



Monitoring performance of cardiac surgery: the SCTS governance programme

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Monitoring performance of cardiac surgery: the SCTS governance programme

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Background

The Guardian

NHS heart surgery

The data explained 244 doctors and the problem of comparing mortality rates

Figures on mortality rates are collected and analysed in various ways by different heart units in hospital trusts across the country, making it impossible to compare individual heart surgeons. Under the Guardian's request for information, all units were able to give "near mortality data for surgeons who do 10 or more cases a year". The number of cases, and number and percentage of those dying, but these figures will vary little. Sometimes the best surgeons have the

highest rates, because they operate on those closest to death and with the most to gain from surgery. So we requested three years of risk-adjusted data for the commonest operation, coronary artery bypass graft, to give a more meaningful picture. Some trusts were able to give "near mortality data for surgeons who do 10 or more cases a year" and high risk data according to a fairly widely used system - EuroSCORE, a check-list of a patient's risk factors for surgery, age, state of his or her heart, and so on. Each factor scores a point.

Following the example of four trusts in the north-west who published their results in the British Medical Journal, we asked heart units to report on eight cases into low risk of the procedure or fewer, and high risk of six or more. Some trusts, however, sometimes give a score for each factor to assess risk and therefore give overall mortality rates. Some say the north-west trusts have risk-adjusted but only risk stratified, which does not allow for the complexity of some high risk

cases. Papworth and its George's in London are among those who prefer logistic EuroSCORE, which gives a more complex computer value for each case. Other units use the older EuroSCORE, which is simpler to calculate but is less accurate. A very important factor in assessing any surgeon's death rate is the number of cases that he or she has done. Some trusts are open to question about the number of operations they perform, such as initial valve surgery, and may do a few more difficult

cases in emergency, few operative care and anaesthetists at hospitals investigate deaths in many operations. On a graph using 95% confidence intervals, which allows for all of this, each surgeon's rate will fall down to a level that is not statistically significant. Although the surgeon operating or supervising the operation is responsible for its outcome, a death can be due to many factors.

Some had specific points, arguing that other factors such as morbidity during surgery (for instance, brain damage) could be better predictors. Some were concerned that publication could lead to risk-averse behaviour, with surgeons avoiding more complicated cases. Some argued that it would have had larger to pressure the paperwork themselves and that. Some of their individual comments will be found on the Guardian website.

