A Rapid Review of the Safety and Quality of Care for Acute Adult Patients in NHS Lanarkshire

HSMR Appendix

December 2013
Healthcare Improvement Scotland is committed to equality. We have assessed the review process for likely impact on equality protected characteristics as defined by age, disability, gender reassignment, marriage and civil partnership, pregnancy and maternity, race, religion or belief, sex, and sexual orientation (Equality Act 2010). You can request a copy of the equality impact assessment report from the Healthcare Improvement Scotland Equality and Diversity Officer on 0141 225 6999 or email contactpublicinvolvement.his@nhs.net
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1 Introduction

1.1 This Hospital Standardised Mortality Ratio (HSMR) appendix focuses on the work that took place to understand the range of factors that might be driving the higher than average HSMR across NHS Lanarkshire’s three acute hospitals. This included:
   a) a more detailed analysis of NHS Lanarkshire’s HSMR data to identify the key drivers behind the higher than average figures. Information on this is outlined in Section 2 of this appendix.
   b) work to look at the potential impact of other factors, including the quality of the data being used to predict the number of deaths. The findings from this are outlined in Section 3 of this appendix.

1.2 This appendix also summarises the key actions taken by NHS Lanarkshire and Healthcare Improvement Scotland’s HSMR Review Group¹ from February 2012 to the point of initiation of the Rapid Review. These are outlined in Section 4 of this appendix.

1.3 This work was progressed parallel to the Rapid Review into the safety and quality of care for acute adult patients.

1.4 Errors in clinical care can cause harm, including avoidable deaths. Research suggests that 5% of deaths in hospital are possibly or probably preventable, and these occur mostly in frail people with limited life expectancy. Used wisely, hospital mortality data can help to highlight aspects of systems of care that can be improved to make things better for patients and their families. However, using mortality rates as an indicator of the quality of care is not straightforward.

1.5 The actual mortality rate (often called the ‘crude’ or ‘observed’ rate) will vary between hospitals because some hospitals will admit more patients who have a high risk of death than other hospitals. This is due to factors such as the health of the local population and the configuration of clinical services provided. The HSMR seeks to take account of these differences and uses a statistical model to predict the risk of death and then compares this to the actual number of observed deaths. However, like any model, it is only as good as the data going into it and the baseline assumptions it is built on. The model used in Scotland is different to the Dr Foster and Summary Hospital-Level Mortality Indicator models used in England.

1.6 It is neither wise nor appropriate to make judgements about the quality of care on the basis of HSMR data, nor is it possible to talk of lives saved or lost. Rather a higher than average HSMR should be used as a ‘smoke alarm’ leading to a more detailed investigation to ascertain whether there are any significant issues about the quality of care delivered.

¹ If a hospital is identified as having a relatively high HSMR, then Healthcare Improvement Scotland has a structured dialogue with the NHS board in question. This dialogue is overseen by the HSMR Review Group. The group seeks reassurance that the NHS board is taking appropriate action to understand and respond to the HSMR data, and also aims to provide advice to the NHS board in this regard. Membership of the group is drawn from some NHS boards, the Information Services Division, and Healthcare Improvement Scotland.
This is exactly how the HSMR data were used in this instance. Section 4 of this appendix summarises the actions that were taken by both NHS Lanarkshire and the HSMR Review Group from the point when NHS Lanarkshire’s HSMR first came into focus in February 2012. This was the point when the data for the period July 2011 to September 2011 were published. This publication\(^2\) highlighted that the HSMR for Monklands Hospital was significantly higher than the Scottish average. The following table summarises the data from that point to the initiation of the Rapid Review.

**Table 1: HSMR levels July 2011 to March 2013**

<table>
<thead>
<tr>
<th>Publication date</th>
<th>HSMR period</th>
<th>Lanarkshire hospitals significantly higher than the Scottish average</th>
</tr>
</thead>
<tbody>
<tr>
<td>February 2012</td>
<td>July - September 2011</td>
<td>Monklands Hospital (this quarter’s figure was later revised down to within the accepted range due to impact of late submission of data)</td>
</tr>
<tr>
<td>May 2012</td>
<td>October - December 2011</td>
<td>Monklands Hospital (this quarter’s figure was later revised down to within the accepted range due to impact of late submission of data)</td>
</tr>
<tr>
<td>August 2012</td>
<td>January - March 2012</td>
<td>All within accepted range</td>
</tr>
<tr>
<td>November 2012</td>
<td>April - June 2012</td>
<td>Monklands Hospital</td>
</tr>
<tr>
<td>February 2013</td>
<td>July - September 2012</td>
<td>Monklands Hospital</td>
</tr>
<tr>
<td>May 2013</td>
<td>October - December 2012</td>
<td>Monklands Hospital&lt;br&gt;Hairmyres Hospital (this quarter’s figure for Hairmyres Hospital was later revised down to within the accepted range due to impact of late submission of data)</td>
</tr>
<tr>
<td>August 2013</td>
<td>January - March 2013</td>
<td>Monklands Hospital&lt;br&gt;Wishaw Hospital (this quarter’s figure for Wishaw Hospital was later revised down to within the accepted range due to the impact of late submission of data)</td>
</tr>
</tbody>
</table>

Therefore, at the point of initiating the Rapid Review in August 2013, each one of the acute hospitals in NHS Lanarkshire had had an HSMR significantly higher than the Scottish average at some point in the preceding 18 months. For this reason, the decision was made to include all three hospitals in this Rapid Review. Subsequently, when analyses were rerun using a more complete dataset, it transpired that only Monklands Hospital has had an HSMR that is significantly higher than the Scottish average.

