The Victorian Cardiac Outcomes Registry: Improving clinical care in real time

28th July 2017
A/Prof Jeff Lefkovits
Safety and Quality in Health Care

Delivery of high-quality clinical care

Clinical quality registries

Health services
Dept of Health
Minister
Clinical networks

ACQSHC
CSANZ
NHF
AHPRA
NHPA
AIHW
MBS

state
federal
Scope of VCOR

- public and private
- outcomes reporting hospital-based (not operator-based)
- limited number of key performance indicators
- multiple modules
  - PCI
  - acute management of STEMI (regional Victoria)
  - heart failure
  - arrhythmias
Cardiovascular procedures in Victoria

Number of procedures (CABG, angiograms and PCI)

Per 1,000 population

- Singapore: 3.6
- Victoria: 6.5
- Queensland: 9.5
- Lothian: 6.4
- Pais Vasco: 3.1
- Private data: Calculated on age-standardized data per 1,000 population

High rates of procedures, especially in private sector

? Appropriateness

SOURCE: Member data; LSN analysis
Registry activities

- Quarterly site reports
- Annual report
- Special reports

- 3 monthly committee meetings (3 separate committees)
- Regular data manager meetings
- Separate PI meetings for other modules – STEMI, HF
Procedures by clinical presentation for public and private hospitals

Public:
- Non-ACS: 34%
- STEMI: 30%
- NSTE-ACS: 36%
- n=6,216

Private:
- Non-ACS: 67%
- STEMI: 8%
- NSTE-ACS: 25%
- n=3,776
Trends in Practice

In-hospital mortality (2013-2016)

- All PCI patients
- All (excl. STEMI & shock/OHCA)
- STEMI patients
- Shock/OHCA only

Year:
- 2013
- 2014
- 2015
- 2016
Trends in Practice

Trends in selected lesion subsets

- Left Main Coronary Artery
- Multivessel PCI
- In-stent Restenosis
- Chronic Total Occlusion

Categorization:
- 2013
- 2014
- 2015
- 2016

% Cases
Example of interrelationship between trend analysis, benchmarking and research
# Trends in Practice

## In-hospital major bleeding (2016)

<table>
<thead>
<tr>
<th>Sub-group</th>
<th>N</th>
<th>Major bleeding rate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clinical Presentation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STEMI</td>
<td>2160</td>
<td>46 (2.1)</td>
</tr>
<tr>
<td>NSTE-ACS</td>
<td>3138</td>
<td>30 (1.0)</td>
</tr>
<tr>
<td>Non-ACS</td>
<td>4668</td>
<td>19 (0.4)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>7633</td>
<td>56 (0.7)</td>
</tr>
<tr>
<td>Female</td>
<td>2333</td>
<td>69 (1.7)</td>
</tr>
<tr>
<td><strong>Arterial Access Route</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radial access</td>
<td>5508</td>
<td>30 (0.5)</td>
</tr>
<tr>
<td>Femoral access</td>
<td>4444</td>
<td>65 (1.5)</td>
</tr>
<tr>
<td>Brachial access</td>
<td>14</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Total</td>
<td>9966</td>
<td>95 (1.0)</td>
</tr>
</tbody>
</table>
Radial artery access

Public

Private

2016 annual report
Prevalence and outcomes of trans-radial access for percutaneous coronary intervention in contemporary practise

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A R T I C L E   I N F O

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Keywords:
Percutaneous coronary intervention
Trans radial access
Femoral access

A B S T R A C T

Background: Trans-radial access for percutaneous coronary intervention (PCI) has been associated with lower vascular complication rates and improved outcomes. We assessed the current uptake of trans-radial PCI in Victoria, Australia, and evaluated if patients were selected according to baseline bleeding risk in contemporary clinical practise, and compared selected clinical outcomes.

Methods: PCI data of all patients between 1st January 2013 and 31st December 2014 were analysed using the Victorian Cardiac Outcomes Registry (VCOR). Propensity-matched analysis was performed to compare the clinical outcomes.