Coronary Artery Bypass Graft

Risk adjusted data (EuroSCORE)										
Hospital	Surgeon	Total			Low risk			High risk		
		Cases	Deaths	%	Cases	Deaths	%	Cases	Deaths	%
Belfast Victoria Hospital	Harvey	305	2	0.7	103	0	0	103	2	2.0
	McLellan	503	11	2.2	419	5	1.2	84	6	7.1
	Shaw	280	1	0.4	209	1	0.4	71	0	0
	Chen	140	4	2.9	120	1	0.8	20	3	15
	Wright	461	17	3.7	381	8	2.1	80	9	11.3
Bristol & St James University Hospitals	Chen	899	7	0.8	738	2	0.3	161	5	3.1
	Wright	559	4	0.7	483	2	0.4	76	2	2.6
	Wright	559	4	0.7	483	2	0.4	76	2	2.6
Cardiff and Vale University Health Board	Chen	527	13	2.5	415	5	1.2	112	8	7.1
	Chen	293	1	0.3	240	4	1.7	53	4	7.5
	Fain	308	8	2.6	252	6	2.4	56	2	3.6
	Chen	293	1	0.3	240	4	1.7	53	4	7.5
	Mudra	488	8	1.6	412	4	1	76	4	5.3
	Chen	293	1	0.3	240	4	1.7	53	4	7.5
	Palan	513	8	1.6	406	3	0.7	107	5	4.7
Castle Hill Hospital	Cole	508	7	1.4	437	2	0.5	71	5	7.1
	Chen	276	1	0.4	236	0	0	40	1	2.5
	Coven	328	7	2.1	262	3	1.2	66	4	6.1
	Shaw	168	7	4.2	146	1	0.7	22	6	27.4
Coventry and Warwickshire Trust	Chen	96	2	2.1	86	1	1.2	10	1	10
	Bills	254	9	3.4	209	4	1.9	55	5	9.1
	Chen	652	8	1.2	567	3	0.5	85	5	5.9
	Norton	321	3	0.9	264	0	0	57	3	5.3
	Chen	262	5	1.8	232	2	0.9	30	3	10
Guy and St Thomas' Hospital	Adelman**	236	5	2.1	214	4	1.9	21	1	4.8
	Asari	276	3	1.1	242	3	1.2	34	0	0
	Blach	292	8	2.7	202	2	1	90	6	6.7
	O'Brien	116	6	5.2	103	4	3.9	13	2	15.4
	Shah	349	6	1.7	279	4	1.4	70	2	2.9
	Shah	416	9	2.2	334	5	1.5	82	4	4.9
	Wan	276	1	0.4	233	0	0	43	1	2.3
	Wang	238	2	0.9	175	1	0.6	63	1	1.6
	Johns	271	5	1.8	206	2	1	65	3	4.6
	MRC Manchester Heart Centre	Chen	412	1	0.2	346	0	0	66	1
Keenan		328	6	1.8	275	3	1.1	53	3	5.7
Chen		41	0	0	36	0	0	5	0	0
Olson		337	9	2.7	286	5	1.7	51	4	7.8
Prendergast		438	16	3.7	375	7	1.9	63	9	14.1
Allen		523	6	1.1	440	3	0.7	83	3	3.6
Darymow-Hay		401	9	2.2	315	3	0.9	86	6	7
Chen	222	1	0.5	160	0	0	62	1	1.6	
Allen	441	2	0.4	338	1	0.3	103	1	1	
Blacklock	627	14	2.2	545	6	1.1	82	8	9.8	
University of Warwick	297	6	2	238	2	0.7	59	4	6.7	
Royal Victoria Hospital	144	4	2.8	133	0	0	11	4	35.3	
Non risk adjusted data (adjusted data on website)										
Hospital	Surgeon	Cases	Deaths	%	Hospital	Surgeon	Cases	Deaths	%	
Barts & London Hospital	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
Bristol & St James University Hospitals	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
Cardiff and Vale University Health Board	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
Coventry and Warwickshire Trust	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
Guy and St Thomas' Hospital	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
MRC Manchester Heart Centre	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
Papworth Hospital	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
Royal Victoria Hospital	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		
	Chen	212	1	0.5	Chen	212	1	0.5		