\(^2\) [http://www.isdscotland.org/Health-Topics/Quality-Improvement/Publications/](http://www.isdscotland.org/Health-Topics/Quality-Improvement/Publications/)
2 HSMR analysis

HSMR – how is it calculated?

2.1 The HSMR is calculated as the ratio of observed deaths (the actual number of deaths within 30 days of admission to hospital, irrespective of the place of the death) to the predicted number of deaths. Day case admissions are included. Patients who die after 30 days will be counted as survivors in this model, whether they die in hospital or elsewhere:

\[ \text{HSMR} = \frac{\text{observed deaths}}{\text{predicted deaths}} \]

2.2 Therefore, a change in HSMR may be the result of a change in either the observed number of deaths, or the predicted number, or indeed both.

2.3 The predicted probabilities of death are based on national activity using October 2006 to September 2007 as the baseline year. An HSMR value of greater than 1 means that more deaths occurred than predicted, and an HSMR value of less than 1 means that fewer deaths occurred than predicted. This does not necessarily mean that the care was poor (or good), or that lives were lost (or saved). In his review into the quality of care and treatment provided by 14 hospital trusts in England[^3^], Sir Bruce Keogh stated that: “It is clinically meaningless and academically reckless to use such statistical measures to quantify actual numbers of avoidable deaths.”

2.4 In fact, very few hospitals will have an HSMR that exactly matches the average and one factor contributing to this will be random variation. Therefore, some statistical methods are used to identify those hospitals whose HSMR indicates the need for further investigation. At present, when considering the quarterly HSMR for individual hospitals, two key methods are used:

a) The HSMR for each hospital is plotted on a ‘funnel chart’ with confidence intervals set at 2 and 3 standard deviations above and below the Scottish average. An HSMR outside 3 standard deviations is unlikely to be the result of random variation.

b) The trend over time for HSMR for each hospital is plotted using run charts. Statistical techniques are used to identify when the trend over time indicates the need for further investigation.

2.5 The HSMR guide[^4^] highlights: “The real value of the HSMR lies in reviewing the data for an individual hospital over a period of time. A healthcare provider should continuously review its HSMR data, being aware of how the HSMR changes over time and using this information to contribute to wider efforts to improve patient care. The HSMR at present is not fit for purpose as a screening tool for identifying low or high performing hospitals, and it should not be used to make comparisons between hospitals. Even comparing an individual hospital’s HSMR with the Scottish average is potentially problematic, and at present such comparisons should be used but interpreted with caution.”

HSMR for Scotland – comparison over time

2.6 At a Scotland level, there has been a marked decrease in the HSMR over time (Figure 1a). The Scottish HSMR for April to June 2013 is 0.86. There is a downwards shift in HSMR starting in April to June 2009, which has been sustained. This is caused by an increase (upwards shift) in the predicted number of deaths, while the number of observed deaths has remained fairly constant (Figures 1b and 1c). The patterns on the number of observed and predicted deaths are broadly mirrored when looking at the percentage of observed and predicted deaths (Figures 1d and 1e). There is some evidence of a decrease in observed deaths when calculated as a percentage of all admissions, although this has not continued.

Figure 1a. Hospital Standardised Mortality Ratio (HSMR), for deaths within 30 days of admission to hospital. Data presented for Scotland. October-December 2006 to January-March 2013.

Source: Information Services Division’s SMR01 database linked with National Records of Scotland death records. Published November 2013.

Figure 1b. Number of observed deaths (numerator of HSMR) for deaths within 30 days of admission to hospital. Data presented for Scotland. October-December 2006 to January-March 2013.

Source: Information Services Division’s SMR01 database linked with National Records of Scotland death records. Published November 2013.
Figure 1c. Number of predicted deaths (numerator of HSMR) for deaths within 30 days of admission to hospital. Data presented for Scotland. October-December 2006 to January-March 2013.

Source: Information Services Division’s SMR01 database linked with National Records of Scotland death records. Published November 2013.

Figure 1d. Percentage of admissions to hospital where death occurred within 30 days of admission (numerator of HSMR). Data presented for Scotland. October-December 2006 to January-March 2013.

Source: Information Services Division’s SMR01 database linked with National Records of Scotland death records. Published November 2013.
Figure 1e. Percentage of admissions to hospital where death was predicted within 30 days of admission (denominator of HSMR). Data presented for Scotland. October-December 2006 to January-March 2013.

Source: Information Services Division’s SMR01 database linked with National Records of Scotland death records. Published November 2013.

HSMR – national differences between types of hospitals

2.7 Monklands, Hairmyres and Wishaw hospitals are all large general hospitals (as defined by ISD Cost Book). It should be noted that the HSMR for large general hospitals (combined) is significantly higher than the HSMR for teaching hospitals (combined) (Figure 2). It is unclear what combination of factors is causing this difference, for example an unintended consequence of the statistical model used to produce the HSMR or a genuine difference in the quality or safety of patient care. The trajectory for both categories of hospital is very similar. The smaller general hospitals show greater variability which is not unexpected because of the effects of smaller numbers of admissions.

