HEALTH | **dr foster** ®

MEDICAL DIRECTOR: IN FOCUS

The impact of sepsis coding changes in 2017/2018

Executive summary

Sepsis has been the subject of national attention in recent years, with a concerted effort to raise awareness of the symptoms amongst both healthcare workers and the general public encouraging early and accurate diagnosis. As a result of this increased focus on sepsis diagnosis, screening tools that assist early identification have been developed and implemented across the NHS.

The focus on sepsis has also seen the coding guidelines for sepsis undergo several changes. The data analysis in this report demonstrates a clear link between coding changes and fluctuations in the numbers of coded sepsis spells.

The first major change encouraged the coding of sepsis in the primary diagnosis position and caused a dramatic rise in sepsis numbers. The second major change sought to address this spike by giving more weight to the judgement of individual clinicians in the sequencing of conditions. While this change did see the number of coded sepsis spells decline, it has not returned to the previous level.

The quick succession of changes has resulted in large variation in coding practice between trusts. If left unchecked, this variation could have an impact on trust-level mortality ratios, as well as national risk analysis, benchmarks, and tariffs.

In order to reduce variation in sepsis coding between trusts, Dr Foster recommends trusts agree a clear internal process for identification of sepsis and undertake regular reviews of coding practices for recording sepsis. It also recommends continued research and education around accurate diagnosis of sepsis to support the improvement of early treatment pathways and coding.

Introduction

Sepsis is a rare, life-threatening condition that can develop rapidly from a local infection such as a chest infection, or urinary tract infection if left untreated. While sepsis can be caused by an infection in only one part of the body, if bacteria causing sepsis is found in the bloodstream, this is termed septicaemia.

In 2014, the percentage of all admissions that were classified in the diagnosis group of septicaemia was 0.4 per cent, rising rapidly to 1.3 per cent in 2017. Early identification of sepsis is vital but can be challenging and, over the last three years, a number of screening tools and other aids have been implemented by acute trusts in an effort to assist in the early identification of sepsis.

This drive to increase awareness and identification of developing sepsis has contributed to a rapid increase in the sepsis International Classification of Diseases (ICD10) codes A40 and A41 being used as the main treatable condition during an admission (primary diagnosis) within trusts for clinical coding purposes. The sepsis codes A40 and A41 made up 99.6% of the septicaemia diagnosis group used in mortality models in 2017/18 (Hospital Episode Statistics).

There have been two recent, noteworthy changes in the national guidelines of how sepsis should be coded – the first in April 2017 and then again in April 2018. Following the coding changes in April 2017, the practice of swift identification and treatment of a local infection early in its presentation resulted in an increase in the number of spells coded with a primary diagnosis of sepsis.

In April 2018, a growing awareness of the distinction between the rarer condition of sepsis and a patient presenting with the early signs of a developing severe infection was recognised and resulted in a second change in the national coding guidelines.

The accuracy of coding impacts on trust remuneration and mortality indicators, and concerns have been raised around the wider impact the fluctuations in numbers are

having. Coding practices can have an impact on national benchmarks for clinical outcomes and influence national tariffs. It is therefore important to try and reduce the national variation of sepsis coding practices.

This briefing sets out to explain the changes and highlight actions that medical directors can consider in response.

DIAGNOSIS CODING EXPLAINED

Episode: A continuous period of admitted care spent under a single consultant

Spell: A continuous period of admitted care spent at a single provider

International Classification of Diseases 10th Revision (ICD10) codes: A set of standard medical classification codes used to define diseases, disorders, injuries and other related health conditions

Primary diagnosis: a single diagnosis code (ICD10 code) that is used to indicate the main condition established to be chiefly responsible for the admission of the patient to the hospital during an episode

Secondary diagnosis: additional diagnosis codes (ICD10 codes) that are used to indicate secondary conditions present during an episode that require attention

Diagnosis group: a classification that is assigned to each spell of care based on the primary diagnosis codes used within the episodes

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What has changed since April 2017?

The April 2017 coding change encouraged the coding of sepsis in the primary diagnosis position of an episode in two ways: increased emphasis on clinical terminology; and changes in coding where multiple conditions are present.