Helping doctors make better decisions

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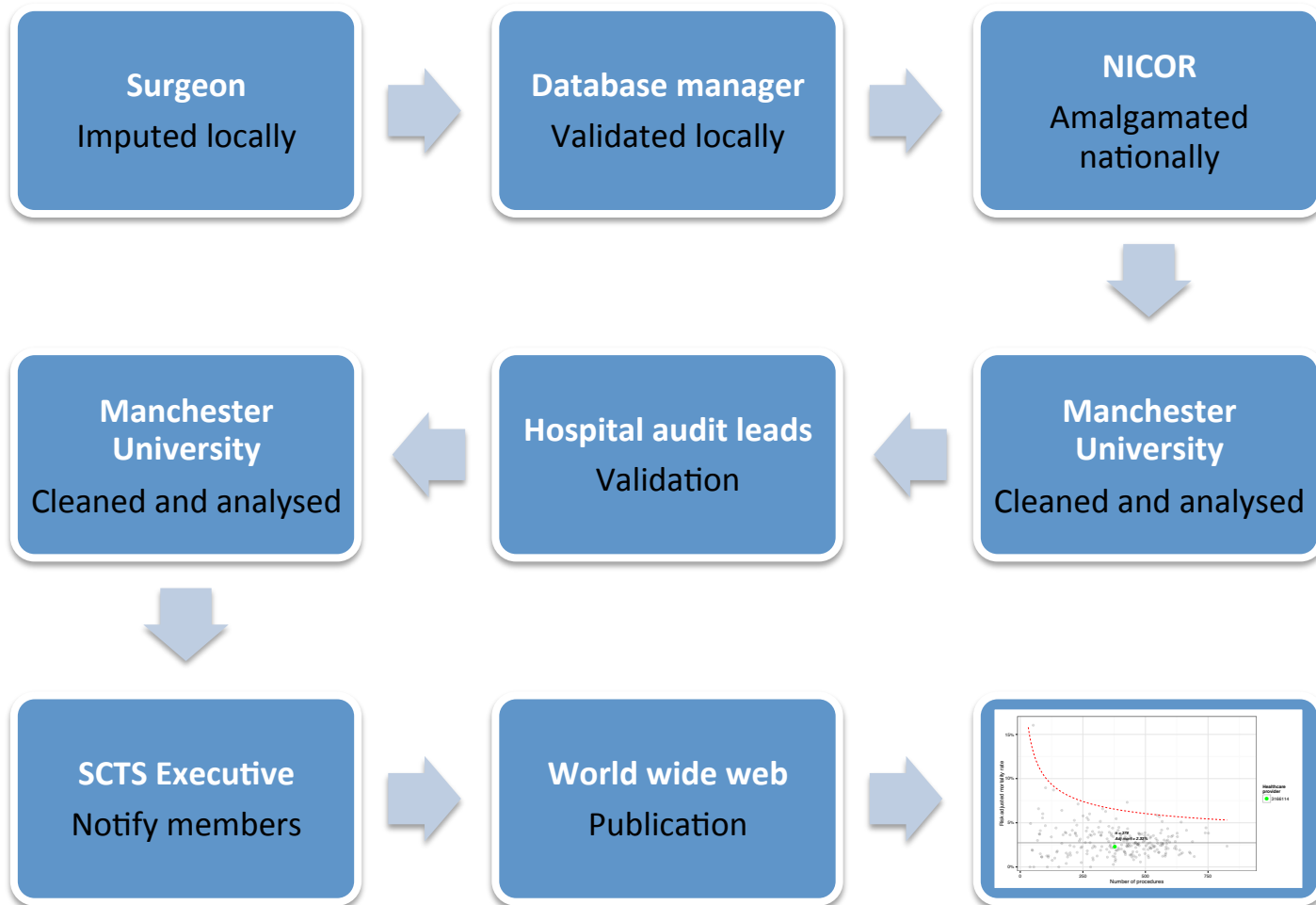
Mortality data in adult cardiac surgery for named surgeons: retrospective examination of prospectively collected data on coronary artery surgery and aortic valve replacement

Ben Bridgewater on behalf of the adult cardiac surgeons of north west England

Publishing mortality rates by named hospital and consultant since 2001 and 2005 respectively

Risk adjusted data (Personal)												
Hospital	Surgeon	Total			Low risk			High risk				
		Cases	Deaths	%	Cases	Deaths	%	Cases	Deaths	%		
Royal Victoria Hospital	Chen	212	1	0.5	Chen	212	1	0.5	Chen	212	1	0.5
	Chen	212	1	0.5	Chen	212	1	0.5	Chen	212	1	0.5
	Chen	212	1	0.5	Chen	212	1	0.5	Chen	212	1	0.5
	Chen	212	1	0.5	Chen	212	1	0.5	Chen	212	1	0.5
	Chen	212										

