Measuring Improvements in Sepsis Mortality using Statistical Process Control

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The **Quality Improvement Division** works in partnership with patients, families and all who work in the health system to improve the quality and safety of care. **Measurement for Quality** is one of the six key drivers of the Framework for Improving Quality in our Health Service.

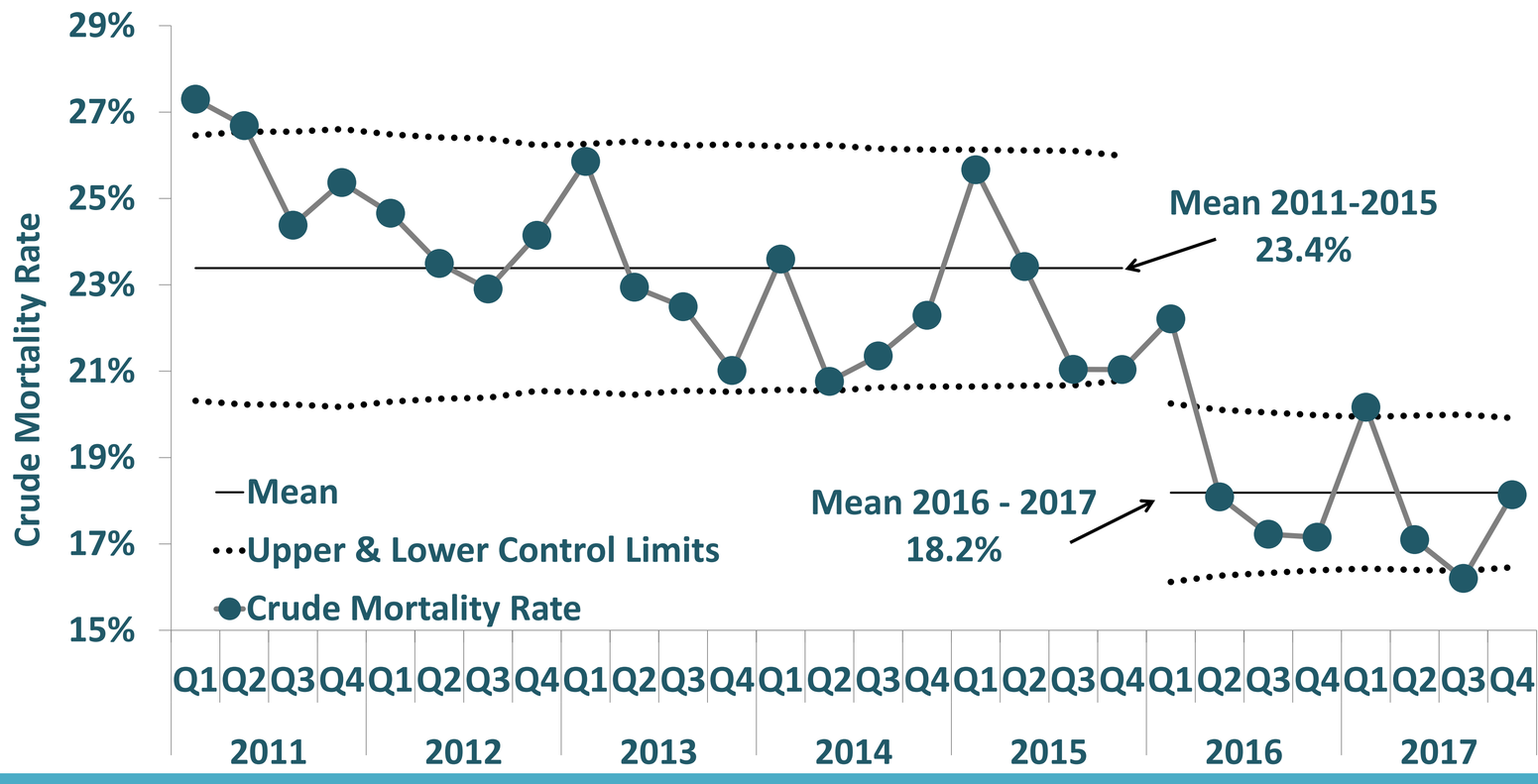
The aim of the **National Sepsis Programme** is to reduce mortality and decrease healthcare usage from sepsis.
The availability and intelligent use of high quality data on sepsis incidence and mortality is essential for achieving these goals.

Methods

The traditional methods of analysing data generally do not require statistical expertise. **Statistical Process Control** (SPC) methods require knowledge of the appropriate type of SPC chart to use, and statistical calculations to determine the upper and lower control limits showing the expected level of variation over time or across the system.

The Quality Improvement Division collaborated with the National Sepsis Programme to analyse, interpret and report data on patients with sepsis based on these principles. SPC methods have been applied to Hospital Inpatient Enquiry data for patients with sepsis, and used to facilitate greater interpretation and knowledge of the variation in sepsis mortality over time and across hospitals.