INCREASED EMPHASIS ON CLINICAL TERMINOLOGY

Terminology became a factor for coders to consider. The 2017 coding changes dictated that where the clinician recorded terms such as urinary sepsis, urosepsis, biliary sepsis, ocular sepsis or chest sepsis in a patient's medical record, a sepsis ICD10 code should be coded in the primary position of the spell, with the ICD10 codes indicating the cause or condition to be coded in the secondary position. As some clinicians would use these terms interchangeably with local infections, this may have resulted in patients with local infections being classified by coders as only having sepsis. A further factor was the acceptance that a coder may use the sepsis code if a screening tool, such as the ED/AMU Sepsis Screening & Action Tool released by the UK Sepsis Trust in 2016, positively identified sepsis in the clinical notes.

CHANGES IN CODING WHERE MULTIPLE CONDITIONS ARE PRESENT

The recording of multiple conditions within the same episode also changed. Before April 2017, if other severe conditions such as pneumonia, or skin conditions presented with sepsis, the severe condition would generally be coded in the primary position with sepsis coded in a secondary position. After April 2017, this was reversed, and sepsis was generally coded in the primary diagnosis position of the spell.

April 2017 – March 2018		Mrs X is admitted with a principal illness of pneumonia but she also has symptoms of sepsis. She is discharged alive and well after a few days of treatment.	> April 2018	
Health record for Mrs X			**Health record for Mrs X**	
Primary diagnosis: **Sepsis**	Secondary diagnosis: **Pneumonia**		Primary diagnosis: **Pneumonia**	Secondary diagnosis: **Sepsis**

Mrs X is classified in the Septicaemia diagnosis group. The mortality model is run on this group using data from patients who also have a primary diagnosis of sepsis.

Mrs X is classified in the Pneumonia group. The mortality model is run on this group using data from patients who also have a primary diagnosis of pneumonia.

Mortality models use real data generated from cases such as Mrs X's to calculate the expected risk of death from the population. The model outputs for each diagnosis group are used to calculate expected risk for new patients within the same group so it is important that the primary diagnosis is clinically accurate so that the risk can be calculated correctly and assigned appropriately.
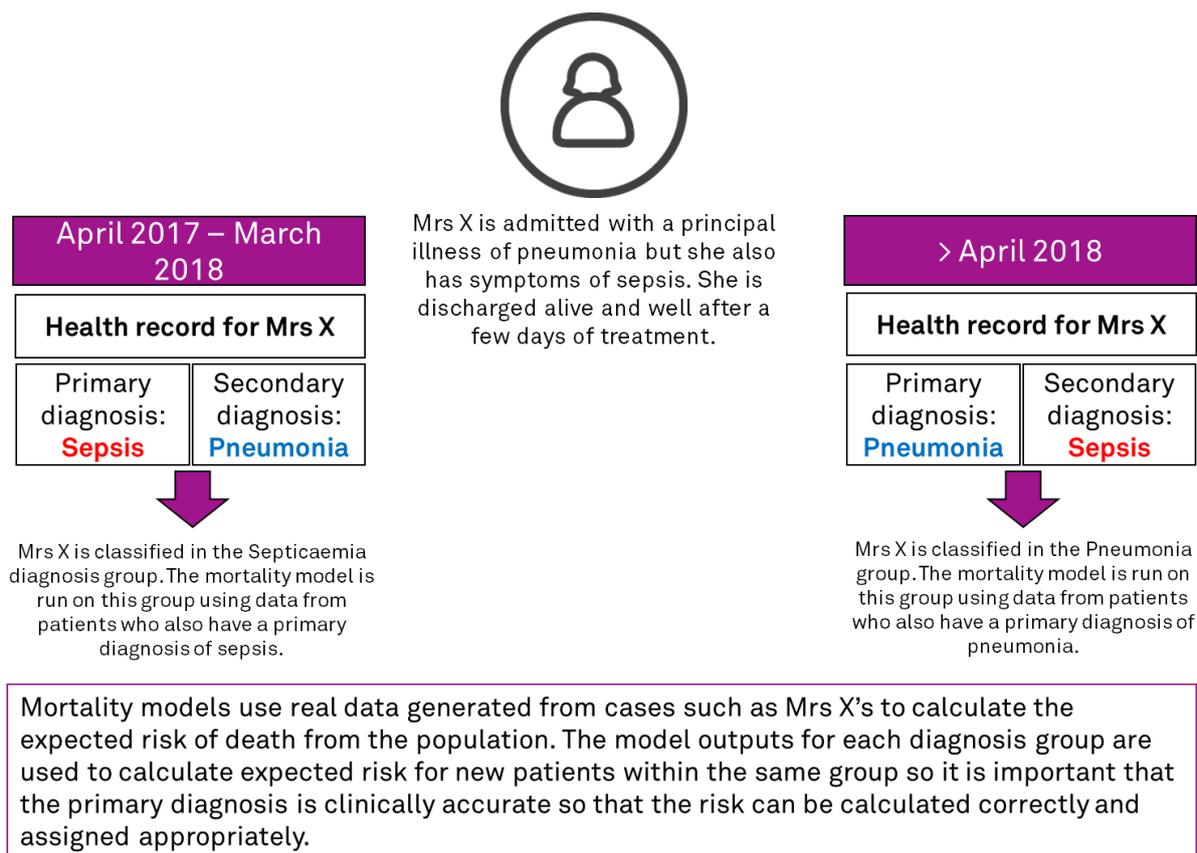
Figure 1 – A patient-level example of the effect of the coding guidelines changes on the primary and secondary diagnosis of sepsis

