Introducing the Suspicion of Sepsis Insights Dashboard

Dr Matt Inada-Kim

Sepsis has never had more publicity, but remains difficult to define. Agreement on a definition is essential to monitor treatment initiatives. This article describes the new Suspicion of Sepsis Insights Dashboard as a practical tool for the front line.

Background

There is pressing need to understand the scale of antibiotic amenable infection in England, balanced against the use of antibiotics and resistance rates of commonly identified bacteria.[1]

There is wide variation in reported sepsis numbers, with national reported numbers ranging from 30,000 to 250,000 and deaths from 9,000 to 50,000.[2,3] This causes confusion, leading to widespread inaccurate media reporting.

High profile reported cases and evidence that suggests timely antibiotic treatment improves survival[4] led NHS England to set up a national sepsis commissioning for quality and innovation (CQUIN[5]) process. This has led to marked national improvement[6] in screening and rapid treatment in both emergency department and inpatient settings (Figures 1 and 2).

The challenge of accurately estimating case numbers

An outcomes measure to assess the effects of such improvements was required. This measure had to be reproducible, credible and well understood to those attempting to improve processes and outcomes at an academic, policy and practice level. However, although sepsis represents the most severe end of infection, it has no gold standard test and defining it fulfils the brief of a 'wicked problem'. It has had dynamic operational definitions over time (Systemic Inflammatory Response Syndrome, National Institute for Clinical Excellence (NICE) CG51 sepsis guidance, National Early Warning Scores [NEWS], quick Sequential Organ Failure Assessment Score [qSOFA][7]), variable interoperator thresholds, fluctuating awareness and inconsistent documentation. All these have led to major differences in estimates of numbers of septic patients.

It is well recognised that there have historically been inaccuracies in the reporting of sepsis through traditional coding mechanisms. An NHS Digital change in coding in 2017 saw an artificial doubling of reported numbers and halving of the mortality of sepsis in the UK (Figure 3).

It soon became clear that a proxy measure would be necessary and that to advance understanding of sepsis, infection needed to be defined from within administrative data.

Clinicians do not reliably document sepsis even when treating patients with obvious evidence,

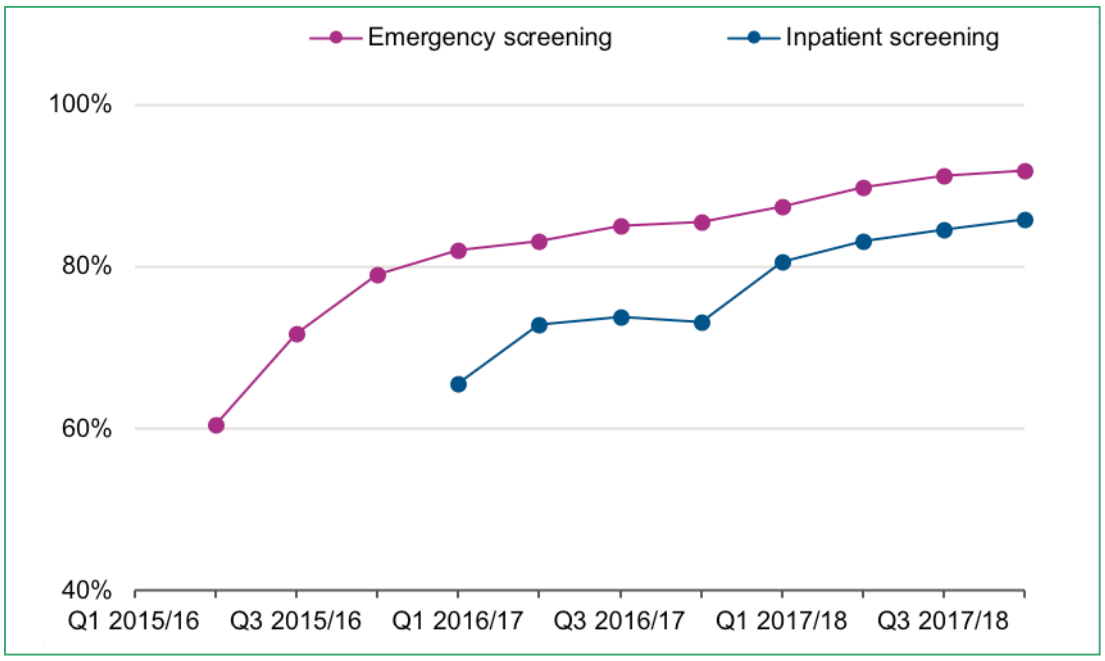

Figure 1: Percentage of patients screened for sepsis, emergency and inpatient screening, 2015/16–2017/18.