Results: 11,711 procedures were analysed. The femoral route was the predominant access site (66%). Patients undergoing trans-radial access PCI were younger (63.9 ± 11.6 vs. 67.2 ± 11.8; p < 0.001), had a higher BMI (28.9 ± 5.5 vs. 28.5 ± 5.2; p < 0.001), more likely to be male (80.0% vs. 74.9%; p < 0.001), less likely to have presented with cardiogenic shock (0.9% vs. 2.8%; p < 0.001) or have the following comorbidities: diabetes (19.8% vs. 23.1%; p < 0.001), peripheral vascular disease (2.9% vs. 4.3%; p = 0.005) or renal impairment (13.6% vs. 22.1%; p < 0.001). The radial group had less bleeding events (3.2% vs. 4.6%; p < 0.001) and shorter hospital length of stay (3.1 ± 4.7 vs. 3.3 ± 3.9; p = 0.006). There was no significant difference in mortality (1.0% vs. 1.4%; p = 0.098).

Conclusions: Trans-femoral approach remains the dominant access site for PCI in Victoria. The choice of route does not appear to be selected by consideration of bleeding risk. The radial route is associated with improved clinical outcomes of reduced bleeding and length of stay consistent with previous findings, and this supports the efficacy and safety of trans-radial PCI in real-world clinical practise.
Benchmarking

Radial artery access rates in acute STEMI (2016)

Strong evidence base for mortality benefit with radial access in STEMI
Continuous improvement: QA activities

Healthscope Hospitals

Ramsay Health Care

VCOR

Victorian Cardiac Outcomes Registry

2013

- Public: 12
- Private: 6

2014

- Public: 12
- Private: 11

2015

- Public: 13
- Private: 14

2016-2017

- Public: 13
- Private: 18

VCOR engaged

Not VCOR engaged
In-hospital major bleeding is a well-recognised performance measure linked with adverse short and long-term outcomes, including increased mortality. Confusingly, there are many different classifications of major bleeding in the clinical arena and this makes comparisons across trials and registries difficult. VCOR has adopted standardised bleeding definitions for cardiovascular clinical trials as established by the international Bleeding Academic Research Consortium (BARC). Consistent with the BARC criteria, major bleeding was defined as including bleeding that requires blood transfusion, cardiac tamponade, intracranial haemorrhage and/or any fatal bleeding.

The overall in-hospital major bleeding rate in 2014 was 0.8% (Figure 30), similar to the 2013 rate of 0.7%. Figure 30 demonstrates individual rates of in-hospital major bleeding among hospitals by case volume. For this reporting period, one hospital was identified as an outlier with their rate of in-hospital major bleeding, and in line with VCOR policy, this information was fed back to the hospital concerned. A subsequent internal review by that hospital identified specific high-risk patient characteristics unique to their patient population that predisposed selected cases to an increased bleeding risk. There were no systemic issues or gaps in care found and the hospital concerned has also now flagged bleeding as an outcome measure that will receive special focus in the coming year.

Highest bleeding rates were seen in patients presenting with STEMI (Table 13). Somewhat unexpectedly, the bleeding rates were similar among males and females (Table 14), as data from 2013 had previously shown a threefold increase in bleeding rates among women. There was a doubling of major bleeding with femoral access compared with radial access (0.9% vs 0.4%). However, case numbers were very low in both groups and it is uncertain whether this increase is actually clinically meaningful (Table 15).
# In-hospital major bleeding

**site-initiated audit: bleeding cases 2014**

<table>
<thead>
<tr>
<th>age/sex</th>
<th>indication</th>
<th>review findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔️ 75 F</td>
<td>STEMI</td>
<td>Retroperitoneal bleed</td>
</tr>
<tr>
<td>✔️ 77 M</td>
<td>Staged PCI</td>
<td>Bleeding gastric ulcer</td>
</tr>
<tr>
<td>✗ 91 M</td>
<td>STEMI</td>
<td>Error calculating Hb drop</td>
</tr>
<tr>
<td>✗ 83 M</td>
<td>STEMI</td>
<td>Suspected brain bleed on CT. No bleed subsequent MRI</td>
</tr>
<tr>
<td>✔️ 62 F</td>
<td>NSTE-ACS</td>
<td>Cerebral haemorrhage</td>
</tr>
<tr>
<td>✔️ 77 F</td>
<td>STEMI</td>
<td>Torrential knee joint bleed from co-incidental septic joint</td>
</tr>
<tr>
<td>✔️ 78 F</td>
<td>Staged PCI</td>
<td>Retroperitoneal bleed</td>
</tr>
<tr>
<td>? 76 F</td>
<td>NSTEMI</td>
<td>Cardiac arrest 2hr later - ? ventricular rupture</td>
</tr>
<tr>
<td>✗ 51 F</td>
<td>PCI – urgent CAGS</td>
<td>Post-op Hb drop - doesn’t’ count as PCI-related</td>
</tr>
<tr>
<td>✔️ 84 F</td>
<td>NSTEMI</td>
<td>Hb drop without obvious bleeding event</td>
</tr>
</tbody>
</table>
Proportion of cases with door-to-balloon times under 90 min