As a result of these changes, April 2017 to March 2018 saw a period where a particularly high volume of episodes were coded with a sepsis code (A40, A41) in the primary position of the episode. As shown in **Figure 2**, out of all spells that contained a sepsis code, the proportion where the sepsis code was recorded in the primary position of at least one episode in the spell rose dramatically compared with previous years. As a diagnosis group is determined based on the primary diagnosis codes, this in turn influenced the patients falling into the septicaemia diagnosis group.

The April 2018 guidelines sought to overcome this issue by addressing the vague terminology associated with local infections. Sequencing severe conditions with sepsis has been left up to clinical judgement, which often requires the clinical coder to validate an entry of sepsis with the clinician. Since the implementation of these guidelines, the volume of spells with sepsis in the primary diagnosis position of at least one episode has decreased nationally as expected, but not to the pre-April 2017 baseline.
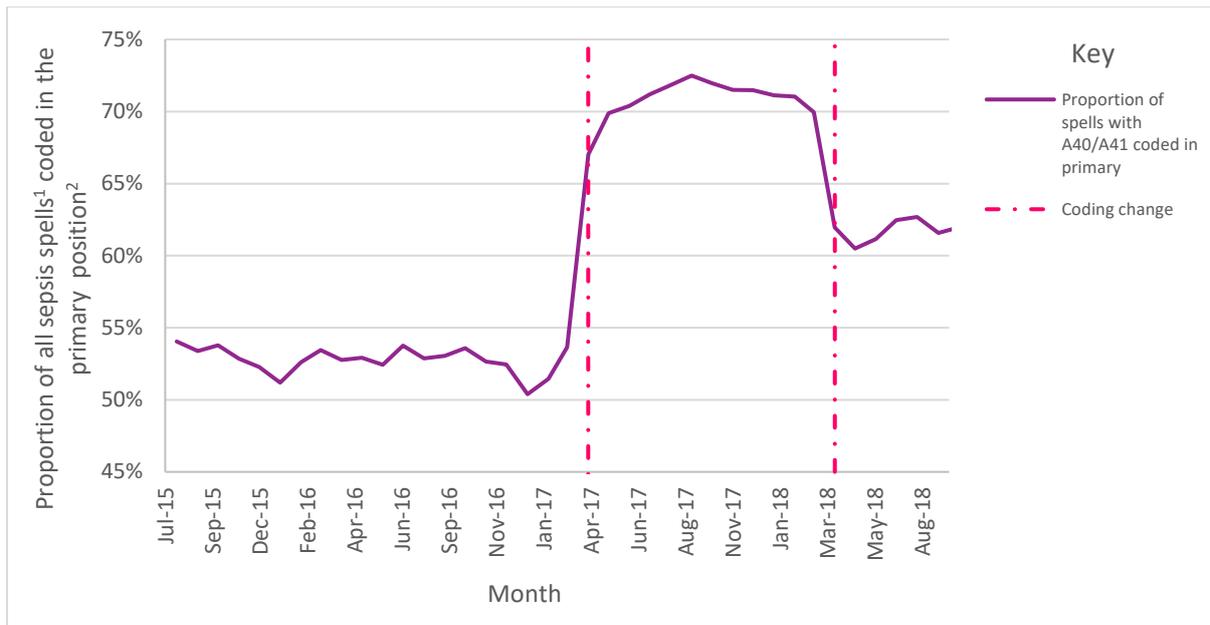
Figure 2 – National trend of the proportion of all sepsis spells where A40/A41 is coded in the primary position[1]
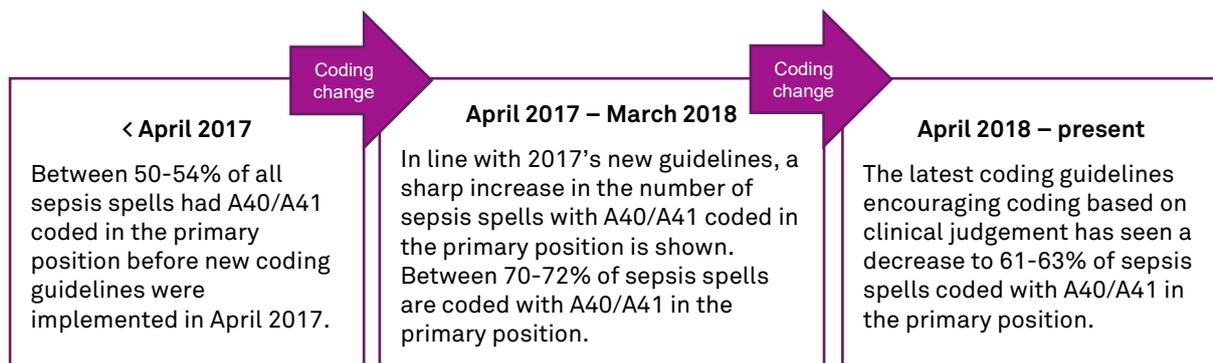