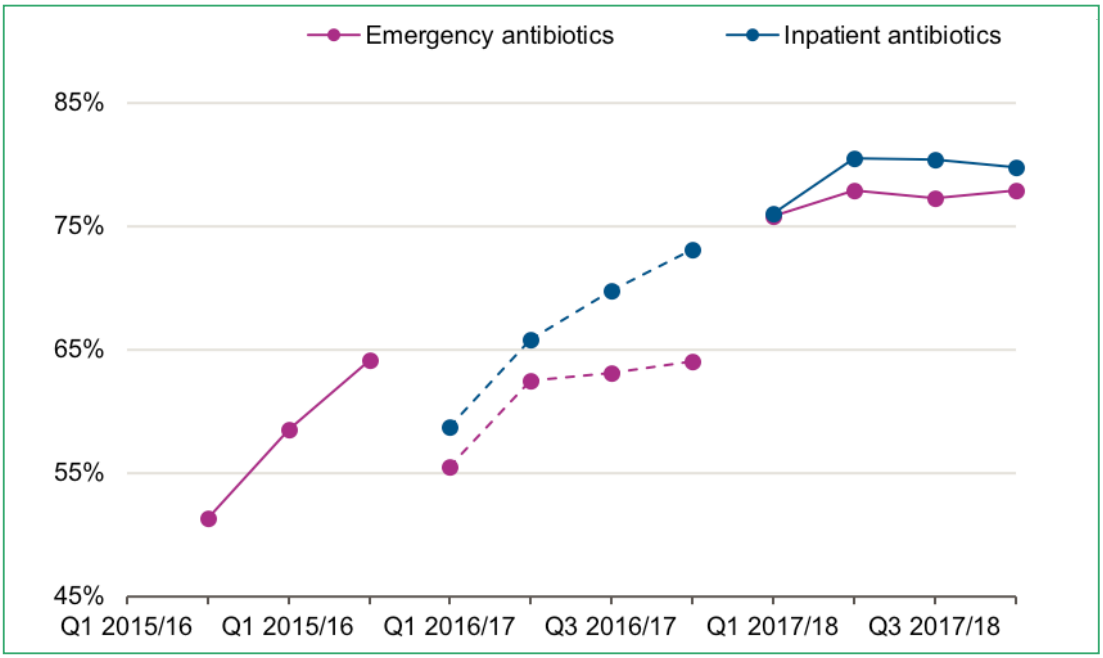

Figure 2: Percentage of patients screened for sepsis given emergency or inpatient antibiotics, 2015/16–2017/18.

but instead document the source of infection, which coders then label as an organ-specific infective pathology; for example chest infection, pneumonia, urinary tract infection or cellulitis.[8]

'When' a code is given to an admission episode also critically affects a code's accuracy. In England, there are three main time points for which codes can be allocated:

1. within four hours of attendance to A&E
2. within 24 hours of admission to intensive care unit (ICU)
3. at the end of the whole admission or at death.

The nearer the end of the admission the code is determined, the greater the veracity of the diagnosis – response to treatment, clinical conviction to treat and positive/negative investigation results can better inform the real reason for admission. For this reason, coding the reason for admission at discharge or death is more accurate.

Even when clinicians are clear and standardised in what definition they use for sepsis, there is still variability in how this is interpreted and operationalised. This is compounded in some countries where coding a patient with sepsis leads to increased remuneration.[9]

Furthermore, a label of sepsis doesn't fit the clinical scenario. The lack of an available sepsis test and need to treat expediently (particularly in physiologically unstable patients) mean clinicians do not treat sepsis per se; they treat when they suspect it and identify this group by their estimation that the patient in front of them is at high risk of bad outcomes.

An alternate view on sepsis is that it should be defined as 'bad infection'. A logical conclusion is to instead measure a proxy – the population that is admitted to hospital with a bacterial infection that is amenable to antibiotic treatment that can cause sepsis – or a suspicion of sepsis (SOS).[10] This is the only population that is less subject to the biases outlined above.

Suspicion of sepsis

The Suspicion of Sepsis Insights Dashboard comprises 250 clinically validated International Classification of Diseases (ICD) codes (ICD-10) that relate to emergency admission bacterial infection arising in all body systems and also include 'sepsis specific' codes such as A40 and A41.[11]

There is a multi-site SOS validation study underway (five sites reviewing the clinical notes of SOS-coded patients). There are also three completed studies:

- 1,040 CQUIN confirmed suspected sepsis cases that demonstrated 93.3% had an SOS code.
- A single site review of 35,000 admissions in six years of continuous analysis of all those with confirmed *Escherichia coli* (639) or *Staphylococcus aureus* (432) bacteraemias showing 86% had an SOS admission code. A follow-up study is planned to see if the remaining 14% represent hospital acquired infection.
- A single site review assessing NEWS versus qSOFA in those patients with SOS.[12] This showed that NEWS had an AUROC of 0.916 for mortality in less than 24 hours.

