**Background:** Cardiac risk scores have been developed to improve risk stratification of acute coronary syndrome (ACS) in patients presenting with chest pain at ED

**Aim:** Comparing performance of GRACE, HEART and TIMI scores in predicting ACS

**Methods:**

- **Design:** Stepped wedge cluster randomized trial: 1,827 usual care; 1,821 HEART care
- **Setting:** 9 Dutch hospitals, differing in size, patients, academic/non-academic
- **Patients:** Chest pain patients at the ED in the HEART care group
- **Risk score:** HEART score calculated at ED, GRACE and TIMI score retrospectively
- **Primary outcomes:** major adverse cardiac events (MACE) within 6 weeks
- We assessed 2 different scenarios, with fixed safety level of 95% or 98% sensitivity

**Results:**

- **Study population:**
  - 1,821 patients in HEART care period, of which 1,748 (96%) patients with risk scores calculated and follow-up
  - 54% male, mean age 62
  - MACE incidence 19%

- **AUCs:**
  - GRACE: 0.73 (95% CI: 0.70-0.76)
  - HEART: 0.86 (95% CI: 0.84-0.88)
  - TIMI: 0.80 (95% CI: 0.78-0.83)

**Scenario 1: sensitivity at least 95%**

<table>
<thead>
<tr>
<th>GRACE score</th>
<th>HEART score</th>
<th>TIMI score</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤73 points</td>
<td>≤3 points</td>
<td>0 points</td>
</tr>
<tr>
<td>340/1,748 (19.5%)</td>
<td>707/1,748 (40.5%)</td>
<td>430/1,748 (24.6%)</td>
</tr>
<tr>
<td>4.1% (14/340)</td>
<td>1.8% (13/707)</td>
<td>1.9% (8/430)</td>
</tr>
<tr>
<td>MACE, of which AMI 5</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>MACE, of which death 0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Negative predictive value (NPV) 0.96</td>
<td>0.98</td>
<td>0.97</td>
</tr>
</tbody>
</table>

**Scenario 2: sensitivity at least 98%**

<table>
<thead>
<tr>
<th>GRACE score</th>
<th>HEART score</th>
<th>TIMI score</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤67 points</td>
<td>≤2 points</td>
<td>-</td>
</tr>
<tr>
<td>243/1,748 (13.9%)</td>
<td>381/1,748 (21.8%)</td>
<td>-</td>
</tr>
<tr>
<td>2.5% (6/243)</td>
<td>0.8% (3/381)</td>
<td>-</td>
</tr>
<tr>
<td>MACE, of which AMI 1</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>MACE, of which death 0</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Negative predictive value (NPV) 0.98</td>
<td>0.99</td>
<td>-</td>
</tr>
</tbody>
</table>

**Conclusion:** At same fixed level of safety (e.g. at least 95% or 98% sensitivity), HEART score outperformed GRACE and TIMI score in discriminating between patients with and without ACS, and identified the largest group of low-risk patients.