< April 2017

Between 50-54% of all sepsis spells had A40/A41 coded in the primary position before new coding guidelines were implemented in April 2017.

April 2017 – March 2018

In line with 2017's new guidelines, a sharp increase in the number of sepsis spells with A40/A41 coded in the primary position is shown. Between 70-72% of sepsis spells are coded with A40/A41 in the primary position.

April 2018 – present

The latest coding guidelines encouraging coding based on clinical judgement has seen a decrease to 61-63% of sepsis spells coded with A40/A41 in the primary position.

Figure 3 – The impact of the changes in coding guidelines on sepsis spells coded in the primary and secondary position

[1] All sepsis spells are defined as all non-elective spells where ICD-10 codes A40 or A41 appear anywhere in any episode

[2] Proportion of sepsis spells where A40/A41 coded in primary $= \dfrac{\text{Number of non-elective spells with A40 or A41 in } \textbf{primary position} \text{ of any episode}}{\text{Number of non-elective spells where A40 or A41 appear } \textbf{anywhere} \text{ in any episode}}$

Variation in the way sepsis is coded

Based on **Figure 2**, the latest guidelines appear to have gone some way to addressing the issue of over-coding sepsis, reducing the volume of spells coded as sepsis that are actually clinically diagnosed as other conditions. However, when observing trends over time at a trust level there is still large national variation between trusts in sepsis coding practices.