Figure 2. Hospital Standardised Mortality Ratio (HSMR), for deaths within 30 days of admission to hospital. Data presented for different categories of Scottish hospitals (teaching, large district general, small general). October-December 2006 to April-June 2013.

Source: Information Services Division’s SMR01 database linked with National Records of Scotland death records. Published November 2013.
HSMR and SMRs for Lanarkshire hospitals – comparison with Scottish average

2.8 The Rapid Review was commissioned following the release, in August 2013, of national HSMR figures for the time period January to March 2013 (Figure 3). When HSMR figures for April to June 2013 were published in November 2013, the analyses for the previous quarter (January to March 2013) were updated (Figure 4). This was to take account of any late (SMR01) records that NHS boards had submitted to ISD. The effect is that the HSMR for Monklands Hospital for January to March 2013 has reduced numerically, although it remains greater than three standard deviations above the national average, and the HSMR for Wishaw Hospital is no longer a statistical outlier. Hairmyres Hospital lies within the expected range on both charts. The reasons for this are explained in Section 3.

Figure 3. Hospital Standardised Mortality Ratio (HSMR), for deaths within 30 days of admission to hospital. Data presented by hospital of admission. January-March 2013. Provisional figures published August 2013.

Figure 4. Hospital Standardised Mortality Ratio (HSMR), for deaths within 30 days of admission to hospital. Data presented by hospital of admission. January-March 2013. Final figures published November 2013.

Source: Information Services Division's SMR01 database linked with National Records of Scotland death records.
2.9 To explore the issues which may relate to the HSMR in Lanarkshire, multiple exploratory analyses were carried out. This requires some caution in interpretation because multiple sub-group analyses may result in statistical artefacts.

2.10 This analysis highlighted that the relatively high HSMR for Monklands Hospital is being driven by emergency medical admissions. In addition, the SMR for emergency surgical admissions was between 2 and 3 standard deviations above the Scottish average. Figure 5 highlights this analysis for the January to March 2013 quarter using the revised data published in November.

Figure 5. Standardised Mortality Ratio for i) emergency medical admissions, ii) emergency surgical admissions, iii) elective medical admissions, and iv) elective surgical admissions. Deaths within 30 days of admission to hospital. Data presented by hospital of admission. January-March 2013.

(i) Emergency medical

(ii) Emergency surgical
(iii) Elective medical

(iv) Elective surgical

Source: Information Services Division’s SMR01 database linked with National Records of Scotland death records. Published August 2013.
HSMR for Lanarkshire hospitals – comparison over time

2.11 All three Lanarkshire hospitals have shown some evidence of HSMR decreasing over time, although this reduction has not been sustained across all three sites (Figure 6). The picture in Lanarkshire broadly mirrors what is seen at Scotland-level, with an increase in the number of predicted deaths (as predicted by the statistical model) appearing to be the most influential factor. It is important to review and understand changes in HSMR over time. It should also be noted that the HSMR for Monklands Hospital has been higher than the Scottish average for a number of quarters.

Figure 6. Hospital Standardised Mortality Ratio (HSMR), for deaths within 30 days of admission to hospital. Data presented for Scotland, Hairmyres Hospital, Monklands Hospital and Wishaw Hospital. October-December 2006 to April-June 2013.

Source: Information Services Division’s SMR01 database linked with National Records of Scotland death records. Published November 2013.
2.12 The HSMR for Monklands Hospital shows an initial downwards shift from 2010, reflecting a decrease in the number of observed deaths and an increase in the number of predicted deaths. This shift was not sustained (Figures 7a, 7b and 7c).

Figure 7a. Hospital Standardised Mortality Ratio (HSMR), for deaths within 30 days of admission to hospital. Data presented for Monklands Hospital. October-December 2006 to January-March 2013.

Figure 7b. Number of observed deaths (numerator of HSMR) for deaths within 30 days of admission to hospital. Data presented for Monklands Hospital. October-December 2006 to January-March 2013.

Figure 7c. Number of predicted deaths (numerator of HSMR) for deaths within 30 days of admission to hospital. Data presented for Monklands Hospital. October-December 2006 to January-March 2013.

Source: Information Services Division’s SMR01 database linked with National Records of Scotland death records. Published November 2013.
2.13 There was a marked decrease in the HSMR for Hairmyres Hospital from January to March 2010. The decrease on HSMR reflected an increase in the number of predicted deaths, while the number of observed deaths remained fairly constant (Figures 8a, 8b and 8c).

Figure 8a. Hospital Standardised Mortality Ratio (HSMR), for deaths within 30 days of admission to hospital. Data presented for Hairmyres Hospital. October-December 2006 to January-March 2013.

Figure 8b. Number of observed deaths (numerator of HSMR) for deaths within 30 days of admission to hospital. Data presented for Hairmyres Hospital. October-December 2006 to January-March 2013.

Figure 8c. Number of predicted deaths (numerator of HSMR) for deaths within 30 days of admission to hospital. Data presented for Hairmyres Hospital. October-December 2006 to January-March 2013.

Source: Information Services Division’s SMR01 database linked with National Records of Scotland death records. Published November 2013.
2.14 From April to June 2009, there was a sustained downwards shift in the HSMR for Wishaw Hospital, reflecting an increase in the number of predicted deaths while the number of observed deaths remained fairly constant (Figures 9a, 9b and 9c).

