CHKS

Insight for better healthcare

Hospital standardised mortality ratios and their use as a measure of quality

A CHKS Market Intelligence report

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Abstract:

Analysis of the data set which Hospital Standardised Mortality Ratios (HSMRs) are based on raises questions about its suitability for this purpose. HSMRs rely on an assumption that the data set is uniform and consistent over time. This analysis shows that it has been both changing over time and varies between organisations – creating problems for the interpretation of HSMRs and is therefore a call for improved and consistent coding of hospital activity.

Context:

In the wake of discussion and debate around HSMRs the Department of Health has launched a review into their use as a measure of the quality of care. CHKS has joined the working group that will investigate these ratios, agree a single methodology and prepare guidance on what they mean and how they should be interpreted. CHKS researchers have been examining the reasons for the apparent large scale decrease in mortality shown by HSMRs and found some interesting results.

Why this analysis?

CHKS is the UK's leading independent provider of healthcare intelligence and improvement services. We have over 20 years experience of working with hospitals trusts to identify areas where quality of care can be improved. Our work starts with a coding review which is fundamental to the use of performance measures that are often used to benchmark hospitals.

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We know there is nothing wrong with HSMR statistical methodologies but at the same time we know they rely on an assumption that the data set is stable. CHKS analysis has shown that this assumption is flawed. HES data has been improving over time, for a number of reasons including Payment by Results, and the resulting variability in the quality of data between organisations accounts for a large proportion of the variance.

Our researchers carried out a longer term study examining the trends in HSMRs against crude mortality numbers in hospital. They decided to look at the last full five financial years and part of this one (April 2004 to July 2009 inclusive).

Over recent years, both the published HSMR and RAMI have been falling. However, the important point to make is that actual hospital deaths have not fallen: there were 225,439 deaths in English hospitals in 2004-05, and 222,738 in 2008-09, with intermediate years showing almost identical figures.

What did we find?

We used the CHKS Risk Adjusted Mortality (RAMI) measure which is based on a similar methodology to the published HSMR measure developed by Imperial College (but not identical) as this allowed a more detailed examination (there being only a limited number of time points published for the Imperial College HSMR).

Over recent years, both the published HSMR and RAMI have been falling. In the 2009, the published HSMR showed a fall of 7 per cent in a single year, while RAMI has shown a similar fall. Over five years the RAMI has fallen by about 50 per cent.

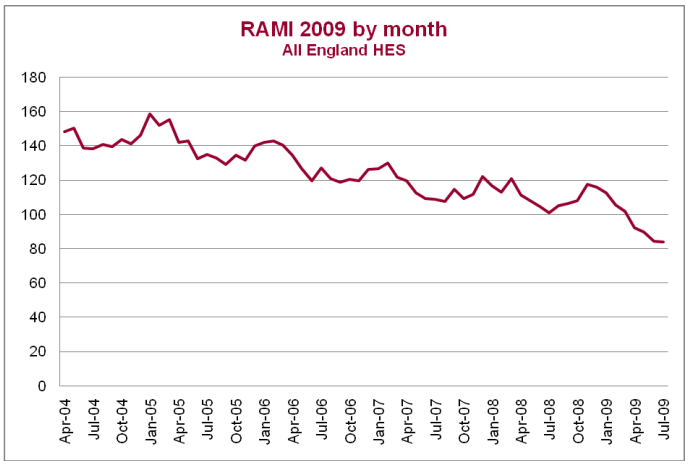

Figure 1. Trend over time of one hospital standardised mortality rate

However, the important point to make is that actual hospital deaths have not fallen: there were 225,439 deaths in English hospitals in 2004-05, and 222,738 in 2008-09, with intermediate years showing almost identical figures. So how can this apparent divergence be explained?

To find out why there is a discrepancy you have to look in more detail at the way the standardised mortality ratios are compiled. They compare the number of deaths that occurred with the number that are predicted by the statistical model. This model looks at the data for patients admitted and gives each patient a probability of death which is then summed across all admissions to give a predicted value.

Over the five years the average predicted mortality has been rising and this rise is about one third – from an average severity index (the index of likelihood of dying with the presenting diagnoses) of three rising to four. See Figure 2.

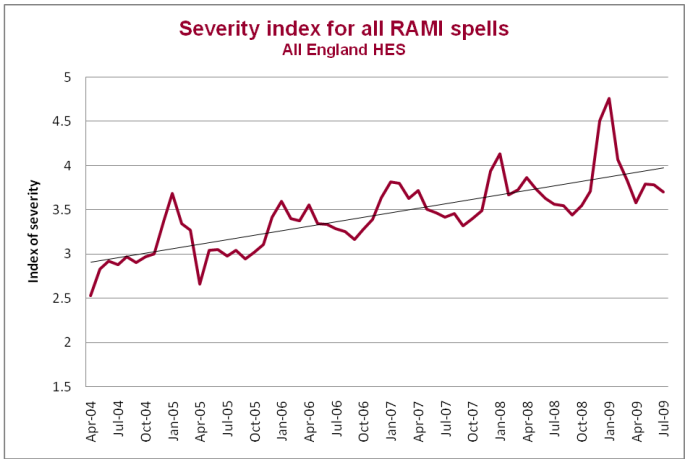

Figure 2. Average predicted mortality for all patients

Our findings show that risk adjusted mortality ratios have been falling because the expected number of deaths has been increasing over time. It is not realistic to think that the population of patients entering hospital over the last five years have become 'sicker'. The answer lies in the way that hospital deaths are coded.

