Diagnostic sensitivity and false positive AKI alerts through unlinking of an integrated Grampian biochemistry service – Report for the UK Renal Registry

Simon Sawhney, Nick Fluck, Angharad Marks and Corri Black

Background

Grampian has a relatively unique position of an integrated biochemistry service for the whole region. This is helpful when studying AKI, where accurate baseline is crucial and one missing test result can alter findings. E-alert AKI systems that appear to perform reasonably in Grampian may not perform as well in other areas if care is shared across different services that are not integrated.

Grampian biochemistry service contains two linked laboratories in Aberdeen and Elgin. Of 417295 patients with biochemistry profiles in Grampian 1999-2009, there were 32053 patients (7.7%) that had blood tests processed by each of the two laboratories (i.e. border patients). Without integration of the two laboratories, this minority of patients may be at risk of being misclassified by an automated detection algorithm. Note that in other areas the proportion of patients in border areas will vary greatly, but this analysis here has been restricted only to those 32053 bordering patients (integration will have made no difference in the others).

Methods

In this analysis the NHS England AKI detection algorithm was compared for each year from 2003-2008 between two set ups:

1. Grampian biochemistry service as it functions in current practice (two linked laboratories providing an integrated service)
2. If the Aberdeen and Elgin laboratories were no longer integrated (hypothetical)

AKI identified in the current integrated service was regarded as "reference standard" for this study. The 32053 patients in bordering areas with and without AKI blood tests were compared in 2x2 plots with sensitivity and false positive rates.

Table 1 - Number of patients with AKI e-alerts in integrated (reference) and non-integrated services

Integrated (reference standard)	Not integrated					
2003	Neg.	Pos.	Total			
"true" normal	30,933	34	30,967			
"true" abnormal	147	939	1,086	sensitivity	86.5	(84.3-88.4)
Total	31,080	973	32,053	false positive	3.5	(2.4-4.8)
2004	Neg.	Pos.	Total			
"true" normal	30,854	46	30,900			
"true" abnormal	180	973	1,153	sensitivity	84.4	(82.2-86.4)
Total	31,034	1,019	32,053	false positive	4.5	(3.3-6.0)
2005	Neg.	Pos.	Total			
"true" normal	30,781	47	30,828			
"true" abnormal	145	1,080	1,225	sensitivity	88.2	(86.2-89.9)
Total	30,926	1,127	32,053	false positive	4.2	(3.1-5.5)
2006	Neg.	Pos.	Total			
"true" normal	30,465	56	30,521			
"true" abnormal	215	1,317	1,532	sensitivity	86.0	(84.1-87.7)
Total	30,680	1,373	32,053	false positive	4.1	(3.1-5.3)
2007	Neg.	Pos.	Total			
"true" normal	30,598	55	30,653			
"true" abnormal	222	1,178	1,400	sensitivity	84.1	(82.1-86.0)
Total	30,820	1,233	32,053	false positive	4.5	(3.4-5.8)
2008	Neg.	Pos.	Total			
"true" normal	30,594	79	30,673			
"true" abnormal	187	1,193	1,380	sensitivity	86.4	(84.5-88.2)
Total	30,781	1,272	32,053	false positive	6.2	(4.9-7.7)

Findings

Approximately 10-15% of detectable AKI would be missed in patients in bordering areas if laboratories were not integrated. In addition ~5% of patients would be alerted as AKI who would not if more complete integrated data were available.

Limitations

This analysis uses the NHS England algorithm in an integrated service as reference standard, but even in this setting misclassification of patients can occur. These findings also only apply to those patients with blood tests processed in both laboratories. This is a minority of patients in Grampian and will vary in different regions.