Figure 9a. Hospital Standardised Mortality Ratio (HSMR), for deaths within 30 days of admission to hospital. Data presented for Wishaw Hospital. October-December 2006 to January-March 2013.

![Graph showing hospital standardised mortality ratio](image)

Figure 9b. Number of observed deaths (numerator of HSMR) for deaths within 30 days of admission to hospital. Data presented for Wishaw Hospital. October-December 2006 to January-March 2013.

![Graph showing observed deaths](image)

Figure 9c. Number of predicted deaths (numerator of HSMR) for deaths within 30 days of admission to hospital. Data presented for Wishaw Hospital. October-December 2006 to January-March 2013.

![Graph showing predicted deaths](image)

Source: Information Services Division’s SMR01 database linked with National Records of Scotland death records. Published November 2013.
3 What factors might be contributing to the higher HSMR?

3.1 In parallel to the Rapid Review of the safety and quality of patient care, the review team asked ISD to undertake a detailed analysis of factors related to data, the model and the way services are delivered in NHS Lanarkshire that may be contributing to the higher than predicted HSMR. The factors considered and a summary of findings is highlighted in Section 4 of the main report (and repeated here for ease of reference). This chapter highlights the detail behind these findings.

Table 2: Summary of factors other than the quality of care that might be impacting the HSMR

<table>
<thead>
<tr>
<th>Factor potentially impacting HSMR</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality of clinical coding</td>
<td>Highly unlikely that impacting on the HSMR</td>
</tr>
<tr>
<td>Accuracy of diagnosis on initial admission</td>
<td>Highly unlikely that impacting on the HSMR</td>
</tr>
<tr>
<td>Quality and timeliness of discharge documentation</td>
<td>May be impacting on the HSMR</td>
</tr>
<tr>
<td>Initiation of Hospital at Home services in Monklands Hospital</td>
<td>Highly unlikely that impacting on the HSMR</td>
</tr>
<tr>
<td>Late submission of SMR01 records (national acute inpatient data set)</td>
<td>Is impacting on the HSMR in the provisional data</td>
</tr>
<tr>
<td>Palliative and end of life care</td>
<td>Unlikely that impacting on the HSMR</td>
</tr>
</tbody>
</table>

Quality of clinical coding

3.2 Coding errors are defined as incorrect codes chosen to represent the written diagnoses in medical notes or discharge summaries (regardless of whether or not the written diagnosis was correct or appropriate). A random sample of 100 SMR01 records (the hospital coding returns from which information to calculate HSMR is drawn) for Monklands Hospital were checked by the ISD Data Quality Team. The error rate for the main diagnosis code was found to be in line with error rates seen in national data quality surveys (ie 10% error rates for the full diagnostic code, less than this for the abbreviated code which is used in the HSMR calculation.) Therefore it is highly unlikely that the quality of coding is impacting on the predicted mortality at Monklands Hospital. In view of this finding it was not necessary to undertake an audit of coding at Wishaw Hospital and Hairmyres Hospital. However, there are other possible reasons why the information that is used to calculate HSMR might not be correct.

Accuracy of diagnosis on initial admission

3.3 If imprecise diagnoses are systematically attached to admissions for a hospital, this may lead to the HSMR being artificially increased. As an example, a patient might arrive
complaining of breathlessness, but later be found to have severe heart failure. Breathlessness can have many causes some of which are mild and others severe, so overall the predicted mortality is low. So whilst both diagnoses are correct, the more precise one should be used. In meetings with clinical staff in NHS Lanarkshire, it was suggested that admission practices (use of a rapid assessment unit) meant that the admission diagnoses recorded might be more likely to be provisional or based on symptoms, thus artificially inflating the HSMR. Such rapid assessment units are also found in most other hospitals. However, ISD checked this issue by substituting the discharge diagnosis for the admission diagnosis and rerunning the HSMR model. The diagnosis recorded on discharge is generally regarded to be more accurate than the admission diagnosis, although there are sound reasons why the model uses admission diagnosis. This analysis was undertaken for each hospital and had a negligible effect. Specifically, the HSMR for Monklands Hospital was still markedly higher than the Scottish average. Therefore it is highly unlikely that misattribution of diagnosis on admission specifically is impacting on the predicted mortality at Monklands, Wishaw or Hairmyres hospitals.

3.4 The review team is aware that a previous analysis undertaken by ISD for NHS Lanarkshire had rendered a different result. The review team met with ISD to investigate this difference. ISD has advised that analyses presented to NHS Lanarkshire on 20 December 2012 used a different form of prediction model. NHS Lanarkshire was not aware of this, and understood that ISD had presented analysis showing that Monklands Hospital HSMR was markedly and uniquely affected by the use of discharge diagnosis. Specifically, it appeared that, when the HSMR was rerun for all Scottish hospitals using the diagnosis on discharge rather than admission, then the HSMR for Monklands Hospital was no longer markedly higher than the national average. ISD has now advised the review team that the differences were the result of using a different statistical model, rather than the change of diagnosis (admission v discharge episode). The published Scottish HSMR figures are produced using a decision tree methodology, but the analyses prepared for NHS Lanarkshire in December 2012 had, for pragmatic reasons, used a model based on logistic regression. The latter analyses were carried out specifically to look at the impact on predicted mortality of diagnosis at discharge and of deprivation. The review team acknowledges that the presentation and initial interpretation of this information might have resulted in NHS Lanarkshire carrying out work to explore the factors underlying this.

