AMIS Plus in Perspective with Other Large Registries

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Stadtspital Triemli Zürich
ACS Registries

- National Registries
  - AMIS Plus
  - PRAIS UK
  - RIKS HIA (Swedish Intensive Care Registry)

- Multinational Registries
  - European Heart Survey ACS
  - CRUSADE
  - NRMI (American Registry)
  - GRACE
AMIS Plus Registry

- AMIS Plus (Acute Myocardial Infarction in Switzerland) – national registry, observational study since 1997
  - 76 Swiss hospitals
  - 30,234 cases with AMI and UA
- Follow-up (started 2005)
  - Three months and one year
    » 3-month follow-up
      - Total available 4278/4456 (96%)
    » 12-month follow-up
      - Total available 3314/3423 (97%)
AMIS Plus Questionnaire

- Over 180 variables that include:
  - Demographics
  - Risk factors, symptoms
  - Immediate therapy
  - Laboratory parameters
  - Hospitalisation course and discharge treatment

- Since March 2005 long-term follow-up
  - 3-months
  - 12-months

March 09
To collect data on:

- Trends in epidemiology (including risk factors) in patients with acute coronary syndrome
- Diagnostic and therapeutic interventions during hospitalisation
- Compliance with guidelines
- Quality of treatment and outcome during hospitalisation
- Integration of new diagnostic and therapeutic interventions

...in order to optimize the care of patients with acute coronary syndrome.
ACS Registries

- AMIS Plus
- PRAIS UK
- RIKS HIA (Swedish Intensive Care Registry)

**Multinational Registries**
- European Heart Survey ACS
- CRUSADE
- NRMI (American Registry)
- GRACE
EURO Heart Survey – Acute Coronary Syndrome

- Patient enrollment:
  - Year 2000: 10484 patients
  - Year 2005: 6302 patients

- 65 Clusters of 103 tertiary and community hospitals from 25 member countries of the ESC.
CRUSADE Registry

CRUSADE: Quality Improvement Initiative

Promoting collaboration between ER physicians and cardiologists
400 US hospitals
2001-2003: > 200‘000 patients enrolled
Cardiac Risk Factors According to Age: Data from Crusade Registry

Circulation 2007;115:2549-69

N = 56 963
AMIS-Registry 1997-2004
Risk Factors in 11‘932 Patients With Acute Myocardial Infarction

![Bar Chart]

**Proportion of patients (%)**

- Age ≤ 50 years, n=1727
- Age 51-60 years, n=2515
- Age 61-70 years, n=2875
- Age 71-80 years, n=3134
- Age ≥ 81 years, n=1681

**Risk Factors:**
- Hypertension
- Hyperlipidemia
- Diabetes
- Smoking (current)
- Obesity
Nationale Registry of Myocardial Infarction (NRMI)

Large observational registry

> 1’600 US hospitals
demographic, procedural, therapeutic and outcome data
NSTEMI and STEMI
1994-2003 > 1 million patients enrolled.
Door-to-Balloon Time
C. P. Cannon et al. JAMA 2000;283:2941-2947

![Graph showing Door-to-Balloon Time with data points and error bars for different time intervals.]

- **No. of Patients**:
  - 0-60: 2230
  - 61-90: 5734
  - 91-120: 6616
  - 121-150: 4461
  - 151-180: 2627
  - >180: 5412

- **Multivariate OR**:
  - 0-60: 1.0
  - 61-90: 1.14
  - 91-120: 1.15
  - 121-150: 1.41
  - 151-180: 1.62
  - >180: 1.61

- **95% Cl**:
  - 0-60: 0.87-1.48
  - 61-90: 0.89-1.4
  - 91-120: 1.08-1.84
  - 121-150: 1.23-2.14
  - 151-180: 1.25-2.08

- **P Value**:
  - 0-60: .35
  - 61-90: .29
  - 91-120: .01
  - 121-150: <.001
  - 151-180: <.001
  - >180: <.001
GRACE: 80 Active Core Study
Sites: 16 Clusters in 13 Countries

58,866 cases enrolled
GRACE Registry

- GRACE is a large, ongoing, observational registry of patients with Acute Coronary Syndromes hospitalized in 94 hospitals in 14 countries across 4 continents (Europe, North & South America, Australia, New Zealand)