The flow of data

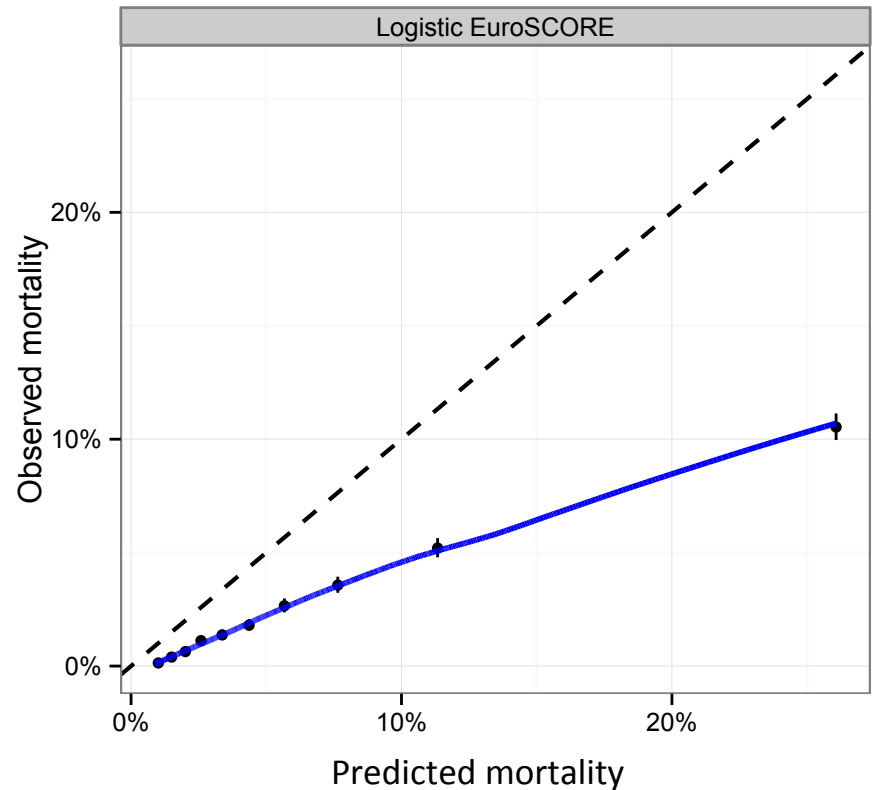


Data preprocessing

- **The registry is cleaned:**
 - transcriptional, numerical, temporal & clinical errors resolved
 - duplicate and non-cardiac records removed
- **The data is filtered:**
 - operations between 1st April 2008 & 31st March 2011
 - exclude transplantations; trauma; primary VADs
 - exclude minors (<18 years)
 - exclude private hospitals
 - exclude emergency & salvage procedures

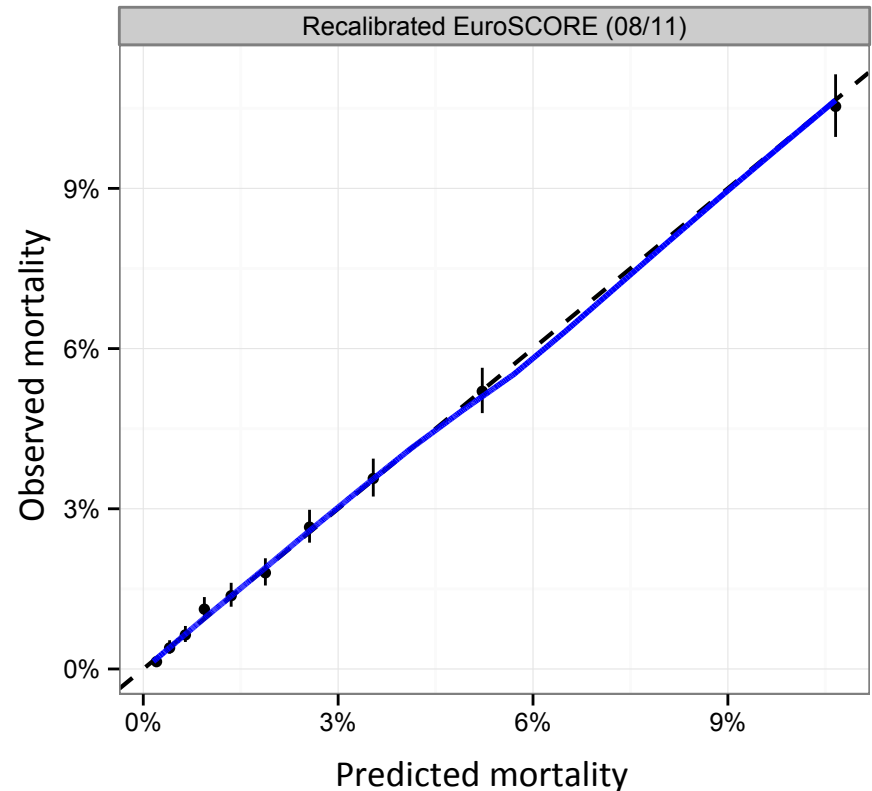
Risk-adjustment

- Necessary to **risk-adjust** outcome measures
- Old models, e.g. logistic EuroSCORE, are **miscalibrated**
- Would lead to all units being identified as below the target



