Mortality rates at Mid-Staffordshire NHS Foundation Trust

Standard Note: SN/SG/5030

Last updated: 18 May 2009

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Between March and October 2008, the Healthcare Commission carried out an investigation into care quality at Mid-Staffordshire NHS Foundation Trust. The investigation was triggered by unusually high hospital standardised mortality ratios (HSMRs) observed at the trust. The objective of this note is to explain the concept of HSMRs, and summarise the statistics relating to HSMRs at mid-Staffordshire that were available before the investigation, and those that came to light afterwards.

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1 Background

In 2007, the Healthcare Commission began a programme to identify NHS trusts with high mortality rates. Data from these trusts is analysed by the commission, and if necessary an explanation is sought from them. If the commission is left unsatisfied by a trust's explanation, the case can be 'escalated', and an investigation undertaken; this is what occurred at Mid-Staffordshire NHS Foundation Trust (henceforth mid-Staffordshire).

The investigation was triggered by unusually high hospital standardised mortality ratios (HSMRs) observed at mid-Staffordshire by both the Healthcare Commission and the Dr Foster Intelligence unit[1]. The objective of this note is to explain the concept of HSMRs, and summarise the statistics relating to HSMRs at mid-Staffordshire available before the investigation, and those that came to light afterwards.

2 Hospital Standardised Mortality Ratios

The Hospital Standardised Mortality Ratio (HSMR) is a comparison of the observed number of deaths in a particular hospital with the number of deaths that might be expected, having taken into account risk factors such as age, diagnoses and the presence of other diseases (i.e. the hospital's case mix). The expected number of deaths is calculated from national level data, and the HSMR is a measure of risk *relative to* this national 'average'.

For instance, a HSMR of 100 represents a death rate commensurate with what is observed nationally, taking into account that hospital's case mix; a HSMR exceeding 100 represents an excess risk of death in the hospital in question etc.

Both Dr Foster Intelligence and the Healthcare Commission use HSMRs[2] as indicators of hospital performance. The key assumption underpinning this quality-mortality interpretation is that, once account has been taken of the 'case mix' of individual hospitals, any remaining differences in mortality rates, relative to the national average, can be attributed to quality of care.

The accuracy of the HSMR as a measure of care quality is thus reliant on the inclusion of all relevant factors influencing risk of in-hospital death. For instance, if age is not accounted for, then hospitals that treat an older-than-average mix of patients will have higher HSMRs, even if their care quality is commensurate with the national average. The standardisation process is intended to account for such factors, so that the only systematic explanation for higher mortality is poorer care quality.

The following adjustments ('standardisations') are made by the Dr Foster HSMR:-

- Sex
- Age on admission (in five-year bands up to 90+)
- Admission method (emergency or elective)
- Socio-economic deprivation quintile of area of residence of patient
- Co-morbidities
- Number of previous emergency admissions

[1] The Dr Foster unit is a research department at Imperial College devoted to measuring and analysing variations in healthcare quality. It was established in 2000. An associated public private partnership, Dr Foster Intelligence, was launched in February 2006.

[2] The Healthcare Commission refers to its own mortality ratios as simply a 'standardised mortality ratio', and the Dr. Foster measures as 'hospital standardised mortality ratios'; in this paper, the HSMR term is used for both.

