“How to improve the quality of data collection?”

BACTS Database Committee

BSW may 3, 2008
The Proces of Datacollection

• Standardised registry
  – Aggregated dataset
  – Categorical/continuous variables
  – Definitions of datafields
  – Export specifications

• Datacollection
  – Centre wide, nation wide
  – Validation of data

• Data import and datamerging

• Data analysis and reporting
  – Value and limitations of risk models
  – In-hospital mortality and quality of care
  – Quality indicators
  – Public reporting
National registry

• Accuracy
  – Data descriptions
  – Precision

• Completeness
  – Patients: no “missing” fields
  – Centrum wide: all patients
  – Nation wide: all centres

Validation of the quality of the data
STS database: golden standard

• Adult cardiac surgery database
  – Started 1990
  – 848 participating sites
  – >3 000 000 procedures
  – Outcome analysis
  – Risk stratification models

• Congenital heart surgery database

• General thoracic surgery database
STS database: golden standard

- Well defined dataset (384 fields)
- Data and software specifications (v2.61)
- Tool for outcome analysis and quality improvement
- Risk stratification models
STS database: golden standard?

• Limitations
  – Incomplete
    • 60 à 70 % of centres
  – No on-site audit
    • Accuracy
    • Completeness
  – Observation intervall to short
    • Hospital stay
    • 30 day mortality
Periprocedural mortality

• STS operative death
  – In-hospital mortality: unlimited in time
  – 30 days

<table>
<thead>
<tr>
<th>Field Name:</th>
<th>Mort-Op Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Name:</td>
<td>MitOpD</td>
</tr>
<tr>
<td>Definition:</td>
<td>Indicate whether the patient had an operative mortality. Includes both (1) all deaths occurring during the hospitalization in which the operation was performed, even if after 30 days, and (2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure unless the cause of death is clearly unrelated to the operation.</td>
</tr>
<tr>
<td>Harvest Coding:</td>
<td>1 = Yes  2 = No</td>
</tr>
<tr>
<td>Valid Data:</td>
<td>Yes; No</td>
</tr>
<tr>
<td>Format:</td>
<td>Text (categorical values specified by STS)</td>
</tr>
<tr>
<td>Data Source:</td>
<td>User</td>
</tr>
</tbody>
</table>

STS Adult Cardiac Data Specifications  August 24, 2007  Version 2.61
Eacts Congenital Database

Verified Centers

Scheduled for 2008 (Data of 2007)

1. Klinik für Herz- und Gefäßchirurgie - Deutsches Herzzentrum München, Germany
2. Klinik der Kardiochirurgie, Herzzentrum Leipzig, Germany
3. Deutsches Kinderherzzentrum - Asklepios Klinik Sankt Augustin GmbH St. Augustin, Germany
4. Cardio-Thoracic Surgery Department AKH - Medical University of Vienna, Austria
5. Pediatric Cardiothoracic Surgery - Wilhelmina Children’s Hospital, Utrecht, Netherlands

Data of Year 2006

1. Klinik für Herz- und Gefäßchirurgie - Deutsches Herzzentrum München, Germany
2. Pediatric Cardiac Surgery - University Children’s Hospital, Zürich, Switzerland
3. Department for Paediatric Cardiothoracic Surgery - The Children’s Memorial Health Institute, Warsaw, Poland
4. Deutsches Kinderherzzentrum - Asklepios Klinik Sankt Augustin GmbH St. Augustin, Germany
5. Department for Paediatric Cardiothoracic Surgery - Polish Mother’s Health Centre - Research Institute, Lodz, Poland
Eacts Congenital Database

Data verification results

Source Data Verification

(data of 2003 - 2006)

No of verified procedures: 5,892

No of all collected procedures for 2003 - 2006: 32,270
Verified procedures: 5,892 = 18.26% for 2003 - 2006
and 10.98% of all procedures in Database

Verification results

<table>
<thead>
<tr>
<th>Procedures</th>
<th>N - 5,810</th>
<th>N - 5,892</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter</td>
<td>Before verification</td>
<td>After verification</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>Std dev</td>
</tr>
<tr>
<td>age (y)</td>
<td>22.22</td>
<td>40.33</td>
</tr>
<tr>
<td>aor Tear (mm)</td>
<td>52.41</td>
<td>47.36</td>
</tr>
<tr>
<td>cph Tear (mm)</td>
<td>104.53</td>
<td>70.78</td>
</tr>
<tr>
<td>los (d)</td>
<td>15.44</td>
<td>10.83</td>
</tr>
<tr>
<td>weight (kg)</td>
<td>16.18</td>
<td>22.44</td>
</tr>
</tbody>
</table>
EACTS

Third Eacts Database Report
The European Association for Cardio-Thoracic Surgery
Adult Cardiac Surgical Database