75%
Median times from door to cath lab:
In-hrs vs out-of-hrs
Factors associated with high-performing sites

1. On-site nurse “champion” for STEMI management
2. Dedicated data collector
3. Well-developed system for pre-hospital notification with AV
4. Strong relationship between cardiology and ED
5. Preference for direct transfer to cath lab
6. Cath lab on-call team within 30 min of hospital
Where is there room for improvement?
Outlier management

PCI module

30-day risk adjusted mortality (2016)

- Hospitals
- 3 standard deviations
- 2 standard deviations

2.8%
Overall performance

Regional STEMI module

Door-to-needle times for regional STEMI patients by hospital
Overall performance

Heart failure snapshot module

Discharge planning

Cases (%)

<table>
<thead>
<tr>
<th></th>
<th>Cases (%)</th>
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<tbody>
<tr>
<td>Heart Tx / LVAD</td>
<td>1</td>
</tr>
<tr>
<td>Heart Failure Exercise Program</td>
<td>8</td>
</tr>
<tr>
<td>Heart Failure Program</td>
<td>35</td>
</tr>
<tr>
<td>Cardiac Rehab</td>
<td>7</td>
</tr>
<tr>
<td>Pharmacist Medication Review</td>
<td>5</td>
</tr>
</tbody>
</table>
### Clinical indicators for non-ACS PCI

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Positive functional test</th>
<th>High grade stenosis</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td>●</td>
<td>●</td>
<td>●</td>
<td>1069 (31.3)</td>
</tr>
<tr>
<td>○</td>
<td>●</td>
<td>●</td>
<td>257 (7.5)</td>
</tr>
<tr>
<td>●</td>
<td>●</td>
<td>○</td>
<td>84 (2.5)</td>
</tr>
<tr>
<td>●</td>
<td>○</td>
<td>●</td>
<td>1559 (45.6)</td>
</tr>
<tr>
<td>●</td>
<td>○</td>
<td>○</td>
<td>133 (3.9)</td>
</tr>
<tr>
<td>○</td>
<td>○</td>
<td>●</td>
<td>267 (7.8)</td>
</tr>
<tr>
<td>○</td>
<td>●</td>
<td>○</td>
<td>18 (0.5)</td>
</tr>
<tr>
<td>○</td>
<td>○</td>
<td>○</td>
<td>32 (0.9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3419 (100)</td>
</tr>
</tbody>
</table>
Looking ahead
Absorb Biodegradable Vascular Scaffold System

2 May 2017

Consumers and health professionals are advised that Abbott Vascular Australia, in consultation with the TGA, is issuing a hazard alert for Absorb Biodegradable Vascular Scaffold (BVS) System in response to data from some recent studies showing elevated rates of heart attack and blood clot. Abbott Vascular Australia is also recalling all unused stock of this device and has removed it from the Australian Register of Therapeutic Goods (ARTG).
Linkage Studies

VCOR

VCOR PCI module

AV

VCOR STEMI module

ANZCTS

VAED

NDI

PBS
Module for implantable devices

- Appropriateness of insertion
- Lead performance
- Device performance
- Procedural and long term outcomes
In-hospital/30 day risk-adjusted mortality rates for PCI:

New York State 2012

New York State Department of Health
August 2014
<table>
<thead>
<tr>
<th>Hospital</th>
<th>Cases</th>
<th>Deaths</th>
<th>OMR</th>
<th>EMR</th>
<th>RAMR</th>
<th>95% CI for RAMR</th>
<th>Cases</th>
<th>RAMR</th>
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</thead>
<tbody>
<tr>
<td>NYP Hospital - Columbia Presbyterian</td>
<td>91</td>
<td>0</td>
<td>0.00</td>
<td>0.66</td>
<td>0.00</td>
<td>(0.00, 5.51)</td>
<td>80</td>
<td>0.00</td>
</tr>
<tr>
<td>Collins M</td>
<td>655</td>
<td>7</td>
<td>1.07</td>
<td>0.99</td>
<td>0.97</td>
<td>(0.39, 2.00)</td>
<td>625</td>
<td>0.67</td>
</tr>
<tr>
<td>#Dangas G</td>
<td>407</td>
<td>2</td>
<td>0.49</td>
<td>1.26</td>
<td>0.35</td>
<td>(0.04, 1.27)</td>
<td>364</td>
<td>0.40</td>
</tr>
<tr>
<td>#Dominguez-Echevarria A</td>
<td>105</td>
<td>0</td>
<td>0.00</td>
<td>0.50</td>
<td>0.00</td>
<td>(0.00, 6.24)</td>
<td>105</td>
<td>0.00</td>
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<tr>
<td>Goyal N</td>
<td>40</td>
<td>1</td>
<td>2.50</td>
<td>0.42</td>
<td>5.35</td>
<td>(0.07, 29.76)</td>
<td>40</td>
<td>2.99</td>
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<tr>
<td>Gray W</td>
<td>100</td>
<td>3</td>
<td>3.00</td>
<td>2.89</td>
<td>0.94</td>
<td>(0.19, 2.74)</td>
<td>67</td>
<td>0.00</td>
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<tr>
<td>#Grose R</td>
<td>267</td>
<td>1</td>
<td>0.37</td>
<td>0.60</td>
<td>0.57</td>
<td>(0.01, 3.15)</td>
<td>258</td>
<td>0.00</td>
</tr>
<tr>
<td>Irobunda C</td>
<td>99</td>
<td>1</td>
<td>1.01</td>
<td>0.44</td>
<td>2.05</td>
<td>(0.03, 11.40)</td>
<td>97</td>
<td>1.33</td>
</tr>
<tr>
<td>#Johnson M</td>
<td>147</td>
<td>1</td>
<td>0.68</td>
<td>0.42</td>
<td>1.44</td>
<td>(0.02, 8.03)</td>
<td>144</td>
<td>0.86</td>
</tr>
<tr>
<td>#Kesanakurthy S</td>
<td>875</td>
<td>10</td>
<td>1.14</td>
<td>0.73</td>
<td>1.40</td>
<td>(0.67, 2.58)</td>
<td>861</td>
<td>0.94</td>
</tr>
<tr>
<td>Kirtane A</td>
<td>453</td>
<td>6</td>
<td>1.32</td>
<td>1.00</td>
<td>1.19</td>
<td>(0.44, 2.60)</td>
<td>422</td>
<td>0.78</td>
</tr>
<tr>
<td>#Kodalı S</td>
<td>475</td>
<td>8</td>
<td>1.68</td>
<td>0.90</td>
<td>1.68</td>
<td>(0.72, 3.31)</td>
<td>436</td>
<td>1.28</td>
</tr>
<tr>
<td>Kreps E</td>
<td>175</td>
<td>3</td>
<td>1.71</td>
<td>1.37</td>
<td>1.13</td>
<td>(0.23, 3.30)</td>
<td>161</td>
<td>0.78</td>
</tr>
<tr>
<td>#Laifer L</td>
<td>23</td>
<td>0</td>
<td>0.00</td>
<td>0.26</td>
<td>0.00</td>
<td>(0.00, 56.12)</td>
<td>23</td>
<td>0.00</td>
</tr>
<tr>
<td>Leon M</td>
<td>167</td>
<td>2</td>
<td>1.20</td>
<td>0.57</td>
<td>1.88</td>
<td>(0.21, 6.79)</td>
<td>166</td>
<td>1.09</td>
</tr>
<tr>
<td>Mehran R</td>
<td>161</td>
<td>2</td>
<td>1.24</td>
<td>1.43</td>
<td>0.78</td>
<td>(0.09, 2.83)</td>
<td>141</td>
<td>0.57</td>
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<tr>
<td>#Moses J</td>