3.5 ISD advised that the decision tree model was superior to the specific logistic regression model used to produce the analyses referred to above, and that the review team should rely on the former when reaching a conclusion on the HSMR analysis. While the logistic regression model in the above analysis was what statisticians term a 'main effects' model, the decision tree model permitted interactions between the variables used to predict mortality. To illustrate the difference, in the logistic regression model the effect of age on risk of death was identical for all diagnosis groups examined, whereas in the decision tree model the age-related risk was allowed to differ between diagnosis groups. In this instance, this makes the decision tree model superior since, for example, the risk of death for lung cancer patients is very high, at whatever age the cancer is diagnosed while for pneumonia the risk of death would be very much greater for a 90 year-old compared with a 60 year-old. The statisticians concluded that the lower HSMR for Monklands Hospital in the previous analysis was due to overestimation of the predicted number of deaths in the specific logistic regression model. The logistic regression model used in this instance was employed to enable a more rapid production of exploratory analyses, and a different logistic regression model could be designed which enables interactions between the different variables in the model.
3.6 It is also important to emphasise that such statistical models are necessarily incomplete, and there might be factors that have a notable influence on the data that are not adequately taken account of by the model. For example, NHS Lanarkshire has hypothesised that excessive comorbidity in a relatively young population, and also the relatively late presentation to its hospitals for acute care, might not be truly captured by the decision tree model.

Discharge documentation

3.7 Related to this, the case note review highlighted instances where discharge letters are being filed in the case notes 5-6 months after death. In some cases, there was no discharge letter. NHS Lanarkshire believes that the quality and timeliness of discharge documentation may be impacting adversely on their HSMR. If the written diagnosis is absent or imprecise, then the coders have to work with the information available. Therefore, it is possible that the coding could be technically correct (as 3.2 shows it is), but not accurately reflecting the true probability of a patient dying (3.3). Delays in producing discharge summaries may also contribute to delays in submitting SMR01 records (3.10-3.11). It, therefore, remains possible that an unusual level of incomplete/inaccurate discharge documentation throughout the patient journey at Monklands Hospital is contributing to the relatively high HSMR observed. **Consultants are responsible for the timely production of accurate discharge summaries. The Scottish Intercollegiate Guidelines Network (SIGN) published guidance on discharge documentation in June 2012.**

Hospital at home service

3.8 The Age Specialist Service Emergency Team (ASSET) is an initiative at Monklands Hospital where patients, mainly elderly, who previously would have been admitted to hospital are now cared for on a ‘hospital at home’ basis. All else being equal, it seems likely that the true risk of death of these patients will be lower than similar patients actually admitted. Theoretically the selective removal of these better prognosis patients from the HSMR calculation could have an adverse impact on the reported figure.

3.9 To attempt to quantify this possible effect, ISD received a file of records of 1,900 ASSET patients for 2011-2013. These records contained dates of referral and ‘discharge’ along with demographic information and a written statement of the patient’s condition. 377 patients with a referral date in January to March 2013 were selected and ISD coded for diagnosis. These records were then added to the HSMR analysis as a ‘virtual ward’ attached to Monklands Hospital as the ASSET service is only attached to Monklands Hospital. The effect of this was negligible. **Therefore, it is reasonable to conclude that this ‘hospital at home’ scheme does not account for any of the higher than predicted mortality at Monklands Hospital.**

Late submission of SMR01 records

3.10 Published HSMR figures are revised if more data become available for analysis in a subsequent quarter. The November 2013 HSMR publication shows that the figure for Monklands Hospital (for January to March 2013) of 1.38, which was flagged as provisional, has been revised downwards due to the late addition of 2,086 episodes of care. The revised figure is 1.26. The same effect was seen in both Wishaw and Hairmyres hospitals. **It is apparent that late submission of SMR01 returns is having an appreciable effect on the value of HSMR for each of the hospitals in NHS Lanarkshire. This has impacted on Wishaw Hospital and moved its HSMR back within the acceptable range. However, Monklands Hospital remains a statistical outlier.**
Table 3: Revisions to HSMR Data

<table>
<thead>
<tr>
<th>Hospital</th>
<th>HSMR for Jan-Mar 2013 in August publication</th>
<th>HSMR for Jan-Mar 2013 in November publication</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monklands Hospital</td>
<td>1.38</td>
<td>1.26</td>
<td>Statistical outlier at 1.38 and 1.26</td>
</tr>
<tr>
<td>Wishaw Hospital</td>
<td>1.10</td>
<td>1.04</td>
<td>Was a statistical outlier at 1.10 but no longer a statistical outlier at 1.04</td>
</tr>
<tr>
<td>Hairmyres Hospital</td>
<td>1.04</td>
<td>0.95</td>
<td>Not a statistical outlier</td>
</tr>
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</table>

3.11 The review team noted that whilst late submission of data, or failure to complete discharge summaries, may affect the HSMR value, it is the responsibility of the NHS board to submit accurate and timely data. NHS boards are expected to submit SMR01 records to ISD within 6 weeks following the end of the month of discharge. The review team also noted that this revising down of figures due to late submission of data has been an ongoing issue for NHS Lanarkshire and that the July to September 2011 Monklands Hospital data were previously revised from being a statistical outlier to a non statistical outlier on the basis of late returns. (This was also found for the data for October to December 2011.)