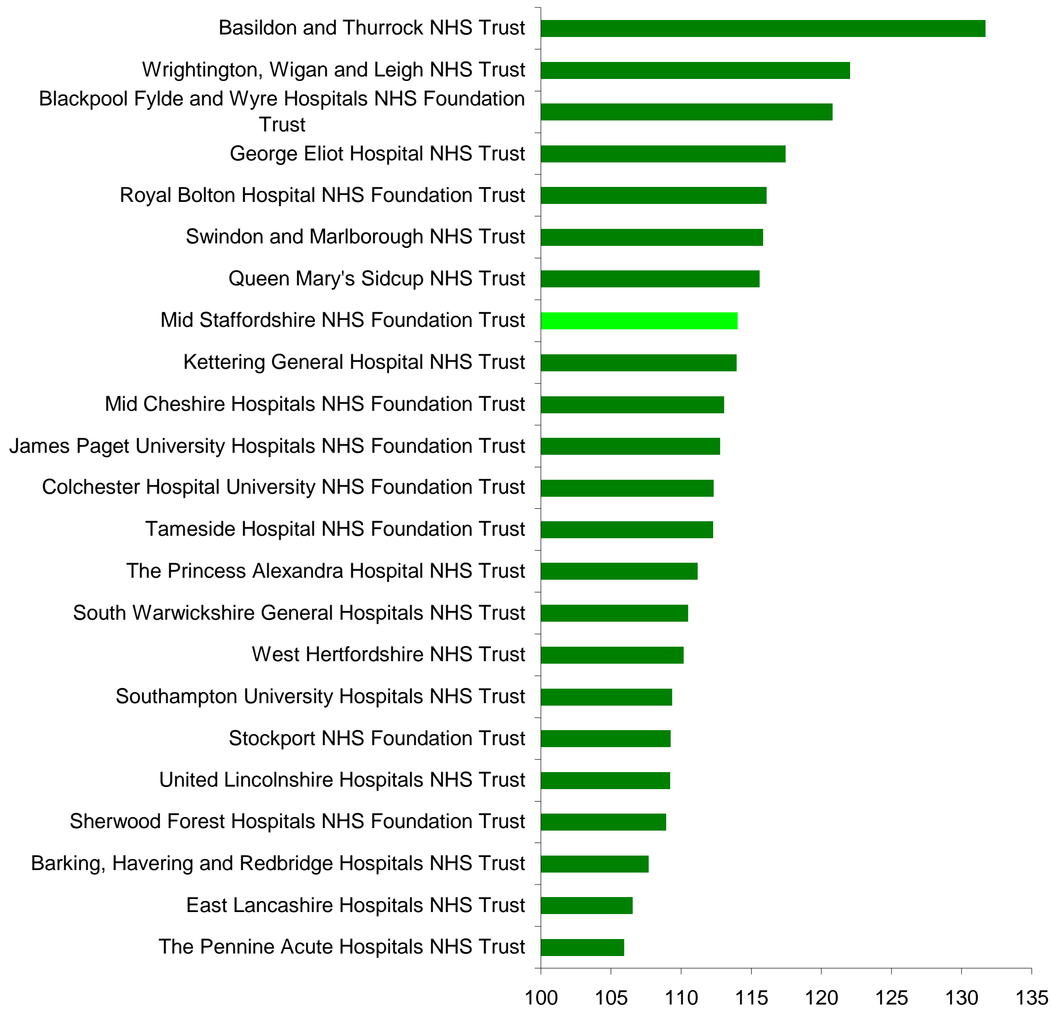
- Financial year of discharge
- Primary diagnosis

The adjustments made by the Healthcare Commission are less thorough. It standardises for:-

- Sex
- Age
- Admission method
- Healthcare resource group of diagnosis
- Calendar quarter

Even if all hospitals were to deliver identical levels of care quality, there would still remain some residual variation in their standardised mortality ratios, due to non-systematic factors that might broadly be described as 'plays of chance'. Taking these into account gives rise to a range of values within which the HSMR might reasonably be expected to fall, if care quality is consistent with the national average. In a statistical context, trusts with HSMRs that lie outside of this range are said to exhibit *significantly different* HSMRs (and hence deliver significantly different care quality) from the national average.

NHS acute trusts that were identified in the Dr Foster *Hospital Guide 2008* (based on 2006/07 data) as having significantly high HSMRs, are shown in the chart below. More statistics relating specifically to mid-Staffordshire NHS Foundation Trust are described in the sections that follow.



Trusts with significantly high HSMRs, 2008
Basildon and Thurrock NHS Trust
Wrightington, Wigan and Leigh NHS Trust
Blackpool Fylde and Wyre Hospitals NHS Foundation Trust
George Eliot Hospital NHS Trust
Royal Bolton Hospital NHS Foundation Trust
Swindon and Marlborough NHS Trust
Queen Mary's Sidcup NHS Trust
Mid Staffordshire NHS Foundation Trust
Kettering General Hospital NHS Trust
Mid Cheshire Hospitals NHS Foundation Trust
James Paget University Hospitals NHS Foundation Trust
Colchester Hospital University NHS Foundation Trust
Tameside Hospital NHS Foundation Trust
The Princess Alexandra Hospital NHS Trust
South Warwickshire General Hospitals NHS Trust
West Hertfordshire NHS Trust
Southampton University Hospitals NHS Trust
Stockport NHS Foundation Trust
United Lincolnshire Hospitals NHS Trust
Sherwood Forest Hospitals NHS Foundation Trust
Barking, Havering and Redbridge Hospitals NHS Trust
East Lancashire Hospitals NHS Trust
The Pennine Acute Hospitals NHS Trust
100
105
110
115
120
125
130
135

