Interhospital Transfers Are Costly, Cause Delays and Do Not Address the Imbalance of Access to Revascularization: The Case for More Angiographic Facilities? Results From the Global Registry of Acute Coronary Events

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Background: Hospital revascularization rates for patients (pts) admitted with acute coronary syndromes (ACS) vary depending on proximity to a hospital capable of coronary revascularization. We examined whether interhospital transfers balance out these variations and represent the most effective use of resources.

Methods: We compared clinical outcomes, resource use and costs for ACS pts enrolled in GRACE to Dec ’02, presenting directly to centers with (Rv+) or without (Rv-) 24h access to revascular (PCI/CABG) facilities and for pts transferred (Tr) to a Rv+ unit for acute care. Costs were estimated ($/k) using key drivers: length of stay, ward type and use of PCI, stent or CABG.

Results: 25,344 pts presented initially to Rv+ (74%) and Rv- (26%). Almost 1 in 5 pts needed acute Tr. Overall hospital mortality rates were similar (5.4%) for Rv+ and Rv- pts. Mean cost of all ACS pts was $9601/$2533. Almost 1 in 3 Tr pts did not proceed to revasc. In the UK alone, the estimated cost of care of Tr pts annually would be $5040 (€3953) using key drivers: length of stay, ward type and use of PCI, stent or CABG.

Conclusions: Tr rates would have to increase to 20% to 60% to balance the substantial differences in revasc rates between centers. Access to angiography before Tr would realise substantial potential cost savings by avoiding Tr for pts unlikely to proceed to revasc. Further economic data is urgently needed to determine the most optimal use of resources. Increased angiographic facilities may also allow more equitable access to early revasc for all ACS pts with suitable anatomy.

<table>
<thead>
<tr>
<th>Category</th>
<th>Admitted to Rev+ (n=18,817)</th>
<th>Admitted to Rev- (n=5527)</th>
<th>Transferred to Rev+ (n=3093)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA pts in category (%)</td>
<td>22.1</td>
<td>20.4</td>
<td>41.9</td>
</tr>
<tr>
<td>Mean age (years)</td>
<td>85.5</td>
<td>66.7</td>
<td>62.6</td>
</tr>
<tr>
<td>Age ≥90</td>
<td>63.0</td>
<td>57.7</td>
<td>76.5</td>
</tr>
<tr>
<td>Pts receiving PCI/CABG (%)</td>
<td>35.9/6.2</td>
<td>2.6/0.5</td>
<td>50/5.10</td>
</tr>
<tr>
<td>Discharge transfer to acute facility (%)</td>
<td>4.3</td>
<td>19.5</td>
<td>6.0</td>
</tr>
<tr>
<td>Total length of stay, mean (med) (95%CI)</td>
<td>8.9 (7.0)</td>
<td>8.5 (7.0)</td>
<td>9.8 (7.0)</td>
</tr>
<tr>
<td>Total index hospital costs, mean (med) (95%CI)</td>
<td>5595</td>
<td>4267</td>
<td>6732</td>
</tr>
<tr>
<td>US</td>
<td>6712 (6571)</td>
<td>3953 (3299)</td>
<td>8572 (7878)</td>
</tr>
</tbody>
</table>

Note all comparisons (1 vs 2) & (1 vs 3) P<0.001 except Wilcoxon for length of stay.

Are American College of Cardiology/American Heart Association Preoperative Practice Guidelines for Stress Testing Followed?

Howard Weinstein, Barbara Spalton, Richard M. Steingart, Memorial Sloan-Kettering Cancer Center, New York, NY

Background: ACC/AHA preoperative practice guidelines for stress testing are widely promulgated but the extent to which they are followed and applicable in specialized populations is unknown.

Methods: Accordingly, we retrospectively applied the ACC/AHA preoperative guidelines to a group of 776 consecutive patients (pts) undergoing abdominal, genitourinary, head and neck or thoracic surgery referred for preoperative exercise stress echocardiography (ESE).

Results: Eighty-four percent of stress tests were not indicated by existing ACC/AHA guidelines. The rate of cardiac events (AMI, CHF, UA and death) in these pts was low (1.8%) and ESE provided no further risk stratification (Fig). In pts where stress testing was indicated by the guidelines, the event rate was 7%. ESE provided further risk stratification in this group (Fig).

Conclusions: 1) Compliance with preoperative stress testing guidelines in this population is poor, resulting in extensive testing that provides no further risk stratification. 2) Where stress testing is indicated by guidelines, ESE provides important prognostic information.

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Population Rates of Invasive Cardiac Procedures in British Columbia, 1995-2001

Gordon E. Paton, Karin H. Humphries, Mona Izadnegahdar, Min Gao, Michael Kiely, Ronald G. Carere, Saint Paul’s Hospital, Vancouver, BC, Canada, Centre for Health Evaluation and Outcomes Sciences, Vancouver, BC, Canada

Background: This audit examined the age-sex standardized population rates of coronary angiography (CA), percutaneous intervention (PCI) and coronary artery bypass surgery (CABG) in British Columbia (BC) between 1995 and 2001.