Palliative and end of life care

3.12 Palliative and end of life care is not well recorded in the dataset used to produce HSMR, and is therefore not adjusted for by the HSMR statistical model. It had been suggested that, if an area has a higher proportion of end of life patients who die in hospital than the Scottish average, this might contribute to a higher than average HSMR.

3.13 This analysis looked at the percentage of deaths that occur at home, the percentage of deaths from cancer at home and the percentage of patients on the GP palliative care registers compared with the Scottish average to establish whether Lanarkshire is an outlier on any of these measures. These data do not provide evidence that NHS Lanarkshire has a higher proportion of end of life care provided in hospital (although comparative figures on the percentage of cancer deaths in acute hospital have not been produced). In addition, ISD has reported that they have carried out methodological work that suggests that the provision of palliative care is not contributing to hospitals having a markedly high HSMR.
Figure 10. Percentage of death registrations where the death occurs at home (all causes). Data presented as i) a funnel plot by NHS board of residence (NHS Lanarkshire indicated by yellow diamond) and ii) data table for NHS Lanarkshire and Scotland. April 2012 to March 2013.

i) Funnel plot

ii) Data table

<table>
<thead>
<tr>
<th></th>
<th>All deaths</th>
<th>All Deaths at Home</th>
<th>%</th>
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<tbody>
<tr>
<td>NHS Lanarkshire</td>
<td>6106</td>
<td>1539</td>
<td>25.2%</td>
</tr>
<tr>
<td>Scotland</td>
<td>55808</td>
<td>13752</td>
<td>24.6%</td>
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Figure 11. Percentage of death registrations where the death occurs at home (all causes) and has an underlying cause of malignant neoplasm (excluding non melanoma skin cancer). Data presented as i) a funnel plot by NHS board of residence (NHS Lanarkshire indicated by yellow diamond) and ii) data table for NHS Lanarkshire and Scotland. April 2012 to March 2013.

i) Funnel plot

ii) Data table

<table>
<thead>
<tr>
<th></th>
<th>All cancer deaths</th>
<th>Cancer Deaths at Home</th>
<th>%</th>
</tr>
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<tbody>
<tr>
<td>NHS Lanarkshire</td>
<td>1655</td>
<td>512</td>
<td>30.9%</td>
</tr>
<tr>
<td>Scotland</td>
<td>15645</td>
<td>4423</td>
<td>28.3%</td>
</tr>
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Source: Information Services Division’s SMR01 database linked with National Records of Scotland death records.
Conclusions and recommendations

3.14 The late submission of records had a notable impact on the HSMR for Monklands Hospital for the period January-March 2013. When these figures were first published in August 2013, the HSMR was 1.38. When the figures were updated in November 2013, using a more complete dataset, the HSMR was 1.26. Monkland’s HSMR was significantly higher than the Scottish average for both these analyses.

3.15 The HSMR for Wishaw and Hairmyres hospitals are also reduced when late submissions are included, with Wishaw Hospital moving from a statistically significant outlier to within the expected range for January to March 2013 and Hairmyres Hospital moving from a statistically significant outlier to within the expected range for October to December 2012.

3.16 It is important to appreciate that the final HSMR figures are a better description of the true situation as they are based on a more complete dataset, but that the provisional ones are those to which all involved, particularly Healthcare Improvement Scotland and NHS Lanarkshire, have to respond to at the time. If NHS boards submit their SMR01 records to ISD within 6 weeks of the end of the month in which the patient was discharged, as expected, then there should be very little difference between the provisional and final figures.

3.17 The review team noted that late submission of data has previously resulted in an inaccurately elevated HSMR for Monklands Hospital for July to September 2011 and for October to December 2011. NHS Lanarkshire has reported that the underlying cause of the late submission of SMR01 forms to ISD for this time period is different to the reasons for the late submissions observed more recently. The review team noted that there continued to be issues, and that it is the responsibility of each NHS board to submit complete, accurate and timely data.

3.18 Quality of coding, local admission practice and care at home policies do not appear to contribute markedly to the high HSMR. There is a component of the high HSMR at
Monklands Hospital that remains unexplained and may be a result of one or a combination of the following:

a) The accuracy of diagnosis recorded in the clinical records. The case note review found some evidence of issues here, but it has not been possible to quantify the magnitude. Specifically, if hospital discharge summaries in NHS Lanarkshire are routinely less complete or accurate than for other hospitals, then this in theory could artificially inflate the HSMR for NHS Lanarkshire's hospitals. It is currently not known how complete or accurate NHS Lanarkshire’s discharge summaries are compared with the rest of Scotland.

b) Limitations of the HSMR model. All models are recognised as having limitations, as there will always be un-measurable factors which influence the risk of death which they cannot take account of. It is unlikely, but not impossible, that there is something about the population of patients admitted to Monklands Hospital that has not been adequately controlled for in the model. The review team asked ISD to undertake a review of the effect of including the Scottish Index of Multiple Deprivation (SIMD) in the model and this did not have a significant effect.