- First 10–20 consecutive cases per centre / month who present with qualifying symptoms PLUS evidence of CAD are included at referral centers (clustered with community hospitals)
GRACE Registry

- Random audit of all centres is taking place over a 3-year cycle, including 10% source data verification. Data are collected via e-CRF and independent data analysis is performed by the Center for Outcomes Research Research (COR, U Mass)

- The GRACE group has an impressive track record
  - 63 manuscripts published or in press and 109 abstracts presented
  - GRACE Risk Score is well validated and was incorporated in 2007 ESC Guidelines for treatment of NSTEMI
Increasing Need of Blood Transfusion With Increasing Age in ACS Patients With and Without PCI

Data from VIGOUR Trials, CRUSADE, GRACE and NRMI-2 Registry

Circulation 2007;115:2549-69
Management and 6-month outcomes in elderly and very elderly patients with high-risk non-ST-elevation acute coronary syndromes: The Global Registry of Acute Coronary Events

Gerard Devlin\(^1\)*, Joel M. Gore\(^2\), John Elliott\(^3\), Namal Wijesinghe\(^1\), Kim A. Eagle\(^4\), Álvaro Avezum\(^5\), Wei Huang\(^2\), and David Brieger\(^6\) for the GRACE Investigators

\(^1\)Department of Cardiology, Waikato Hospital, Hamilton, New Zealand; \(^2\)University of Massachusetts Medical School, Worcester, MA, USA; \(^3\)Christchurch School of Medicine, Christchurch, New Zealand; \(^4\)University of Michigan Medical Center, Ann Arbor, MI, USA; \(^5\)Dante Pazzanese Institute of Cardiology, São Paulo, Brazil; and \(^6\)Concord Hospital, Sydney, Australia

GRACE Registry 1999-2006
35'512 patients with NSTEMI/ACS

18'466 6 months follow-up data available = study population
56% young <70 years
44% older than 70 years,
27% elderly (70-80 years), 17% very elderly (>80 years)

Eur Heart J 2008
### Table 2  Inhospital management for high-risk patients with NSTE-ACS

<table>
<thead>
<tr>
<th>Treatment</th>
<th>&lt;70 years (n = 10 380)</th>
<th>70–80 years (n = 5057)</th>
<th>&gt;80 years (n = 3029)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspirin, n (%)</td>
<td>9838 (95)</td>
<td>4647 (92)</td>
<td>2739 (91)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Beta-blocker, n (%)</td>
<td>9021 (87)</td>
<td>4086 (81)</td>
<td>2404 (80)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Statin, n (%)</td>
<td>7196 (70)</td>
<td>3095 (61)</td>
<td>1552 (52)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>ACE-inhibitor/ARB, n (%)</td>
<td>6263 (61)</td>
<td>3204 (65)</td>
<td>1843 (61)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I MWH, n (%)</td>
<td>6441 (63)</td>
<td>3175 (63)</td>
<td>1721 (57)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Glycoprotein IIb/IIIa blocker, n (%)</td>
<td>3010 (29)</td>
<td>1102 (22)</td>
<td>441 (15)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Thienopyridine, n (%)</td>
<td>5575 (54)</td>
<td>2320 (46)</td>
<td>1163 (39)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Warfarin, n (%)</td>
<td>465 (4.6)</td>
<td>499 (10)</td>
<td>270 (9.1)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Nitrate, n (%)</td>
<td>8604 (83)</td>
<td>4274 (85)</td>
<td>2539 (84)</td>
<td>0.03</td>
</tr>
<tr>
<td>Calcium-channel blocker, n (%)</td>
<td>23/5 (23)</td>
<td>15/5 (32)</td>
<td>1005 (34)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Cardiac catheterization, n (%)</td>
<td>6926 (67)</td>
<td>2758 (55)</td>
<td>988 (33)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>PCI, n (%)</td>
<td>3924 (38)</td>
<td>1402 (28)</td>
<td>535 (18)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>CABG, n (%)</td>
<td>732 (7.2)</td>
<td>363 (7.3)</td>
<td>92 (3.1)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>
Swedish Registry on Cardiac Intensive Care (RiksHIA)
Proportion of Patients Undergoing Coronary Angiography