3 Statistics relating to Mid-Staffordshire NHS Foundation Trust

3.1 Prior cause for concern

Internal surveillance of HSMRs at mid-Staffordshire

HSMRs had been internally surveyed at mid-Staffordshire since early 2006, when the trust purchased the Dr. Foster real-time monitoring system. The output from the system was shown by the trust to the Healthcare Commission in the course of its investigation; it revealed that during 2007/08, the trust was alerted to significantly high mortality rates in ten emergency admission diagnosis groups. These are shown in the table below.

Diagnosis groups generating mortality warnings from mid-Staffordshire's real-time monitoring system (emergency admissions only)

Patient group	Deaths at mid-Staffordshire	Expected number of deaths	Relative risk ratio
Acute cerebrovascular disease	129	95.2	135.5
Other lower respiratory disease	17	9.6	177.6
Cancer of bronchus lung	36	23.9	150.6
Septicemia (except in labour)	46	26.8	171.4
Cancer of ovary	8	2.9	276.6
Intestinal infection	11	5	317.5
Cancer of rectum and anus	6	1.9	313.8
Other infections, including parasitic	2	0.2	1067.2
Peri-, endo- and myocarditis cardiomyopathy	2	0.2	1172.7
Sickle cell anaemia	1	0	n/a

Source: Healthcare Commission

External surveillance

Dr Foster

Dr Foster Intelligence identified mid-Staffordshire as having a significantly high overall HSMR (including both elective and emergency admissions) in its Hospital Guides.

- In the 2008 guide (based on 2006/07 data), its HSMR was **114** (eighth-worst performing acute trust)
- In the 2007 guide (based on 2005/06 data), its HSMR was **127** (second-worst performing acute trust)

Prior to the Healthcare Commission investigation, the centralised monitoring system also generated 'mortality outlier' alerts [3], shown in the table below.

Patient groups identified as mortality outliers by Dr Foster Intelligence

Group	Date
Operations on jejunum	Jul-07
Aortic, peripheral and visceral artery aneurysms	Aug-07
Peritonitis and intestinal abscess	Aug-07
Other circulatory disease	Nov-07

[3] These are analytically equivalent to a significantly high HSMR within a particular patient group

Healthcare Commission
The Healthcare Commission assesses NHS organisations against the two broad criteria of 'Quality of Service' and 'Use of Resources'.

'Use of Resources' is a primarily measure of the organisation's financial probity. For non-foundation NHS Trusts, the measure is based on the Audit Commission's assessment of statutory audits conducted during the year, and for foundation trusts, it is based on financial risk ratings compiled by Monitor, the independent regulator of foundation trusts.

'Quality of Serivce' is a measure of the organisation's success in meeting national standards, and progressing towards national targets. It is a single qualitative assessment (Excellent, Good, Fair or Weak) based on a quantitive composite of 63 separate indicators. These are split as follows

- Core standards (43 indicators, self-assessed by Trust and cross-checked by Commission) - measure success against Government's core standards for NHS healthcare
- Existing national targets (10 indicators, Healthcare Commission-assessed) - measure success against targets set by Government in the 2003-06 planning round
- New national targets (10 indicators, Healthcare Commission-assessed) - measure success against targets set by Government in the 2005-08 planning round .

Mid-Staffordshire's performance in the Healthcare Commission's *Annual Health Checks* is shown in the table below.

Criteria	2005/06 Rating	2006/07 Rating	2007/08 Rating	
			Provisional	Revised
Quality of service	**Fair**	**Fair**	**Good**	**Weak**
Core standards	Partly met	Fully Met	Almost met	Not met
Existing National targets	Almost met	Fully Met	Fully met	Fully met
New National targets	Fair	Weak	Good	Good
Use of resources	**Fair**	**Good**	**Good**	**Good**

Based on the Trust's self-assessment against the core indicators, mid-Staffordshire was provisionally rated as 'Good' for quality of service in 2007/08. However, following the recent Healthcare Commission investigation into the trust, performance against core standards was downgraded, and its Quality of Service rating was revised to 'Weak'.