**Unique patient identifier**

**Date-of-birth**

**Gender**

- Male
- Female
- Unknown

**Initial registry data**

**Hospitalisation**

**Country code**

**Hospital code**

**Date-of-admission**

**Date-of-operation**

**Date-of-discharge / Date-of-death**

<table>
<thead>
<tr>
<th>Cardiac history</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Angina (CCI class)</strong></td>
</tr>
</tbody>
</table>
| CCS 0
| CCS 1
| CCS 2 |
| CCS 3
| CCS 4 |

<table>
<thead>
<tr>
<th><strong>Dyspnoea (NYHA grade)</strong></th>
</tr>
</thead>
</table>
| NYHA 1
| NYHA 2 |
| NYHA 3
| NYHA 4 |

<table>
<thead>
<tr>
<th><strong>Number of previous myocardial infarctions</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
</tr>
<tr>
<td>One</td>
</tr>
<tr>
<td>Two or more</td>
</tr>
<tr>
<td>Unknown</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Most recent myocardial infarction</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>No MI</td>
</tr>
<tr>
<td>&lt; 6 hours before operation</td>
</tr>
<tr>
<td>6-24 hours before operation</td>
</tr>
<tr>
<td>1-7 days before operation</td>
</tr>
<tr>
<td>8-21 days before operation</td>
</tr>
<tr>
<td>22-90 days before operation</td>
</tr>
<tr>
<td>&gt;90 days before operation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Congestive heart failure</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
</tr>
<tr>
<td>Yes</td>
</tr>
</tbody>
</table>

**Previous Interventions**

<table>
<thead>
<tr>
<th><strong>Previous PCI</strong></th>
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</thead>
<tbody>
<tr>
<td>No PCI</td>
</tr>
<tr>
<td>PCI &lt;24 hours before surgery</td>
</tr>
<tr>
<td>PCI &gt;24 hours before surgery: same admission</td>
</tr>
<tr>
<td>PCI &gt;24 hours before surgery: previous admission</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Date of last PCI</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>dd/mm/yyyy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Previous cardiac, vascular or thoracic surgery</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
</tr>
<tr>
<td>CAB</td>
</tr>
<tr>
<td>Valve</td>
</tr>
<tr>
<td>Other</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Date of last cardiac surgery</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>dd/mm/yyyy</td>
</tr>
</tbody>
</table>

This form is laid out so that questions requiring a single response are identified by round radio buttons next to the options. Where questions where more than one response may be selected are identified by square tick boxes next to the options.
Third Eacts Database Report
Datacollection in Belgium

• Minimal dataset
Datacollection in Belgium

- Minimal dataset
  - Procedural description

- Extended dataset
  - Euroscore risk factors
  - Diabetes
  - Length / Weight
  - Incision
The process of data collection in Belgium: more numbers

**Number of participating centres in Belgium**

### CARDIAC SURGERY IN NUMBERS (ROYAL DECREE)

<table>
<thead>
<tr>
<th></th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reporting center</strong></td>
<td>27</td>
<td>28</td>
<td>29</td>
<td>29</td>
<td>29</td>
<td>28</td>
</tr>
<tr>
<td><strong>Cardiac operations</strong></td>
<td>11437</td>
<td>12773</td>
<td>13635</td>
<td>13694</td>
<td>12920</td>
<td>12876</td>
</tr>
</tbody>
</table>
Datacollection in Belgium

• Minimal dataset
  – Obligatory: Federal law
  – 29/29 centres (28)
  – 100% complete

• Extended dataset
  – Voluntary
  – 18 centres, 50% of procedures.

- Descriptive terms and identifying codes for reporting medical services and procedures
- Uniform language
  - Administrative management
  - Medical education and outcomes
  - Health insurance programs
CPT:
Current Procedural Terminology

- Codes and descriptions: accurate
- A lot of information in one code
- Yearly update: new procedures - new codes
- Easy to adapt the registration without changing the registry
CPT problems

• Many codes
• Coding errors
  – VSR (33545) and VSD (33681)
  – Venous graft without arterial graft (33510-33516)
• Unlisted procedures
• Analysis difficult
Isolated CABG

• Inclusion: All cabg codes
  – 33510-33523, 33533-33536

• Possible with
  – 33530: redo
  – 33508: ESVH
  – 35600: radial artery
  – 33967-33973: IABP codes
  – 33572: coronary endarterectomy

• Exclusion of valve codes, etc. …
“Other” Code

- Code 33999: unlisted cardiac procedure
  - Unlisted
  - Best match:
    - SVR - DOR: recently 33548, before 33542 ("myocardial resection")
    - Resuscitation with ECC: 33960 “ECMO” Code (Prolonged extracorporeal circulation for cardiopulmonary insufficiency)
    - Pfo closure: 33641 ("repair atrial septal defect")
    - “Maze Procedures”: 33253
“Other” Code