<td>1695</td>
<td>7</td>
<td>0.41</td>
<td>0.52</td>
<td>0.71</td>
<td>(0.29, 1.47)</td>
<td>1694</td>
<td>0.44</td>
</tr>
<tr>
<td>#Parikh M</td>
<td>28</td>
<td>0</td>
<td>0.00</td>
<td>0.64</td>
<td>0.00</td>
<td>(0.00, 18.30)</td>
<td>28</td>
<td>0.00</td>
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<tr>
<td>#Perry-Bottinger L</td>
<td>76</td>
<td>1</td>
<td>1.32</td>
<td>0.57</td>
<td>2.08</td>
<td>(0.03, 11.56)</td>
<td>76</td>
<td>1.24</td>
</tr>
<tr>
<td>Rabbani L</td>
<td>588</td>
<td>3</td>
<td>0.51</td>
<td>0.93</td>
<td>0.49</td>
<td>(0.10, 1.45)</td>
<td>531</td>
<td>0.00**</td>
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<td>#Sehhat K</td>
<td>1</td>
<td>0</td>
<td>0.00</td>
<td>1.06</td>
<td>0.00</td>
<td>(0.00, 100.0)</td>
<td>1</td>
<td>0.00</td>
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<td>#Sherman W</td>
<td>176</td>
<td>1</td>
<td>0.57</td>
<td>1.20</td>
<td>0.43</td>
<td>(0.01, 2.38)</td>
<td>155</td>
<td>0.00</td>
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<td>Singh V</td>
<td>1243</td>
<td>4</td>
<td>0.32</td>
<td>0.44</td>
<td>0.65</td>
<td>(0.18, 1.67)</td>
<td>1227</td>
<td>0.51</td>
</tr>
<tr>
<td>Stone G</td>
<td>56</td>
<td>0</td>
<td>0.00</td>
<td>0.52</td>
<td>0.00</td>
<td>(0.00, 11.41)</td>
<td>55</td>
<td>0.00</td>
</tr>
<tr>
<td>Teirstein P</td>
<td>12</td>
<td>0</td>
<td>0.00</td>
<td>1.98</td>
<td>0.00</td>
<td>(0.00, 13.90)</td>
<td>11</td>
<td>0.00</td>
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<tr>
<td>#Weinberger J</td>
<td>1</td>
<td>0</td>
<td>0.00</td>
<td>0.11</td>
<td>0.00</td>
<td>(0.00, 10.00)</td>
<td>1</td>
<td>0.00</td>
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<tr>
<td>Weisz G</td>
<td>341</td>
<td>3</td>
<td>0.88</td>
<td>1.20</td>
<td>0.66</td>
<td>(0.13, 1.93)</td>
<td>294</td>
<td>0.54</td>
</tr>
<tr>
<td>Williams M</td>
<td>191</td>
<td>3</td>
<td>1.57</td>
<td>1.86</td>
<td>0.76</td>
<td>(0.15, 2.23)</td>
<td>163</td>
<td>0.70</td>
</tr>
<tr>
<td>All Others</td>
<td>102</td>
<td>1</td>
<td>0.98</td>
<td>2.55</td>
<td>0.35</td>
<td>(0.00, 1.93)</td>
<td>78</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>8750</td>
<td>70</td>
<td>0.80</td>
<td>0.83</td>
<td>0.87</td>
<td>(0.68, 1.10)</td>
<td>8304</td>
<td>0.59</td>
</tr>
</tbody>
</table>
Outlier Reporting

“Red dot” outlier

Hospitals
3 standard deviations
2 standard deviations

2.8% Risk-adjusted 30-day mortality (%)
Past, Present and Future

1. Team effort
   - Angela Brennan, Diem Dinh
   - Rita Brien, Janine Doyle, Harriet Carruthers
   - John McNeil, Chris Reid, Danny Liew, Dion Stub

2. Well-positioned as an exemplar cardiovascular clinical quality registry

3. Interesting times with increasing emphasis on performance monitoring, regulatory oversight and interrelationships among funders, providers, state and federal authorities