Our researchers found that the average number of codes per patient has increased by around one third over the five years in question. In other words, more codes are being added for each patient episode. Whilst in reality some hospitals really will have patients with more comorbidities than others it is also likely to reflect different coding practices. What it is difficult to argue with, however, is that it has an effect on the corrected death rates.

The more codes, in general, the higher the expected mortality, the lower the HSMR or RAMI and the better the hospital appears. Figure 3 shows the increase in the average number of diagnostic codes recorded by all hospitals in England (note: the graph starts a year later at April 2005) and that there is an increase from around three to four diagnostic codes for each patient.

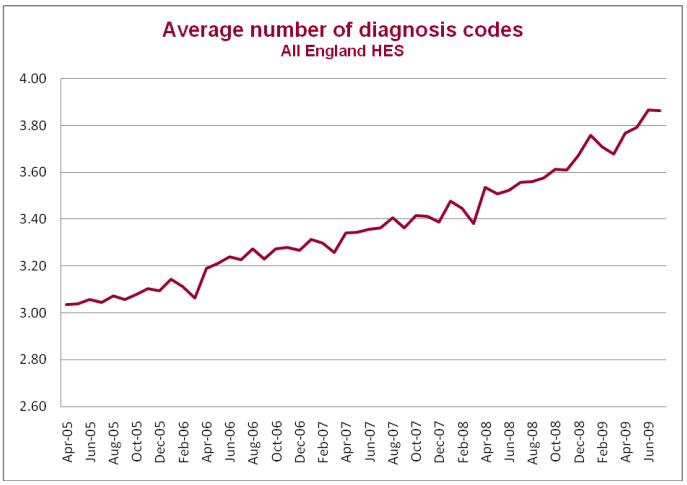

Figure 3. Average number of diagnosis codes per patient

It should be noted that this is only one measure of improved coding that may affect mortality ratios, others would include the accuracy of the coding (especially ensuring that a diagnosis is recorded not just symptoms) and also the completeness of coding (not all episodes of activity get coded).

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So improved coding, or as it is sometimes referred to 'coding creep', rather than an increase in the severity of illness, accounts for the falling risk adjusted mortality ratios. The likely explanation is that payment by results (PBR) has encouraged hospitals to look more carefully at the codes that are attributed to patient episodes. Indeed they have been told by a number of sources to improve the accuracy of their coding (particularly the Audit Commission).

If we then compare the current position regarding how much variability there is between hospitals in their depth of coding we can see that the variation goes from around an average of three diagnostic codes per patient for some hospitals to four and a half for others. This variation is greater than the change which has produced a fifty per cent reduction in the mortality ratio over five years. Figure 4 shows the average number of diagnosis codes per patient for each hospital during the period April to July 2009.

Our researchers found that the number of hospital deaths coded Z51.5 has risen from under 400 per month in April 2004 to more than 1,800 per month in June 2009.

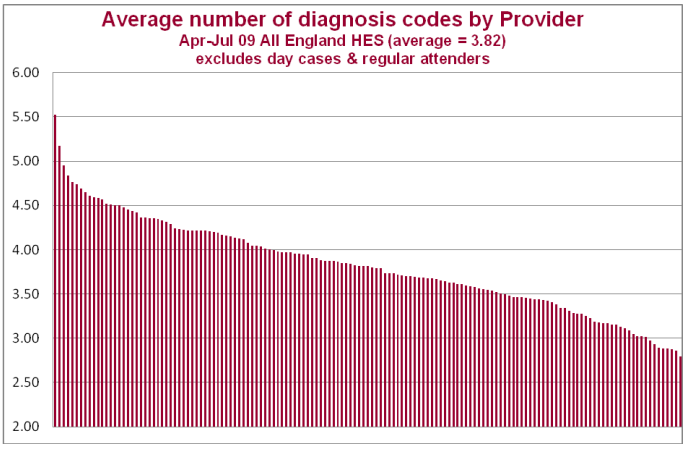

Figure 4. Average number of diagnosis codes by provider organisation

Is palliative care coding having an impact?

We then decided to look specifically at the number of patients given the code for palliative care, Z51.5. Both indexes, the published HSMR and RAMI, correct for this, though in different ways. Hospitals cannot be expected to save the lives of palliative care patients, so it would be unfair to include them in the count. There is still some disagreement nationally on the appropriate use of the Z51.5 code and its use may be variable because of this. It is important that it is used correctly to assist local health economies to plan for end of life care.