• Concommittant non cardiac procedures
  – Lobectomy, carotid artery thromboendarterectomy, femoral artery pseudoaneurysm

• Irrelevant codes:
  – Exclusion atrial appendage, closure PFO, ESVH
Frequent coding problems

• Different code for venous graft only or in venous graft in combination with arterial graft
  – 33533,33510       ----  33533,33517
  – 33405,33517       ----  33405,33510

• Each operation is a new entry (line)
  – 33533,33518,35820

  – 33533,33518
  – 35820
Coding problems

Number Isolated Aortic replacements - by center
(n= 1126) 2005

Cpt-codes:
33405 = AVR other than homograft or stentless
33406 = AVR with homograft
33410 = AVR with stentless valve
New registry: based on EACTS

### Procedure group
- CAB
- Valve
- CAB & valve
- CAB & other
- Valve & other
- CAB & valve & other
- Other

### Other cardiac procedures detail
- None
- Left ventricular aneurysm repair
- Ventricular septal defect repair
- Atrial septal defect repair
- Batista
- SVR
- Congenital
- Transmyocardial laser revascularisation
- Cardiac trauma
- Cardiac transplant
- Permanent pacemaker
- AICD
- Other

### Other non-cardiac procedures detail
- None
- Aorta
- Other thoracic
- Carotid endarterectomy
- Other vascular
New registry: based on EACTS

- CPT: Code 33533
  - Cabg
  - 1 distal
  - Arterial graft
- Pilot project
  - Fall 2008
  - Webbased entry
BACTS National Registry

• **Report 2006**
  – Activity of cardiac surgeons in Belgium
    • Focus on Cardiac operations
    • Non-cardiac operations: LTX
  – Congenital / Adult
    • >16 years

• **Royal Decree (15 July 2004 en 1 Aug 2006)**
  • 229014-229025, 229036-229040, 229051-229062, 229073-229084, 229272-229283, 229515-229526, 229530-229541, 229552-229563, 229574-229585, 229596-229600, 229611-229622 and 229633-229644, **239072-239083 and 239094-239105**
Cardiac operations according to RD

- 229014-229025N1890 heart or great vessels, with ECC
- 229036-229040N850 open heart, hypothermia
- 229051-229062N750 instrumental or digital valvulotomy/commissurotomy
- 229073-229084N700 cardiac wounds
- 229272-229283N1600 aortaresection with temporary bypass
- 229515-229526N2700 more than one valve
- 229530-229541N3000 ECC <20°C
- 229552-229563N3000 ECC <2 years old
- 229574-229585N2250 CABG: two or more mammary arteries
- 229596-229600N2100 1 valve
- 229611-229622N1890 arterial revascularasation
- 229633-229644N1890 OPCAB
- 239072-239083N450 IABP
- 239094-239105N350 removal IABP
Quality improvement

• Bacts website
  – Datadesciptions, export format
  – Cpt codes
  – Faq
• Error report
• Analysis: Revision of all groups and subgroups
• Site visits?
FREQUENTLY ASKED QUESTIONS

Home » BACTS Database » Datamangers Section

Old Codes - Replaced by ...

<table>
<thead>
<tr>
<th>Old</th>
<th>Description</th>
<th>Replaced by</th>
</tr>
</thead>
<tbody>
<tr>
<td>93536</td>
<td>percutaneous approach IABP</td>
<td>33967</td>
</tr>
<tr>
<td>33247</td>
<td>insertion of a transvenous electrode; single chamber (one electrode)</td>
<td>33216</td>
</tr>
<tr>
<td></td>
<td>permanent pacemaker of single chamber pacing cardioverter-defibrillator</td>
<td></td>
</tr>
</tbody>
</table>

Which code should I use to report:

1) ATRIAL APPENDAGE LIGATION (validated by DB Committee)
Datamangers Section

- Home
  - Participating Centers
  - CPT-codes
  - FAQ/Old CPT-codes - Replaced by ...
  - Datafiles Format 2006
    - Data collection
    - CPT codes registry and full data set
    - Valve coding
    - Operation Form
  - Newsletters
    - December, 2007
    - October, 2007
    - January, 2006
Error report