There appears to be a reluctance by organisations to adopt another change so soon, knowing that there is continuing uncertainty at a national level. Many organisations appear to be awaiting a clear national directive. **Figure 4** shows how the proportion of sepsis spells with the sepsis code in the primary position of at least one episode within a spell has varied between trusts over time.
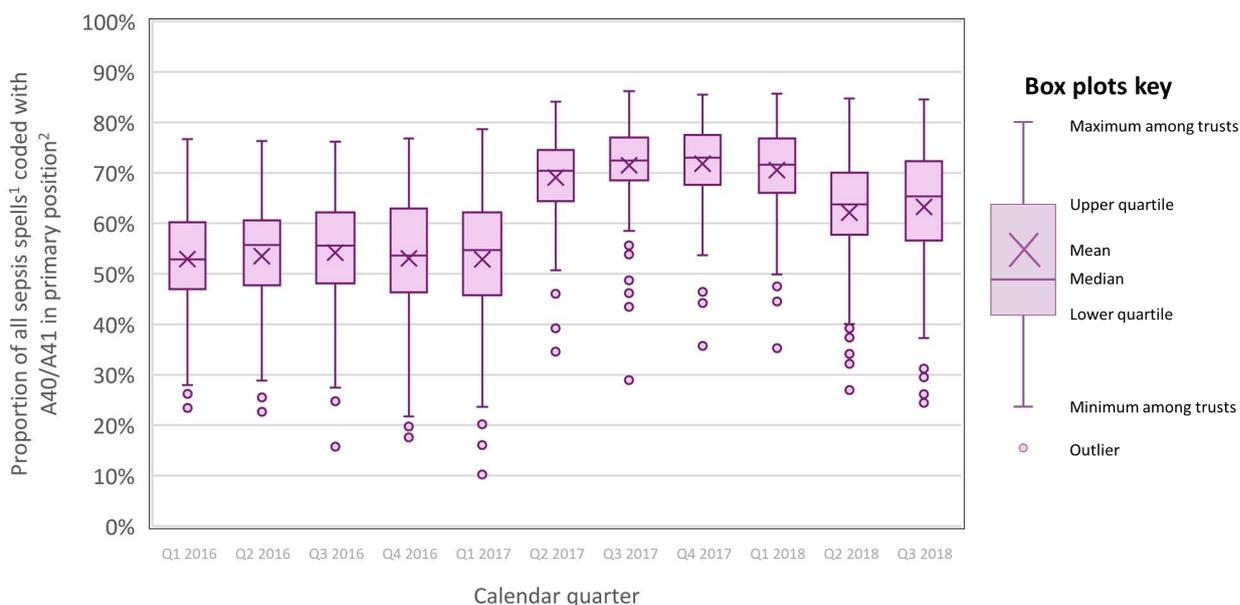
Figure 4 – Quarterly trend showing the variation between trusts in the proportion of all sepsis spells where A40/ A41 is coded in the primary position (Jan 2016 - Sep 2018)

While the period following the first coding change showed reduced variation in trust coding, there were still notable differences between trusts. The period between July and September 2017 showed the least trust variation, where the interquartile range (IQR) for the proportion of sepsis spells with a sepsis code (A40/A41) in the primary position of at least one episode within the spell across trusts was 8 per cent and the median was 72 per cent. Following the latest coding change in April 2018, which places more reliance on clinical judgement, there was a slight increase in trust variation. In the most recent quarter (July to September 2018), the IQR was 15 per cent, with a median of 65 per cent of sepsis spells with at least one episode coded with the sepsis code in the primary position.

Variation in how individual trusts code can affect the reliability of analysis conducted on a national level, as it can have an impact on national benchmarks for clinical outcomes and influence national tariffs. It is therefore important to try and reduce the national variation of sepsis coding practices.

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Impact on mortality ratios

Mortality ratios are determined by estimating the number of expected deaths based on case mix and comparing this with the number of actual deaths that occurred within a hospital. There are multiple diagnosis groups that make up these ratios, and therefore nationally consistent coding changes within a particular diagnosis group such as septicaemia are unlikely to seriously affect the overall measure. The multiple changes in sepsis coding and variation at a trust level may, however, influence the relative risk specifically for the septicaemia diagnosis group.

To calculate mortality ratios, the number of expected deaths is estimated based on the outputs from risk models run on historical data for patients in each particular diagnosis group, that are used to estimate each individual's risk of death. As such, the estimated risk of death for a particular patient within the septicaemia group is based on historical data for all patients that have been classified as having septicaemia.

Primary diagnosis is used to classify patients into diagnosis groups. Because the coding changes for sepsis have resulted in a greater proportion of spells coded with sepsis in the primary diagnosis position of the spell, this is likely to have altered the apparent case mix of patients classified within this group. While patients presenting with a true primary diagnosis of septicaemia are usually considered clinically critical, resulting in a direct admission to an intensive care unit/high dependency unit, patients that have a local infection who may now also be coded with sepsis in the primary diagnosis position may not be so severe. Changes like this can create problems over time as the cohort of patients used to estimate risk of death for this diagnosis group is different to the cohort of patients for which risks are being calculated.