c) Random variation is unlikely to be an explanation when a hospital is as a persistent outlier as Monklands Hospital has been.

d) Quality of care. Whilst it is not possible to draw definitive conclusions about quality of care on the basis of the HSMR, it is possible that issues with quality could cause avoidable deaths and that the HSMR is drawing attention to that.
4 Timeline of communication between NHS Lanarkshire and Healthcare Improvement Scotland and discussions at NHS Lanarkshire Board

4.1 As already highlighted, NHS Lanarkshire’s HSMR first came into focus in February 2012 when the data for the period July to September 2011 was published. This showed that the HSMR for Monklands Hospital was significantly higher than the Scottish average. This chapter summarises the key communications between NHS Lanarkshire and Healthcare Improvement Scotland from February 2012 to the point of initiation of the Rapid Review.

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<tr>
<th>Date</th>
<th>Activity</th>
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<tr>
<td>February 2012</td>
<td>NHS Lanarkshire received data for the July–September 2011 quarter. This showed Monklands Hospital to have a relatively high HSMR. However ISD included a qualification on the data: “Due to implementation of the new PMS TrakCare by a number of NHS boards, I previously advised that insufficient data were available to calculate HSMR’s for hospitals within the affected board areas for the most recent time periods. ISD continues to work with PMS Consortium Boards on national outputs to ensure they meet national definitional and processing requirements. Completeness has greatly improved this quarter and hospitals within NHS Grampian, NHS Borders and NHS Lanarkshire have provisional HSMR’s calculated for the most recent quarters based on their current levels of data completeness. There remains a substantial data deficit; HSMR’s should therefore be interpreted within the context of changes over time to the denominator patient numbers as presented in Table 1.”</td>
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<tr>
<td>February 2012</td>
<td>On 9 February 2012, Healthcare Improvement Scotland wrote to NHS Lanarkshire highlighting the higher than average HSMR at Monklands Hospital and asking for information on the local understanding of these data, any action initiated in response to that understanding and asking whether any additional support to look into the data was required. The letter also noted the significant issues NHS Lanarkshire was experiencing around the late submission of data that had the potential to impact on the figures.</td>
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<td>March 2012</td>
<td>On 8 March 2012, NHS Lanarkshire responded with a detailed report that included findings from a case note review and highlighted a coding backlog of 23,000 episodes for the period April 2011 to December 2011. The response also included a plan that included action on the following areas: • discharge letter review and specification • end of life care • lack of clinical observations on wards • lack of responsiveness of physicians to nursing concerns • potential issues around access to high dependency care • action to address coding backlog, and • establishing a process for ongoing case note reviews.</td>
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<td>April 2012</td>
<td>At the request of Healthcare Improvement Scotland and based on case note reviews, NHS Lanarkshire's response was modified and resubmitted to Healthcare Improvement Scotland on 18 April 2012. This report included an HSMR Improvement Plan.</td>
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<td>May 2012</td>
<td>On 1 May 2012, Healthcare Improvement Scotland responded with feedback from the HSMR Review Group and stated: “The Review Group continues to be encouraged by the approach NHS Lanarkshire is taking to respond to the HSMR data for Monklands,” and that: “The Review Group agreed that NHS Lanarkshire’s improvement plan constitutes an appropriate and proportionate response to the HSMR data.” It also highlighted that: “When the analysis for the period July – September are rerun using a more complete dataset, the HSMR for Monklands is no longer significantly higher than the Scottish average. However, for the latest quarterly HSMR figures released to NHS boards today (covering the period October – December 2011), the HSMR for Monklands is outwith three standard deviations from the Scottish average. We will therefore continue our formal dialogue with you about this matter.” Finally, this letter asked for a further update by 11 February 2013. The letter highlighted that the time period would allow NHS Lanarkshire to ascertain the initial impact of the improvement plan and monitor the impact on the HSMR recognising the time lag in reporting the HSMR data. Finally the letter highlighted some notable patterns on the HSMR data for Wishaw Hospital and Hairmyres Hospital, while confirming that the focus of the formal dialogue was on the HSMR for Monklands Hospital (the HSMRs for Wishaw and Hairmyres hospitals were not greater than three standard deviations above the Scottish average).</td>
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<td>August 2012</td>
<td>Next quarter of HSMR data for January to March 2012 received. All three hospitals were less than 2 standard deviations higher than the Scottish average.</td>
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<td>September 2012</td>
<td>In the September 2012 Board Minutes, “[the then Medical Director] referred members to the section of the report dealing with Hospital Standardised Mortality Rate (HSMR), and advised that the trend was now positive. She attributed this positive movement to the introduction of a number of improvement measures, including improved clinical coding, enhanced surveillance, and the contribution of hospital emergency care teams.... [the then Medical Director] noted an observation from [non executive] that, despite improvement, mortality rates remained higher than the national average. She assured the Board that, as a result of the in-depth analysis undertaken over recent months, which included a specialty and a disease focus, she was confident that the performance on mortality rates for each of the three acute hospitals was not out of line, particularly when account was taken of the baseline for Lanarkshire”. In the accompanying papers a progress report on the Improvement Plan</td>
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<td>October 2012</td>
<td>A 6-month progress report on the HSMR Improvement Plan was compiled by NHS Lanarkshire and circulated to the Clinical Governance Committee members.</td>