- Out of range
  - Age
  - Length
  - weight
Error report

- Double patients

<table>
<thead>
<tr>
<th>Obs.</th>
<th>CENTER</th>
<th>patient</th>
<th>SEX</th>
<th>DATE</th>
<th>BIRTH</th>
<th>CPT1</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>UIA</td>
<td>2420</td>
<td>M</td>
<td>30JAN06</td>
<td>27SEP46</td>
<td>33971</td>
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<tr>
<td>2</td>
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<td>M</td>
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<tr>
<td>3</td>
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<td>2696</td>
<td>M</td>
<td>12MAY06</td>
<td>16MAY30</td>
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<tr>
<td>4</td>
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<td>2696</td>
<td>M</td>
<td>13MAY06</td>
<td>16MAY30</td>
<td>35820</td>
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<tr>
<td>5</td>
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<td>21750</td>
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<tr>
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<td>F</td>
<td>26JUN06</td>
<td>11OCT55</td>
<td>21750</td>
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<tr>
<td>7</td>
<td>UIA</td>
<td>2736</td>
<td>M</td>
<td>13JUN06</td>
<td>16JUN35</td>
<td>33971</td>
</tr>
<tr>
<td>8</td>
<td>UIA</td>
<td>2736</td>
<td>M</td>
<td>20JUL06</td>
<td>16JUN35</td>
<td>33971</td>
</tr>
<tr>
<td>9</td>
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<tr>
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<tr>
<td>11</td>
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<td>05JUL46</td>
<td>35820</td>
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<tr>
<td>12</td>
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<td>2990</td>
<td>M</td>
<td>02OCT06</td>
<td>05JUL46</td>
<td>35820</td>
</tr>
</tbody>
</table>
Error report

• Combination of CPT codes
### Evolution Valvular operations - valve only (in years)

<table>
<thead>
<tr>
<th></th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aortic</td>
<td>2023</td>
<td>2289</td>
<td>2247</td>
<td>2230</td>
</tr>
<tr>
<td>mitral</td>
<td>3230</td>
<td>3271</td>
<td>1360</td>
<td>1160</td>
</tr>
<tr>
<td>tricuspid</td>
<td>46</td>
<td>58</td>
<td>54</td>
<td>52</td>
</tr>
<tr>
<td>pulmonary</td>
<td>18</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>aorte-mitral</td>
<td>281</td>
<td>266</td>
<td>266</td>
<td>257</td>
</tr>
<tr>
<td>aorte-tric</td>
<td>27</td>
<td>10</td>
<td>24</td>
<td>31</td>
</tr>
<tr>
<td>mitro-tric</td>
<td>158</td>
<td>150</td>
<td>265</td>
<td>250</td>
</tr>
<tr>
<td>tri-pulm</td>
<td>6</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>aorta-mitral-tric</td>
<td>49</td>
<td>50</td>
<td>84</td>
<td>62</td>
</tr>
<tr>
<td>Total</td>
<td>3916</td>
<td>4125</td>
<td>4051</td>
<td>4063</td>
</tr>
</tbody>
</table>

### Evolution - type of operation valve only (in years)

<table>
<thead>
<tr>
<th></th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>monovalvular</td>
<td>3301</td>
<td>3618</td>
<td>2487</td>
<td>3447</td>
</tr>
<tr>
<td>bivalvular</td>
<td>466</td>
<td>447</td>
<td>495</td>
<td>539</td>
</tr>
<tr>
<td>trivalvular</td>
<td>49</td>
<td>52</td>
<td>51</td>
<td>58</td>
</tr>
<tr>
<td>Total</td>
<td>3816</td>
<td>4115</td>
<td>4033</td>
<td>4047</td>
</tr>
</tbody>
</table>
Coronary Procedures (CABG):
If one of the CPT codes is between 33510 and 33523, or between 33533 and 33536, then this is called a Coronary Procedure (CABG).
If this condition is valid and the age is strictly less than 16 years, this is called a Coronary Procedure in Children (CABG_kind).
If this condition is valid and the age is above or equal to 16 years, this is called a Coronary Procedure in Adults (CABG_volw).
BACTS datafile: 
Definition of groups

Valve Procedures (VALVE):
If AVP or MVP or TVP or PVP is valid then the procedure is called a valve (VALVE).

Aortic Valve Procedures (AVP):
If one of the CPT codes has a value between 33400 and 33413, then this is called an Aortic Valve Procedure (AVP).
If this condition is valid and the age is strictly less than 16 years, this is called an Aortic Valve in Children (AVP_kind).
If this condition is valid and the age is above or equal to 16 years, this is called an Aortic Valve in Adults (AVP_valw).
Note that CPT codes 33414 till 33417 are not included in this classification.

Mitral Valve Procedures (MVP):
If one of the CPT codes has a value between 33420 and 33430 then this is called a Mitral Valve Procedure (MVP).
If this condition is valid and the age is strictly less than 16 years, this is called a Mitral Valve in Children (MVP_kind).
If this condition is valid and the age is above or equal to 16 years, this is called a Mitral Valve in Adults (MVP_valw).
Quality improvement of report

- Definition of all groups and subgroups
- Regenerate all tables and plots
- Specification and description of all tables
Conclusion

• Completeness and Accuracy
• Quality improvement
  – Website
  – Error report
  – Revision of annual report
  – Site visits