

Abstract 1:

Title: Case study of a simple Insightful approach to investigating Hospital Standardised Mortality Ratios

Background: Despite methodological concerns, Hospital Standardised Mortality Ratios (HSMRs) are promoted as measures of performance.

Aim: Hospitals that experience an increase in their HSMR are presented with a serious challenge but have little guidance on how to investigate this complex phenomenon. We illustrate a simple penetrating approach.

Methods: We used retrospective analysis of routinely collected hospital admissions data comparing observed and expected deaths predicted by the Dr Foster Unit case mix adjustment method over three years (n = 74,860 admissions) in Shropshire and Telford NHS Trust Hospitals. The Trust constitutes the Princess Royal Hospital (PRH) and the Royal Shrewsbury Hospital (RSH), and its overall HSMR increased from 99 in the year 2008/09 to 118 in the year 2009/10.

Results: The increase in HSMR was primarily located in PRH (109 to 130 vs. 105 to 118 RSH). We disentangled the HSMR by plotting run charts of observed and expected deaths. This showed that observed deaths were stable in RSH and PRH, but expected deaths - especially at PRH - had fallen. The fall has two potential explanations: genuinely lower risk admissions or the case-mix adjustment model is underestimating the risk of admissions - possibly caused by inadequate clinical coding. There was no evidence that the case-mix profile of admissions had changed, but there was considerable evidence that the clinical coding process at PRH was producing a lower depth of coding. This resulted in lower expected mortality.

Conclusion: A crucial first step in understanding HSMR is knowing whether the change (increase/decrease) is driven by the numerator or the denominator. This information should be an key part of the HSMR reporting methodology.

[ref: Mohammed MA, Stevens AJ (2013) A Simple Insightful Approach to Investigating a Hospital Standardised Mortality Ratio: An Illustrative Case[1]Study. PLoS ONE 8(3): e57845. doi:10.1371/journal.pone.0057845]

Abstract 2:

Title: Impact of the level of sickness on higher mortality in emergency medical admissions to hospital at weekends

Background: Routine administrative data shows that patients admitted to hospitals over the weekend appear to have a higher mortality compared to weekday admissions. Such data do not take into account the patients' severity of sickness when admitted.

Aim: We wanted to incorporate a standardised vital signs physiological-based measure of sickness known as the National Early Warning Score to investigate if weekend admissions are: sicker as measured by their index National Early Warning Score; have an increased mortality; and experience longer delays in the recording of their index National Early Warning Score.

Methods: We extracted details of all adult emergency medical admissions during 2014 from hospital databases and linked these with electronic National Early Warning Score data in four acute hospitals. We analysed 47,117 emergency admissions after excluding 1657 records where National Early

Warning Score was missing or the first (index) National Early Warning Score was recorded outside 24 hrs of the admission time.

Results: Emergency medical admissions at the weekend had higher index National Early Warning Score (weekend: 2.53 vs. weekday: 2.30, $p < 0.001$) with a higher mortality (weekend: 706/11,332 6.23% vs. weekday: 2039/35,785 5.70%; odds ratio=1.10, $p=0.04$). This was no longer seen after adjusting for the index National Early Warning Score (odds ratio=0.99, $p=0.87$). Index National Early Warning Scores were recorded sooner (0.45 hours, $p < 0.001$) for weekend admissions.

Conclusions: Adult emergency medical admissions at the weekend with electronic National Early Warning Score recorded within 24 h are sicker and have earlier clinical assessments. After adjusting for the severity of their sickness, they do not appear to have a higher mortality compared to weekday admissions.

[**ref:** Mohammed MA et al 2017. Impact of the level of sickness on higher mortality in emergency medical admissions to hospital at weekends. *Journal of Health Services Research & Policy*, 22(4), pp.236-242. DOI: 10.1177/1355819617720955]