UKHVR WEB APP

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Background

- UK Heart Valve Registry initiated in 1986
- Funding withdrawn in 2004
- National Adult Cardiac Surgery Adult Cardiac Audit registry has been collecting clinical data including implant data
Initial idea
(Pl: Mr Joel Dunning*, Middlesborough)

• What are the short-term failure rates of prosthetic valves?
• Are any rates significant after adjustment for other variables?

*Email: joeldunning@doctors.org.uk
Lessons learned
Going one step further

• How does mid-term survival differ between valves?
• Are patient characteristics similar?
• What are the market share trends?... by bovine?... by porcine?
“I think a focus on transparency isn’t just a philosophical or ideological gimmick; it is a necessary progression. I see it this way. The future of healthcare is going to be driven by three forces: the first is economics; the second is public expectations; and the third is technology. [...] It is about putting more data and raw data out into the public domain for others to process and present.”

Sir Professor Bruce Keogh
NHS Medical Director
7 July 2011
Why has this not happened before?

What some believe national registry data looks like
Data wrangling

- All AVRs between April 1998 - March 2012
- Mapped >8000 entries to ~100 valves
- 160 other variables preprocessed
- Exclude: missing implant data (11.2%); non-valve implants (0.6%); unmatched or overmatched data (4.2%)
- Total of 87,423 AVRs
The UKHVR Web App

Built with:

Compliant with Chrome, Safari, Internet Explorer 10, iOS (iPad)
Summary

• The data exists and is useable (and growing!)
• Powerful front-ends can inform all stakeholders
• Transparency drives improvements in quality
Availability

• Still in development

• Requires work: MVRs, rings, failure module, pathology + haemodynamic data

• Requires data validation

• Requires joint SCTS and NICOR approval
Questions?

Some other apps you might also be interested in...

Blue Book Online
Available now: bluebook.scts.org
Coming soon to iOS & web
In case app fails...
The data

Clinical registries are quite messy; however, when it came to the SCTS registry implant data, there were over 8000 different entries for about 100 aortic valve implants! This is because the data is collected inconsistently by two free-text fields per valve. We developed an algorithm that maps all available implant data to a known valve brand (i.e. manufacturer) and model. Sometimes we could only match a brand, but not a (complete) model; these are listed as unknown or partially known valves.

We included all records where there was evidence of AVR occurring between 1st April 1998 and 31st March 2012. It was also necessary to exclude a small number of records. Our exclusion criteria were:

- Fully missing implant data
- Missing discharge status
- Missing NHS number
- Within admission reoperations
- Completely unmatchable data
- Records that matched to multiple brands and/or models
- Mitral valves (sometimes surgeons do actually use MVs in the AV position, but it is rare and there is no definitive way of knowing if a transcriptional error or not)
- Homografts or autografts
- Rings, TAVIs or conduits without valves

In total, this app holds data on 87,423 AVR implants, with an expected further ~10,000 per year. About 1% of records had a recorded implant type that contradicted the valve model. After careful consideration, we gave priority to the derived implant type from the recorded model.

Feedback

Author
Graeme Hickey
Biostatistician
Academic homepage
Contact me

Advisor
Joel Dunning
Cardiac surgeon
Homepage
Contact me

Advisor
Ben Bridgewater
Cardiac surgeon
Homepage
Contact me
SCTS UK Heart Valve Registry Tool v0.6.5

Implant variables

- **Implant type**
  - All
  - Biological
  - Mechanical

- **Implantation date range (financial years beginning)**
  - 1998
  - 2001
  - 2011