Obtaining SOS data is relatively easy and reproducible at local, regional and national levels. This enables assessment of outcomes in response to improvement strategies over time. It also provides a population to assess which sepsis screening tools are the best predictors of bad outcomes.

A measurable population is both stable over time and resonates well with the general public, clinicians and administrators at local, regional and national levels.

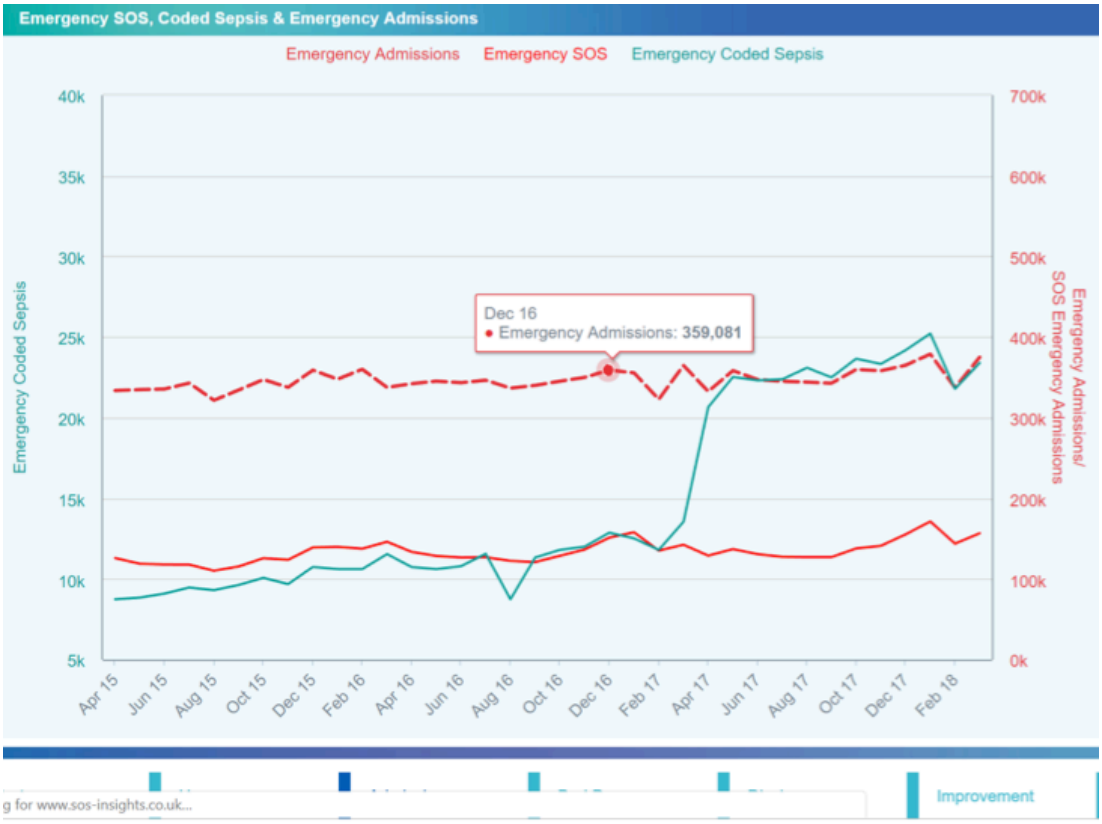

Figure 3: Emergency SOS, coded sepsis and emergency admissions, April 2015–February 2018.

The result: an SOS dashboard

Imperial College Health Partners[13] and the Patient Safety Measurement Unit[14] have created an SOS dashboard that is open access to everyone. A video demonstrating it in action can be seen at: https://vimeo.com/293910760

Future developments are now being planned for refinement of the codes, a benchmarking feature, adding a specific surgical site SOS, and exploring the addition of antimicrobial prescribing and resistance rates for each acute trust, clinical commissioning group and region.

Conclusion

SOS enables transparent benchmarking at local, regional and national levels over time, to track outcomes over time. This enables users to ascertain those organisations or regions that have improved most significantly. It also allows for the creation of statistical process and control charts to ascertain why and what was done, and helps with the dissemination of key interventions that appear to lead to improvement nationally.

In the future, developments will enable a single organisational view of SOS admissions, antibiotic administration and resistance rates/complications. This will give a grounded whole-system view of processes, outcomes and balancing measures in the fight against infection.

References at www.rcpath.org/bulletin-apr19

Dr Matt Inada-Kim
National Clinical Advisor Sepsis,
NHS England