Risk-adjustment

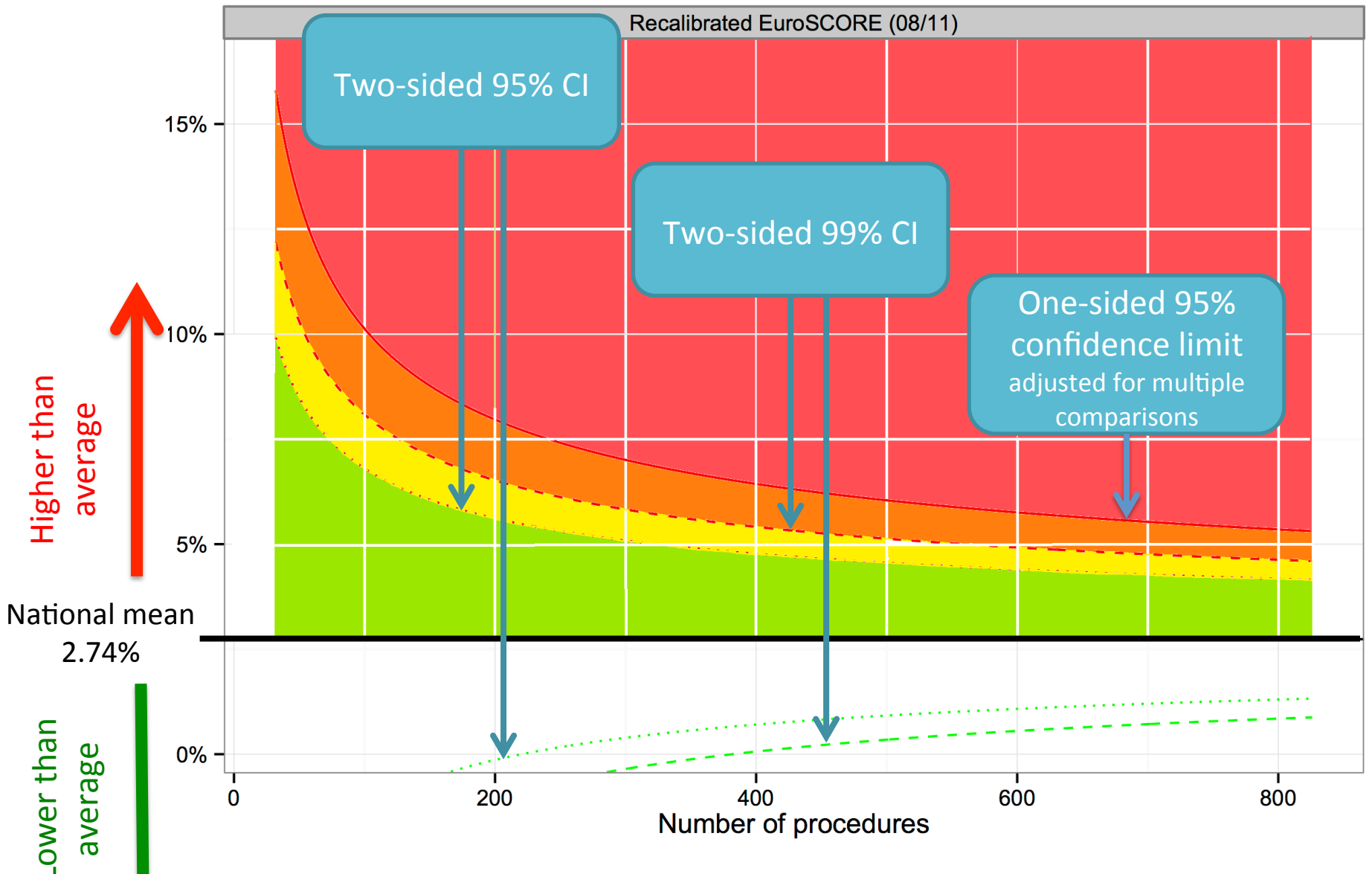
- **Build a new model**
 - incomplete data
 - procedure specific?
- **Refit** existing model
 - does not fit contemporary cohort well
- **Recalibrate** existing model
 - only adjusts for single variable
- **Other** options...