![Graph showing the proportion of patients undergoing coronary angiography from 1995 to 2005, categorized by gender and age group. The graph shows an upward trend in the proportion of angiography over the years.]
Swedish Registry on Cardiac Intensive Care (RiksHIA)

30-Day Mortality in STEMI According to Age and Gender

Andel 30-dagarsmortalitet

15%
20%
25%
30%


30-day Mortality

Women <65 y
Men <65 y
Women 65-74 y
Men 65-74 y
Women ≥ 75 y
Men ≥ 75 y

Courtesy S. James, SCAAR Registry
Age-Related Differences in the Use of Guideline-Recommended Medical and Interventional Therapies for Acute Coronary Syndromes: A Cohort Study

Andreas W. Schoenenberger, MD,∗ † Dragana Radovanovic, MD, ‡ Jean-Christophe Stauffer, MD, § Stephan Windecker, MD, ‖ Philip Urban, MD, # Franz R. Eberli, MD, ** Andreas E. Stuck, MD, * † Felix Gutzwiller, MD, DrPH, ‡ and Paul Erne, MD, † † for the Acute Myocardial Infarction in Switzerland Plus Investigators

AMIS Registry
11932 patients between 2001-2006

Surveys as sources to predict risk in NSTEMI and STEMI
TIMI Risk Score für ST-Hebungsinfarkte (STEMI)
Morrow DA et al. Circulation 2000;102;2031-37

- Entwickelt aus der InTIME II Datenbank: RCT lanoteplase vs. alteplase
- >15'000 Patienten mit ST-Hebungsinfarkt (STEMI) randomisiert
- 30d Mortalität = 6.7%
- Punktescore, aus 10 gewichteten Parametern berechnet
TIMI Risk Score for UA / Non-STEMI
Antmann EM et al. JAMA 2000; 284: 835-842

- Basierend auf zwei RCT von UFH vs. LMWH in UA / NSTEMI (TIMI 11b und ESSENCE)
- 7-Punkte Score aus 7 Risikofaktoren:
  1. Alter ≥65 Jahre
  2. ≥ 3 koronare Risikofaktoren
  3. Bekannte signifikante Koronarstenose
  4. ST-Streckensenkung im Eintritts-EKG
  5. ≥ 2 Anfälle von Angina in den letzten 24 Stunden
  6. Einnahme von Aspirin in den letzten 7 Tagen
  7. Erhöhte myokardiale Marker (Troponin, CK-MB) bei Eintritt

- Output: Risiko für Mortalität / MI / dringliche Revaskularisation innert 14 Tagen
GRACE ACS Risk Model

At Admission (in-hospital/to 6 months)

- Age: Years
- HR: bpm

At Discharge (to 6 months)

- Cardiac arrest at admission
- ST-segment deviation
- Elevated cardiac enzymes/markers

SBP: mmHg
Creat: μmol/l
CHF: Killip Class

Probability of Death
- In-hospital
- To 6 months

Death or MI

Calculator | Instructions | GRACE Info | References | Disclaimer
GRACE™ ACS Risk Model Beta Version

Announcing the new GRACE™ Risk Model for predicting 6-month death, and death/MI due to ACS (MI)

Download GRACE™ ACS Risk
- Features the original GRACE™ Risk Model for in-hospital death, and death/MI due to ACS (MI)
- Easy point-and-click interface
- Uses less than 60K of memory
- For educational purposes only
- Download and use free of charge

www.outcomes.org/grace
Treating physicians were asked to categorize their patients into low, intermediate, and high-risk groups on the basis of overall risk assessment of medical history (e.g. age), physical examination (e.g. heart failure or haemodynamic instability), and laboratory investigations (e.g. ST-segment deviation on ECG). This approach was similar to the American College of Cardiology/American Heart Association (ACC/AHA) and the European Society of Cardiology (ESC) consensus guidelines.1,2
Risikostratifizierung mit dem TIMI Score: für zeitgemäß behandelte Patienten ungenügend