Methods: Data sources were as follows: CABG-BC Cardiac Registry, CA and PCI- BC Medical Services Plan, Acute Coronary Syndromes (ACS, ICD9 codes 410,411,413)- Hospital Separation database, population data- BC Statistics. All rates are age and sex standardized per 100,000 BC resident residents over 35 years.

Results: The rates of diagnostic CA and PCI have increased from 352 and 101 per 100,000 in 1995 to 400 and 154 per 100,000 respectively in 2001 (p=0.01). Single stage ‘ad hoc’ PCI increased from 38% in 1995 to 68% in 2001. The stenting rate increased dramatically from 25% of PCI procedures in 1995 to 90% in 2001 (p=0.01). The rate of CABG remained stable at between 70-79 per 100,000. There was a downward trend in the annual hospitalized incidence of ACS (477 to 430, p=0.04). The incidence of ACS and the rates of CA, PCI and CABG were higher for men in all age groups. PCI was more common than CABG in all groups.

Conclusions: The incidence of ACS in British Columbia is falling. The rates of SCA and PCI are increasing. This may reflect an appropriate evidence-based response to data and the rates of CA, PCI and CABG were higher for men in all age groups. PCI was more common than CABG in all groups.

1058 Medical Simulation: Tools for Learning on the Horizon

Sunday, March 07, 2004, 3:00 p.m.-5:00 p.m.
Morial Convention Center, Hall G
Presentation Hour: 4:00 p.m.-5:00 p.m.

John Puimmanasangoh, Johanna Takkenberg, Marinus Eijkelkamp, Ewout Steyerberg, Lex van Herwerden, Eric Jamieson, Gary Grunkemeier, Dik Habbema, Ad Bogers, Erasmus Medical Center, Rotterdam, The Netherlands, Providence Health System, Portland, OR

Background: A drawback to the choice of bioprostheses for aortic valve replacement (AVR) is their limited durability and resultant need for re-operation. The purpose of this study was to quantify and compare structural valvular deterioration (SVD), re-operation-free life expectancy and the lifetime risk of re-operation after aortic valve replacement with three widely used biopros寨es respectively.

Methods: We used long-term follow-up data on Carpenter-Edwards standard porcine (CE-S), and 37 trans-annular porcine (CE-SA) bioprostheses to generate age-dependent Weibull curves to describe SVD. These curves were used to calculate the median time to SVD at different patient ages of implantation. We also conducted a meta-analysis of the literature (CE-S – 3,161 patients and 22,326 patient-years; CE-P – 2,685 patients and 12,250 patient-years; CE-SA – 3,796 patients and 20,127 patient-years) to estimate the hazards of other valve-related events. The results of the Weibull analysis and meta-analysis were used to parameterize a micro-simulation model, which calculated the re-operation-free life expectancy and lifetime risk of SVD in these patients.

Results: For example, for a 65-year-old male, median time to SVD was 15.3, 20.1 and 22.2 years for the CE-S, CE-P and CE-SA valves. Re-operation-free life expectancy was 9.3, 9.9 and 10.1 years and the lifetime risk of re-operation due to SVD was 31%, 17% and 14% respectively. For a 70-year-old male, this lifetime risk of re-operation due to SVD was 20%, 10% and 8% respectively.

Conclusions: Estimates of SVD in the second-generation pericardial and supra-annular bioprostheses are comparable and provide an advantage over the first-generation standard valve. Both second-generation bioprostheses offer a low lifetime risk of re-operation for elderly patients requiring aortic valve replacement. Microsystemsimulation provides detailed insight into the prognosis after AVR and assists in the choice of a valve for a given patient.

1058-68 A Virtual Heart Model for Image Orientation and Teaching Three-Dimensional Echocardiography
Nico Bruning, Gernoth Grunst, Thomas Berlage, Bernhard Mumm, Johannes Waldinger, Jos R. Roelandt, Erasmus MC, Rotterdam, The Netherlands, GDM, Sankt Augustin, Germany

The interest and clinical applications of three-dimensional echocardiography (3DE) is rapidly growing. While initially used as a research tool, real-time 3DE is currently implemented in state-of-the-art ultrasound consoles. However, most echocardiographers are familiar with two-dimensional imaging and real-time 3D volume rendered images of cardiac pathologies often pose difficulties in understanding both the origin and orientation of the reconstructed tomographic views used for analysis. This phenomenon is referred to as “lost in space”. We developed a virtual reality heart (VR) model and a demonstrator, which can be linked to 3DE data sets, using three specific anatomical landmarks, providing spatial information and the geometric position of the heart within the 3DE data. The demonstrator, which consists outside a dummy thorax, a space locator system and a database that can be filled with 3DE data sets of cardiac pathologies, is used for virtual echocardiographic patient examinations (fig.). We examined the usefulness of the VR heart model integrated in commercially available 3D reconstruction and analytic software (TomTec, Munich, Germany) in 61 3DE data sets obtained in 58 patients (24 transesophageal and 37 transthoracic examinations). In 70.3% of the cases the VR heart model was successfully used to implement 3D reconstruction software.