Goodness-of-fit: Hosmer-Lemeshow $P = 0.56$
Discrimination: AUC = 0.78

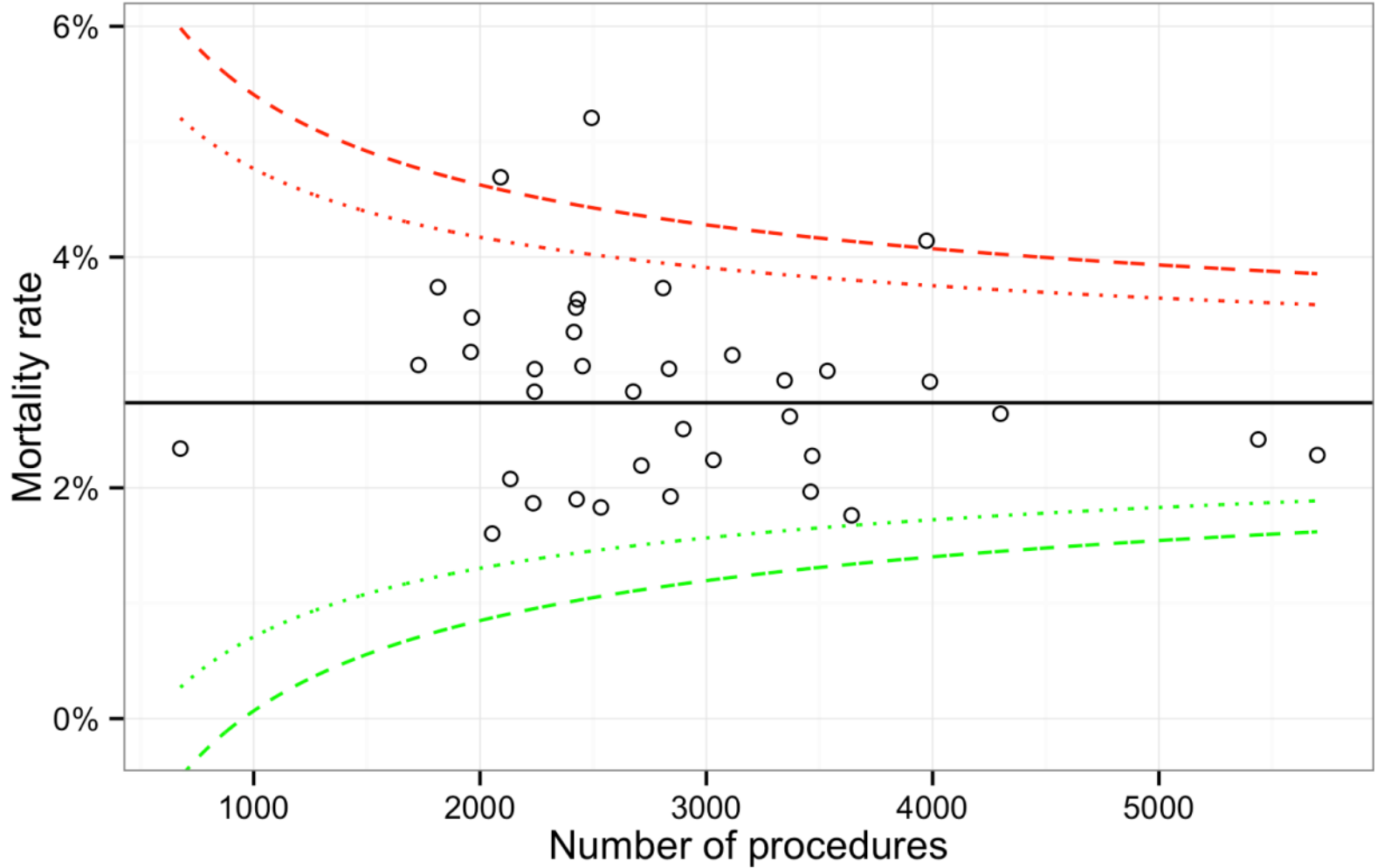
Defining divergence

- Funnel plot methodology
- Confidence intervals used to classify 'outliers'
- For consultant-level analysis we adjust for **multiple comparisons** (when making comparisons of many surgeons, high probability of identify ≥ 1 'outlier' due to chance)
- Standard errors are inflated due to observed **over-dispersion** (greater variability than expected by the binomial model)