<table>
<thead>
<tr>
<th>TIMI Risk Score for STEMI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Historical</strong></td>
</tr>
<tr>
<td>Age 65-74</td>
</tr>
<tr>
<td>Age ≥ 75</td>
</tr>
<tr>
<td>DM/HTN or angina</td>
</tr>
<tr>
<td><strong>Exam</strong></td>
</tr>
<tr>
<td>SBP &lt; 100</td>
</tr>
<tr>
<td>HR &gt; 100</td>
</tr>
<tr>
<td>Killip II-IV</td>
</tr>
<tr>
<td>Weight &lt; 67kg</td>
</tr>
<tr>
<td><strong>Presentation</strong></td>
</tr>
<tr>
<td>Anterior STE or LBBB</td>
</tr>
<tr>
<td>Time to rx &gt; 4 hrs</td>
</tr>
<tr>
<td>Risk Score = Total</td>
</tr>
</tbody>
</table>

Morrow et al. *Circulation* 2000;102:2031

Kurz et al. *Eur Heart J* 2006;27:10 (abstract)
Validated risk prediction scores for ACS mortality:
AMIS model, GRACE score, TIMI risk score

<table>
<thead>
<tr>
<th>AMIS Model</th>
<th>GRACE score</th>
<th>TIMI Risk Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. age</td>
<td>1. age</td>
<td>1. age</td>
</tr>
<tr>
<td>2. Killip class</td>
<td>2. Killip class</td>
<td>2. Killip class</td>
</tr>
<tr>
<td>3. systolic BP</td>
<td>3. systolic BP</td>
<td>3. systolic BP</td>
</tr>
<tr>
<td>4. heart rate</td>
<td>4. heart rate</td>
<td>4. heart rate</td>
</tr>
<tr>
<td>5. prehospital CPR</td>
<td>5. prehospital CPR</td>
<td>5. Weight &lt;67kg</td>
</tr>
<tr>
<td>7. history of stroke / cerebrovascular disease</td>
<td>7. ST-segment deviation</td>
<td>7. hypertension</td>
</tr>
<tr>
<td></td>
<td>8. Elevated myocardial markers</td>
<td>8. history of angina</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9. LBBB or anterior MI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10. time to treatment</td>
</tr>
</tbody>
</table>

Model-Output: Risk of hospital death (%)
The AMIS Plus national registry collects data on acute myocardial infarction, unstable angina, and other cardiovascular events. The data gathered are important for assessing clinical practice, investigating patient group variability, and enhancing clinical practice through continuous quality improvement.

**AMIS Model**

- Age
- Systolic Blood Pressure
- Heart Rate
- Killip Classification
- Pre-hospital cardio pulmonary resuscitation
- History of heart failure
- History of cerebrovascular disease / stroke

*Fill in 0 for no, 1 for yes*

**Prediction Result**

- Predicted Mortality Risk

Submit Form

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Validierung des AMIS Modells

Diskrimination: ROC Kurve

- Alle Patienten im AMIS Register Juni 2005 - Juli 2006 (n = 2854)
- AUC = 0.868
Präzision der Vorhersage mit verschiedenen Scores

alle ACS Patienten im AMIS-Plus Register Juni 2005 - Juli 2006
n = 2854
Spitalmortalität 5.5%
The Krakow (Malopolska) ACS Cohort

- Selectively included patients treated with a non-invasive strategy in 29 hospitals in the greater Krakow area (Poland)
- Inclusion time frame: 2002 - 2006
- 2635 patients
- Hospital mortality 7.6%
- Due to the ability of the AMIS model to cope with missing data: analysis of the complete cohort without exclusions
Performance of the AMIS Model in the Krakow ACS Cohort

- **AMIS model**: AUC = 0.842
- **TIMI STEMI**: AUC = 0.724
- **TIMI Non-STE-ACS**: AUC = 0.698
Summary I

◆ AMIS Data Collection:
  – Prospective inclusion of all patients with ACS in participating hospitals
  – Comparable to other large national registries eg. RIKS-HIA
  – Different to point in time observance of European Heart Survey, CRUSADE etc.
  – Different to selective inclusion in GRACE registry
Summary II

❄ AMIS Datas Set (>180 Variables)
  – Comparable to leading registries eg. GRACE
  – Allows reliable and comparative analysis of specific variables e.g. age, gender, diabetes
  – Allows establishment of very robust risk score

❄ AMIS Follow-up
  – Different to national registries (usually no follow-up)
  – Comparable to GRACE