- **Brand**
  - ALL

- **Show overall market share by:**
  - Brand
  - Model

Clinical variables

- **Age at operation (years)**
  - 18
  - 60
  - 110
## Implant variables

### Implant type
- [ ] All
- [ ] Biological
- [x] Mechanical

### Implantation date range (financial years beginning)
- [ ] 1998
- [ ] 2001
- [ ] 2011

### Brand
- ALL

## Clinical variables

### Age at operation (years)
- [ ] 18
- [ ] 60
- [ ] 110

### Logistic EuroSCORE (%)
- [ ] 0
- [ ] 100

## Clinical variables

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
<th>Type</th>
<th>Number of implants</th>
<th>First recorded implant</th>
<th>Last recorded implant</th>
</tr>
</thead>
<tbody>
<tr>
<td>BJORK SHILEY</td>
<td>MONOSTRUT VALVE GRAFT</td>
<td>Mechanical</td>
<td>9</td>
<td>2001</td>
<td></td>
</tr>
<tr>
<td>EDWARDS LIFESCIENCES</td>
<td>DUROMEDICS DM-9120</td>
<td>Mechanical</td>
<td>4</td>
<td>2002</td>
<td></td>
</tr>
<tr>
<td>EDWARDS LIFESCIENCES</td>
<td>MIRA 3600</td>
<td>Mechanical</td>
<td>133</td>
<td>2001</td>
<td></td>
</tr>
<tr>
<td>EDWARDS LIFESCIENCES</td>
<td>STARR EDWARDS</td>
<td>Mechanical</td>
<td>59</td>
<td>2001</td>
<td></td>
</tr>
<tr>
<td>EDWARDS LIFESCIENCES</td>
<td>UNKNOWN (EDWARDS)</td>
<td>Mechanical</td>
<td>21</td>
<td>2001</td>
<td></td>
</tr>
<tr>
<td>MEDTRONIC</td>
<td>ADVANTAGE BILEAFLET A7760</td>
<td>Mechanical</td>
<td>60</td>
<td>2002</td>
<td></td>
</tr>
<tr>
<td>MEDTRONIC</td>
<td>ATS (UNIDENTIFIED SUB-MODEL)</td>
<td>Mechanical</td>
<td>543</td>
<td>2001</td>
<td></td>
</tr>
<tr>
<td>MEDTRONIC</td>
<td>ATS AORTIC CONDUIT 502AG</td>
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<td>62</td>
<td>2001</td>
<td></td>
</tr>
<tr>
<td>MEDTRONIC</td>
<td>ATS OPEN PIVOT 500FA</td>
<td>Mechanical</td>
<td>832</td>
<td>2001</td>
<td></td>
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<tr>
<td>MEDTRONIC</td>
<td>ATS OPEN PIVOT 501DA AP</td>
<td>Mechanical</td>
<td>153</td>
<td>2001</td>
<td></td>
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<tr>
<td>MEDTRONIC</td>
<td>ATS OPEN PIVOT 505DA AP360</td>
<td>Mechanical</td>
<td>28</td>
<td>2007</td>
<td></td>
</tr>
</tbody>
</table>

Note that the first and last recorded implant dates are for the selected subset of data. They do not reflect the first and last actual implant dates in the UK.
Like all data, valve sizes are subject to recording errors. However, transcriptional error rates are quite small. We have reported these valve sizes as they are recorded in the registry. If you represent a medical device company and believe this data to be erroneous, please contact the app author.
Implant variables

Implant type
- All
- Biological
- Mechanical

Xenograft
- All
- Bovine
- Porcine
- Equine

Implantation date range (financial years beginning)
- 1998
- 2001
- 2011

Brand
- ALL

Stratify on model?

Clinical variables

Age at operation (years)
- 18
- 60
- 110

Logistic EuroSCORE (%)

- 23 observations deleted due to missingness

<table>
<thead>
<tr>
<th>time</th>
<th>n.risk</th>
<th>n.event</th>
<th>survival</th>
<th>std.err</th>
<th>lower 95% CI</th>
<th>upper 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>26486</td>
<td>3124</td>
<td>0.899</td>
<td>0.00172</td>
<td>0.896</td>
<td>0.902</td>
</tr>
<tr>
<td>5</td>
<td>10709</td>
<td>3311</td>
<td>0.742</td>
<td>0.00292</td>
<td>0.737</td>
<td>0.748</td>
</tr>
<tr>
<td>10</td>
<td>894</td>
<td>2112</td>
<td>0.463</td>
<td>0.00630</td>
<td>0.451</td>
<td>0.475</td>
</tr>
</tbody>
</table>
Implant variables

Implant type
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Implantation date range (financial years beginning)
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Brand
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Stratify on model?

Models(s)
- PERIMOUNT 2900 (UNDER MAGNA)
- PERIMOUNT MAGNA 3000
- PERIMOUNT MAGNA EASE W1
- PERIMOUNT MAGNA WITH THE

Hint: To select more than one model hold down the CTRL button on your keyboard (command [cmd] button for Apple Mac) each time you click on a model.

Clinical variables

Age at operation (years)

Survival probability

Log-rank P < 0.001

Time from procedure (years)

7 observations deleted due to missingness

<table>
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<th>n.risk</th>
<th>n.event</th>
<th>survival</th>
<th>std.err</th>
<th>lower 95% CI</th>
<th>upper 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>719</td>
<td>69</td>
<td>0.917</td>
<td>0.00959</td>
<td>0.898</td>
<td>0.936</td>
</tr>
<tr>
<td>5</td>
<td>409</td>
<td>71</td>
<td>0.808</td>
<td>0.01491</td>
<td>0.779</td>
<td>0.838</td>
</tr>
</tbody>
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