The Hospital Standardised Mortality Ratio (HSMR) was originally developed by Professor Sir Brian Jarman at Imperial College London and was further refined by Dr Foster, based on guidance from the Dr Foster Unit at Imperial and used as an indicator of patient safety in the NHS alongside other mortality ratios. The HSMR is designed to account for coding changes over time in two ways:

1. The HSMR models are updated on a monthly basis to include new data. While there is a short period of time after coding changes where the data in the risk model does not reflect the current group of patients, this is corrected as new months of patient data are added to the models.

2. A 'year' parameter is included in the model to adjust for changes that occur over time. As such, if the risk of death for patients in the latest year of data has changed versus previous years, then the predicted risks for patients in hospital in later time periods will be adjusted to reflect this.

While these adjustments should correct for nationally consistent changes over time, when multiple changes occur in quick succession it is likely that fluctuations in the HSMR will be observed at a trust level while the model adjusts with the data.

The charts below show real data from selected trusts demonstrating how their HSMR changed over the period of the April 2017 sepsis coding change.
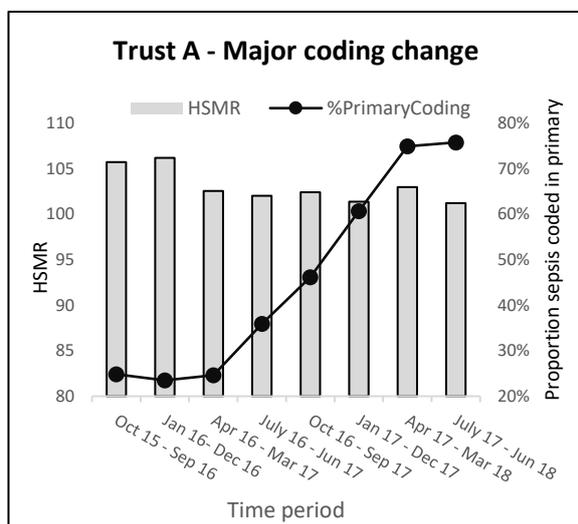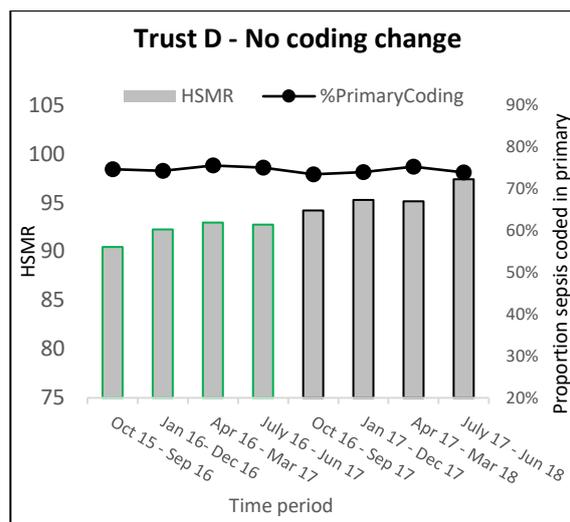

This trust had the **largest change** in sepsis coding patterns but its HSMR remained **within the expected range**.
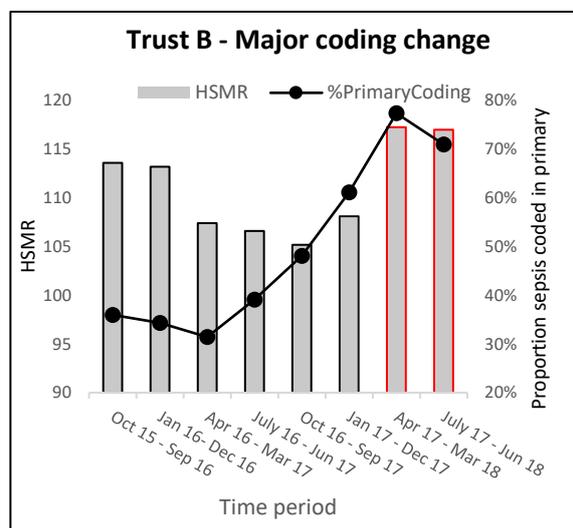
This trust had a **large change** in sepsis coding patterns and its HSMR changed from being **within expected** to being above expected.