Our researchers found that the number of hospital deaths coded Z51.5 has risen from under 400 per month in April 2004 to more than 1,800 per month in June 2009. In 2007-08, 5 per cent of deaths were coded Z51.5 – but some hospitals exceeded 20 per cent. By April-June 2009, the overall percentage had risen to 11.3 per cent, and five hospitals were coding more than 30 per cent of their deaths as palliative care cases. Given the different manner in which Trusts are using this code it is difficult to say what the "correct" level is likely to be. However, the wide variation has a significant impact on mortality ratios – when some Trusts have 30 per cent or more of their deaths excluded and some still have none.

Given the big differences between hospitals in coding depth, and in the use of Z51.5, we doubt that an HSMR ratio can be seen as a suitable single indicator of the quality of care. Figure 5 shows the range between hospitals for April to July 2009.

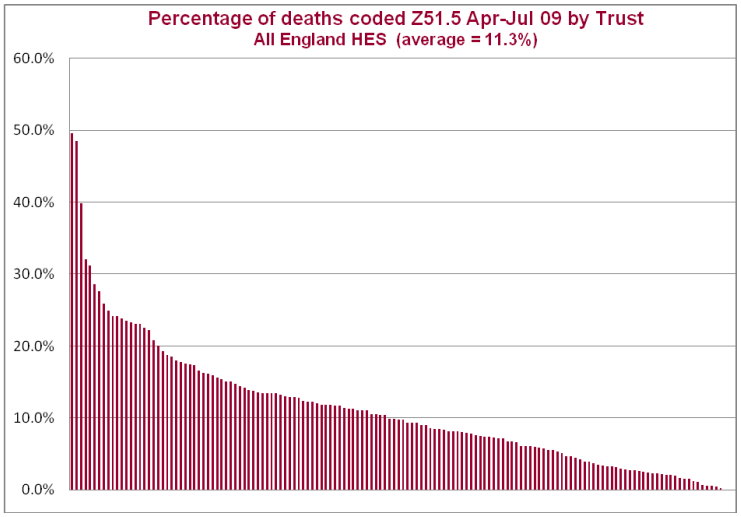

Figure 5. Percentage of deaths coded as palliative care by provider organisation

If crude mortality is not changing and HSMRs are, then it must be an effect on the predictive model that is causing the apparent large improvements. Data quality has been shown to be improving, but also still having wide variation, thus creating a large source of variation that is potentially "drowning out" any real differences in mortality.

What are the implications?

CHKS believes that if all hospitals are coding in the same way, HSMRs ratios might be a good tool to measure quality of care. However, coders are only as accurate as the source they use, most frequently the discharge summary which is generally completed by the most junior doctors. The fundamental issue is that it is these coding variations, and not the quality of care, that determines the result.

To check the validity of this argument, we plotted the chart of monthly crude death rates (adjusted for comparable workload – the spells included in the CHKS RAMI model which excludes maternity, babies, daycases and emergency admissions discharged on the same day as admission) for the five "most improved hospitals" based on the published HSMRs against the England average. The England average has shown a very small decline since April 2004 (this is mainly due to increasing workload). See Figure 6.

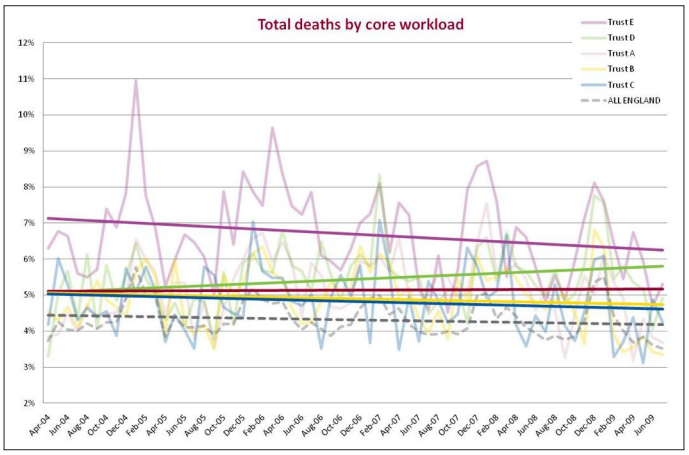

Figure 6. Five "most improved" hospitals vs England trend

All five hospitals remain well above the average. Three are declining, but no faster than the average. One is declining faster than the average, but from a very high level. At one crude death rates have actually increased over the period. This suggests that the five 'most-improved' are not demonstrating a clear improvement in the number of deaths in their hospitals, but rather it's far more about issues of how the data are produced.

Put simply, if crude mortality is not changing and HSMRs are, then it must be an effect on the predictive model that is causing the apparent large improvements. Data quality has been shown to be improving, but also still having wide variation, thus creating a large source of variation that is potentially "drowning out" any real differences in mortality. Further effort must be placed on standardising coding if this statistic is going to measure what it says.

Meanwhile its use should be restricted to tracking individual organisations over time and not for creating league tables that rank facilities (the same view is taken by the Canadian Institute for Health).

Conclusion

HSMRs are being given a high prominence in identifying poorly performing hospitals, however, they rely on an assumption that the underlying data set is robust and stable. This analysis casts doubt on the stability and uniformity of the data set and thereby asks major questions of their suitability for inter-hospital comparisons.