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<td>November 2012</td>
<td>Next quarter of HSMR data for <strong>April to June 2012</strong> received and a funnel chart requested from ISD and this showed Monklands Hospital to be well above the third standard deviation, Wishaw Hospital above the second standard deviation and Hairmyres Hospital on the second standard deviation. On 30 November 2012, NHS Lanarkshire received a further letter from Healthcare Improvement Scotland noting: “...for the latest quarter the HSMR for Monklands remains significantly higher than the average for Scotland” and “we are now arranging a time when colleagues from Healthcare Improvement Scotland (HIS) and ISD can visit Lanarkshire to discuss this further. The aim of this meeting is to support NHS Lanarkshire in progressing its work on the HSMR”.</td>
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<td>November and December 2012</td>
<td>A paper on HSMR was provided to the Corporate Management Team and Clinical Governance Committee (11 December 2012). This paper proposed the establishment of a HSMR Programme to be led by NHS Lanarkshire’s Chief Executive and supported by the Medical Director. This was agreed.</td>
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<td>December 2012</td>
<td>A meeting between Healthcare Improvement Scotland, ISD and NHS Lanarkshire was held. At this meeting, ISD provided breakdowns in the HSMR data (including by month, by elective and non elective, and by specialty).</td>
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<td>December 2012</td>
<td>Inaugural meeting of the HSMR Programme Board.</td>
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<td>January 2013</td>
<td>A draft version of the HSMR progress report was circulated for comments and contributions within NHS Lanarkshire. A job description was developed for the HSMR Programme Manager.</td>
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<td>Board noted: “As the Board is aware, in March 2012 NHS Lanarkshire was requested by Healthcare Improvement Scotland to investigate a relatively high hospital standardised mortality rate for Monklands Hospital for the period July–September 2011. A report on this was provided to Healthcare Improvement Scotland based on case note reviews of the deaths during that period as well as mortality and preventing harm improvement plan. The next quarter data for October–December 2011 demonstrated a continued high data point for Monklands Hospital but also a high HSMR for Wishaw Hospital. The data for the quarter January–March 2012 showed some improvement. However, in November 2012 NHS Lanarkshire received its HSMR data for the latest quarter April–June 2012. This shows that although the mortality rate has reduced at the three hospitals, it still remains high. It is apparent therefore, that the interventions undertaken to date to reduce mortality have not had the required impact. Hence an even more intensive and focused approach is required to implement the improvement plan and identify and address any deficits in care affecting mortality.”</td>
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<tr>
<td>February 2013</td>
<td>NHS Lanarkshire provided Healthcare Improvement Scotland with the progress report on HSMR, identifying actions to date and future areas of action.</td>
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<td>March 2013</td>
<td>Letter received from HIS dated 21 March 2013 stating:</td>
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<td>“On the basis of the information you provided, the Review Group is satisfied that NHS Lanarkshire is taking the HSMR analyses seriously. Furthermore the group acknowledge, and is encouraged by, the significant amount of work that your team has carried out over the period of time since our first correspondence on this matter. We acknowledge that the summary report provided information relating to on-going work and a diverse range of actions within NHS Lanarkshire. The Review Group noted that your interventions have not yet made a discernible impact on the HSMR for Monklands, although we are mindful that it may be too early to observe an impact. The Review Group considered that, given the comprehensive nature of the improvement plan, we would like more clarity on the areas of priority for improving care and where it is thought your interventions will have the biggest impact on reducing mortality e.g. you refer to work around deteriorating patients and sepsis. In summary, the Review Group is encouraged by the effort NHS Lanarkshire is making to understand and respond to the HSMR for Monklands, and specifically engaging clinical staff in this process. The group has noted your recent request for further assistance, and colleagues from Healthcare Improvement Scotland and the ISD will be in touch with your team shortly to arrange a further visit to offer continuing support. The Review Group has also asked that you provide an update of progress in relation to your actions by Thursday 20 June 2013.”</td>
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| May 2013    | HSMR Workshop Event held to gain engagement with HSMR Improvement Programme. This event developed and agreed a revised
A Rapid Review of the Safety and Quality of Care for Acute Adult Patients in NHS Lanarkshire: HSMR Appendix – December 2013

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<td>August 2013</td>
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**Summary**

4.2 The review team noted that, over the course of 2012, the debate at Board level focused on underlying data issues and the extent to which these could be skewing the figures. The review team understand that the Board also supported proposed actions designed to better
understand and improve systems of care, including carrying out case note reviews across the three acute hospitals.

4.3 Submissions to Healthcare Improvement Scotland highlighted that work to improve the quality of care was in place focusing primarily on:

- timely identification and response to deteriorating patients
- sepsis identification and management
- effective communication, and
- end of life care.
We can also provide this information:

- by email
- in large print
- on audio tape or CD
- in Braille (English only), and
- in community languages.

Edinburgh Office
Gyle Square
1 South Gyle Crescent
Edinburgh
EH12 9EB
Phone: 0131 623 4300

Glasgow Office
Delta House
50 West Nile Street
Glasgow G1 2NP
Phone: 0141 225 6999

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The Healthcare Environment Inspectorate, the Scottish Health Council, the Scottish Health Technologies Group, and the Scottish Intercollegiate Guidelines Network (SIGN) are part of our organisation.