account, with positive troponin resulting in admission for the patient.

**Elevated troponin equals admission.**

# Summary

1. Evaluate your patients and determine which patients are appropriate for the HEART Pathway
2. Document the HEART Score in your templates
3. Repeat EKG and Troponin as appropriate as recommended by the HEART Pathway
4. Take the appropriate aid to the bedside to engage in discussion regarding the results and expectant plan of care

# Goals

**Increase patient understanding and experience in the ED**

**Judicious use of limited resources in the appropriate patient population**

## Key Points

**This is a tool, not a substitution for your clinical judgement!**

Not all patients are appropriate for the application of the HEART Pathway. This is a tool for undifferentiated, low risk chest pain. A patient with a presentation highly suspicious for ACS will not fall into the HEART Pathway.

Improve chart documentation with appropriate MDM, HEART score and thorough explanations of your shared decision making discussions.

# Implement HEART into your Practice

**Shared Decision Making Using the HEART Score and a Visual Aid  
in Patients Presenting to the Emergency Department with Chest  
Pain**

# Step 1: Use the HEART Score

Utilizes 5 Components:

**H**istory

**E**KG

**A**ge

**R**isk factors

**T**roponin

## Step 2: Document the HEART Score

Go to [mdcalc.com](https://mdcalc.com) and document the generated score in your template.

### HEART Pathway for Early Discharge in Acute Chest Pain ☆

Identifies emergency department patients with acute chest pain for early discharge.

#### INSTRUCTIONS

Use in patients  $\geq 21$  years old presenting with symptoms suggestive of ACS. Do not use if new ST-segment elevation  $\geq 1$  mm or other new EKG changes, hypotension, life expectancy less than 1 year, or noncardiac medical/surgical/psychiatric illness determined by the provider to require admission.

When to Use ▾

Pearls/Pitfalls ▾

Why Use ▾

History

|                       |    |
|-----------------------|----|
| Slightly suspicious   | 0  |
| Moderately suspicious | +1 |
| Highly suspicious     | +2 |

EKG

1 point: No ST depression but LBBB, LVH, repolarization changes (ex: digoxin); 2 points: ST depression/elevation not due to LBBB, LVH, or digoxin

|                                         |    |
|-----------------------------------------|----|
| Normal                                  | 0  |
| Non-specific repolarization disturbance | +1 |
| Significant ST depression               | +2 |

Age

|           |    |
|-----------|----|
| <45       | 0  |
| 45-64     | +1 |
| $\geq 65$ | +2 |

Risk factors

Risk factors: HTN, hypercholesterolemia, DM, obesity (BMI  $>30$  kg/m<sup>2</sup>), smoking (current, or

|                       |   |
|-----------------------|---|
| No known risk factors | 0 |
|-----------------------|---|

0 points

HEART Pathway Score

Low risk

0.9–1.7% 30-day MACE

Repeat troponin at 3 hours and if negative, discharge home with outpatient follow-up.

Copy Results 📋

Next Steps ➞

#### About the Creator



Dr. Simon A. Mahler

#### Also from MDCalc...

##### Related Calcs

- [HEART Score](#)
- [GRACE ACS Score](#)
- [TIMI Risk Index](#)

#### You might be interested in...

##### Teaching Resources

- [The HEART Pathway: Bridging the Gap Between Operations, Research, and Education](#)  
Dr. Simon A. Mahler, HEART Pathway Creator
- [Groove is in the HEART Pathway](#)  
The Skeptics' Guide to EM
- [HEART PATHWAY for Cardiac Risk](#)  
EM One

#### Partner Content

Calculated Decisions: HEART Pathway  
mHealth in Emergency Medicine

#### Decision Aids

- [Chest Pain Choice Decision Aid](#)  
Mayo Clinic

## Step 3: Decision Aid

Decision aids, which are evidence-based tools **developed to educate and engage patients in decisions regarding their care**, have been shown to increase patient knowledge, decrease patient uncertainty related to feeling uninformed, increase patient engagement in decision making, and improve patient-provider communication.

Shared decision making should be made at the bedside using the appropriate visual tool.

## What's Next?

Prepared for: \_\_\_\_\_

### 1 Your Chest Pain Diagnosis

Your initial test results are **NEGATIVE for a heart attack**. These included:

- **Blood tests** to look for an enzyme called troponin that is released when the heart muscle is damaged. Additional troponin tests may be done to monitor you for heart attack during your emergency visit.
- **An electrocardiogram** to check whether your heart is getting enough oxygen and blood.

However, the chest pain you are experiencing today may be a **warning sign for a future heart attack**.

### 2 What You Can Do

**A STRESS TEST**, which views blood flow to your heart at rest and under stress, may be needed.

Examining your risk will help you and your clinician decide together whether or not you should have additional heart testing.

<sup>1</sup>Stress test options include nuclear stress testing, ultrasound stress testing, or exercise ECG (electrocardiogram) stress testing. Nuclear stress testing involves exposure to radiation which has been shown to be related to increased cancer risk over a lifetime. Your doctor can help you explore which option may be best for you.

### 3 Your Personal Risk Evaluation

Your risk of having a heart or pre-heart attack within the next 45 days can be determined by comparing you to people with similar factors<sup>2</sup> who also came to the Emergency Department with chest pain.

### 4 Would you prefer to have a stress test during this emergency visit or decide later during an outpatient appointment?

- ☐ I would like to have a **stress test during my emergency visit**. I realize that this may increase the cost of my care and/or lengthen my stay.
- ☐ I would like to be **seen by a heart doctor within 24-72 hours** and would like assistance in scheduling this appointment.
- ☐ I would like to **schedule an appointment on my own** to consult with my primary care physician.
- ☐ I would like my **Emergency Department doctor** to make this decision for me.

- <sup>2</sup>• Age
- Gender
  - Race
  - If chest pain is made worse when manual pressure is applied to the chest area
  - If there is a history of coronary artery disease
  - If the chest pain causes perspiration
  - Findings on electrocardiograms (electronic tracings of the heart)
  - Initial cardiac troponin result

Of every **100** people like you who came to the Emergency Department with chest pain...



**1** had a heart or a pre-heart attack within 45 days of their Emergency Department visit, **99** did not.



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Of every **100** people like you who came to the Emergency Department with chest pain...



**50** had a heart or a pre-heart attack within 45 days of their Emergency Department visit, **50** did not.