To give a picture of how mid-Staffordshire fared in comparison with other trusts in the Healthcare Commission's assessment, the percentage of trusts falling into each ratings category in 2007/08 is shown in the table below. The distribution of results is broadly similar for 2006/07 and 2005/06. Whilst its performance was far from outstanding, mid-Staffordshire was not amongst the worst acute trusts, according to the Healthcare Commission's assessment (at least, not until the revised 2007/08 assessment that followed the investigation of the trust). Indeed, in 2006/07, the Healthcare Commission rated mid-Staffordshire one of the four most-improved acute trusts[4].

[4] *2006/07 Annual Health Check National Overview, p.33*

Distribution of results in Healthcare Commission's *Annual Healthcheck 2007/08:* percentage of trusts falling into each assessment category

Rating	**Quality of service**	Core standards	Existing National Targets	New National Targets	**Use of resources**
Weak/Not met	**4.1%**	1.8%	3.0%	2.4%	**7.1%**
Fair/Partly met	**18.9%**	4.7%	5.9%	10.7%	**29.0%**
Good/Almost met	**46.7%**	23.7%	20.1%	42.0%	**24.3%**
Excellent/Fully met	**30.2%**	69.8%	71.0%	45.0%	**39.6%**

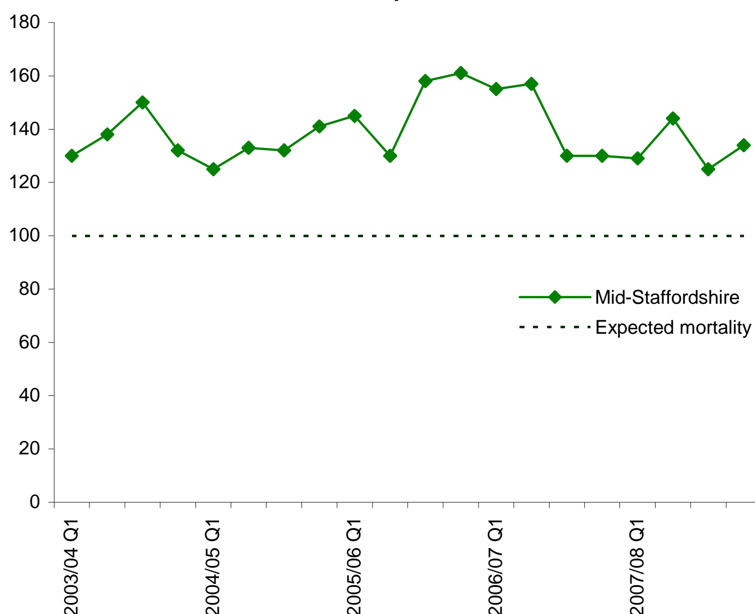
In the run-up to the investigation, the commission were alerted via their own mortality monitoring systems to the following mortality outliers in mid-Staffordshire:

Patient groups identified as mortality outliers by the Healthcare Commission

Group	Date
Diabetes	Aug-07
Epilepsy and convulsions	Sep-07
Repair of abdominal aotric aneurysm	Oct-07

3.2 Retrospective analysis by the Healthcare Commission

Of particular concern at mid-Staffordshire was the mortality rate for emergency admissions[5]. In the course of its investigation, the Healthcare Commission used Hospital Episode Statistics to retrospectively analyse these, producing standardised mortality ratio figures going back to 2003. These are shown in the chart below.



Elective admissions, by contrast, were in line with the national average (see table below). The overall HSMRs produced by Dr Foster shown in the section above are therefore likely to conceal a higher emergency HSMR.

[5] Emergency admissions occur when a patient is admitted to hospital as a matter of urgency, and they account for around a third of all hospital admissions in England

Standardised mortality rates

Year	Type of admission	
	Elective	*Emergency*
2005/06	96*	145
2006/07	85*	137
2007/08	107*	127

* Not statistically significantly different from the England average