Trust C - Minor coding change

Trust D - No coding change
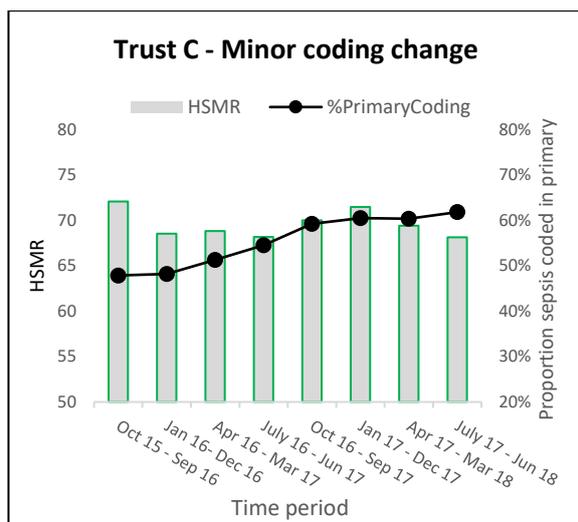
This trust had a **small change** in sepsis coding patterns but its HSMR remained below expected.

This trust had **no change** in sepsis coding patterns and its HSMR changed from being below expected to being **within expected**.

Figure 5 – Examples of how select trusts' HSMR changed over the period of the April 2017 sepsis coding change

The findings indicate that during the time of the single coding change, trust HSMRs remained relatively stable. Even with an extreme coding change, a trust's banding was not necessarily affected. However, situations where there are high levels of variation between trusts, as is the case for sepsis, can cause issues for trusts that do not code in line with the national trend. Risks are calculated using all trusts' data and are therefore likely to reflect how the diagnosis group has changed on a national level. Outliers who have an unusually high or low proportion of sepsis coded in the primary position are affected most, because it is possible that their septicaemia diagnosis group is made up of patients that have very different clinical conditions to the average patient within the group at a national level. It is therefore important that the coding of sepsis is standardised at a national level to avoid unintended consequences on the HSMR and other mortality measures.

Recommendations

1. Trusts should ensure that their documentation for clinical processes and coding practices for recording sepsis is accurate, clear, up to date and regularly reviewed. Universal processes should be mandated at a national level to avoid variation in interpretation and to preserve the validity of the national dataset, which has consequences on the quality and finances of all organisations.

2. Trusts' coding departments should work with their clinical teams to agree a clear internal process to identify which patients have sepsis. Part of this collaborative effort should include a clear agreement on how to distinguish between an identified local infection, such as a chest infection or urinary infection, vs. true sepsis signs.

3. Continued clinical research on the early and accurate diagnosis of sepsis is encouraged. Results may lead to improved early treatment pathways and can also help trusts develop processes to code a clinically valid sepsis diagnosis efficiently.

4. Continued national and regional sepsis events and workshops are encouraged. These events raise awareness of common issues and promote shared learning to improve clinical outcomes and processes.

Appendix 1 – Methodology

The analysis in this report is based on Hospital Episode Statistics data from NHS Digital and all data referenced is anonymised.

CALCULATING THE HSMR

The HSMR is shown for every quarter from September 2016 to June 2018, using the latest quarterly model that was applicable at the time.

Numerator: number of observed deaths within the 56 diagnosis groups making up the HSMR basket of diagnoses within the given time period.

Denominator: number of expected deaths within the given time period. The expected number of deaths is the sum of all the case-mix adjusted probabilities of mortality, calculated using a logistic regression model run at the end of each time period.

CALCULATING THE PROPORTION OF SEPSIS CODED IN THE PRIMARY POSITION ('%PRIMARYCODING')

The '%PrimaryCoding' indicates the proportion of all sepsis spells where ICD-10 codes A40 or A41 codes appear in the primary position of an episode. All sepsis spells are defined as all non-elective spells where ICD-10 codes A40 or A41 appear anywhere in any episode. The %PrimaryCoding is plotted for every quarter from September 2016 to June 2018.

Numerator: number of non-elective spells where ICD-10 codes A40 or A41 codes appear in the primary position of any episode for the time period shown (sum of spells over one calendar year).

Denominator: number of non-elective spells where ICD-10 codes A40 or A41 appear anywhere in any episode for the time period shown (sum of spells over one calendar year).