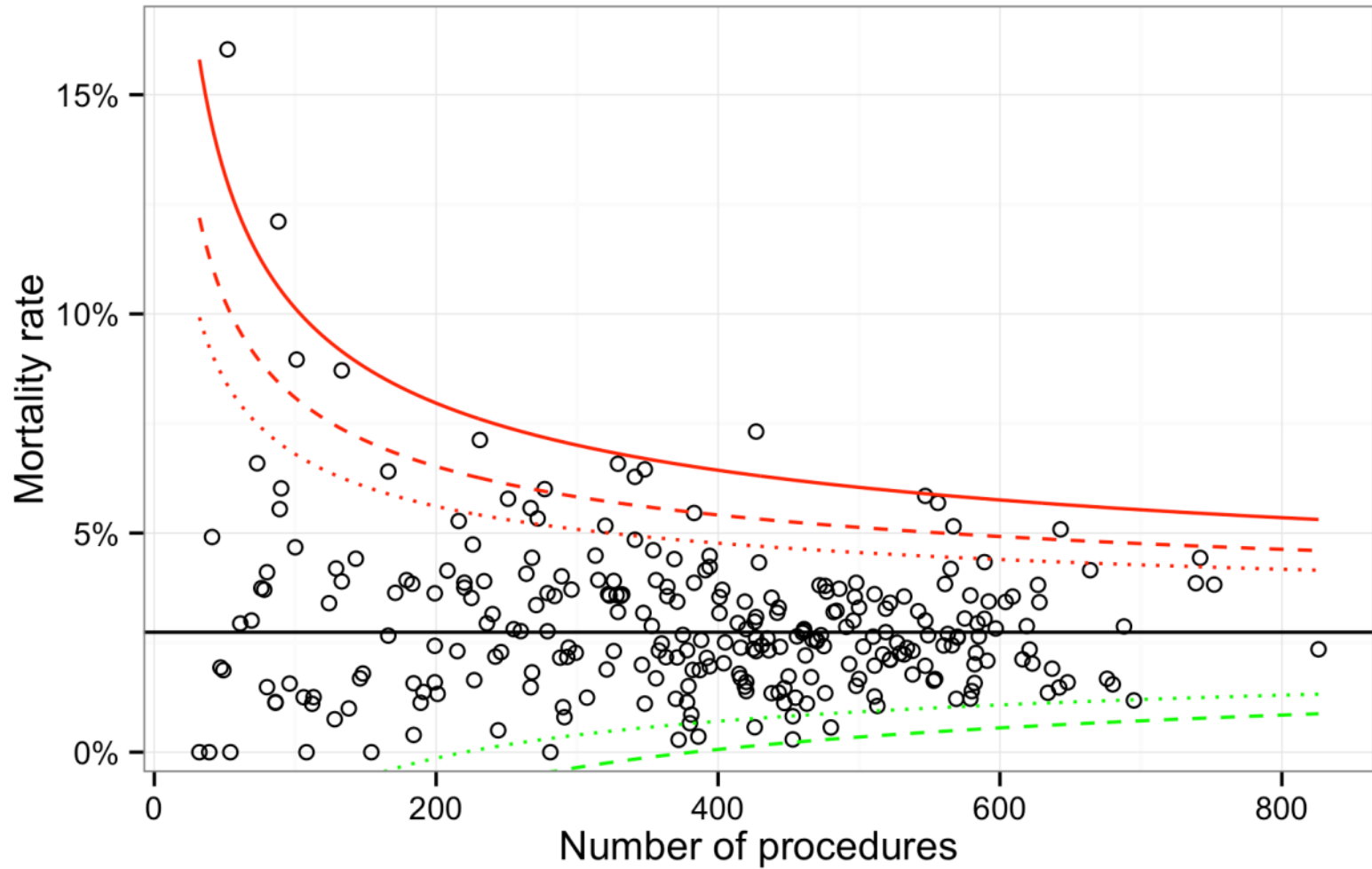


Outliers **above** the 'target' categorised as **yellow** (low level) / **amber** (higher level) / **red** (alert)

Results: hospitals



Results: consultants



Conclusions

- Identifying 'outlier' healthcare providers is **methodologically** (and politically) **challenging**
- **Combining** clinical and analytical **expertise** can reduce errors in classification
- An 'outlier' **does not necessarily imply poor practice**; can be attributable to data quality or case mix
- Future analyses to explore using more sophisticated statistical methodology