Figure 1: The national in-hospital mortality rate for adult patients with a diagnosis of sepsis, quarterly data, 2011 - 2017



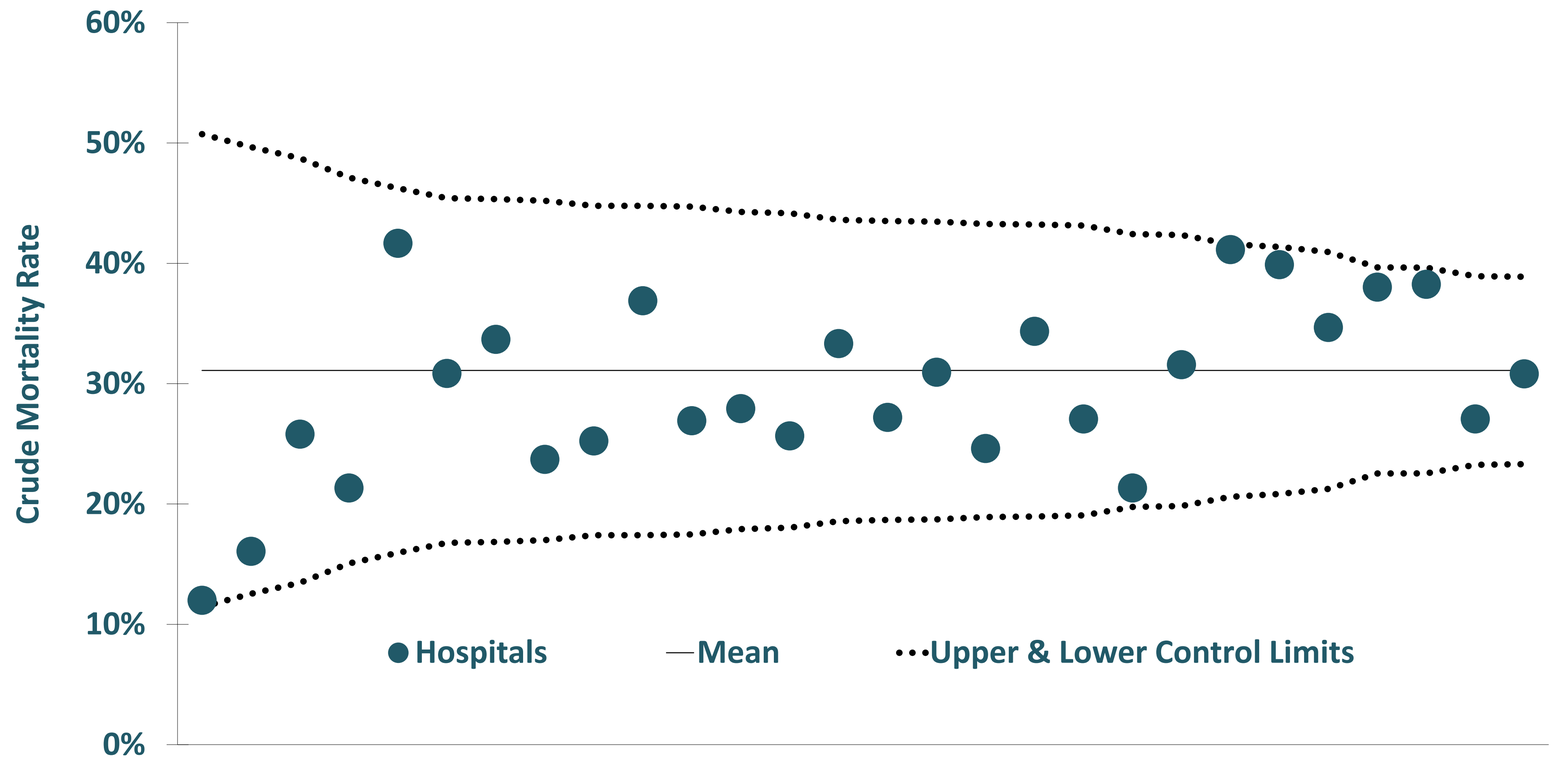
How this improves our understanding:

- ✓ **We see a decrease in the mortality rate, with a shift from 23.4% between 2011-2015 to 18.2% between 2016 & 2017**
- ✓ **We see seasonal variation, with winter peaks in mortality**
- ✓ **We see the level of natural variation in mortality that occurs over time.**

How this improves our understanding:

- ✓ **We see that the average mortality rate for patients with sepsis and admission to a critical care area in 2017 was 31%**
- ✓ **We see the expected level of variation among hospitals**
- ✓ **We see that all hospitals are within the control limits meaning that differences in mortality rates are due to variation likely to have occurred by chance.**

Figure 2: The in-hospital mortality rate for adult patients with a diagnosis of sepsis and admission to a critical care area, by hospital, 2017



Benefits & Outcomes

While SPC methods are more complex than other methods of analysis, the benefits exceed the additional efforts required. Analysis of trends in sepsis mortality has shown a clear signal of improvement between 2011 and 2017 and patterns of seasonality that are within an expected range of variation. Using point in time comparisons for this data could lead to overreaction to normal variation.

For example, in-hospital mortality for patients with sepsis increased from 16.2% in Q3 2017 to 18.1% in Q4 2017 (an increase of 12% related to seasonality). Such an increase presented in isolation may be interpreted as a signal that mortality has started to rise and that the gains achieved are being lost. The SPC chart improves our understanding of the variation in mortality and prevents potential overreaction to changes.

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Source:
Figures 1 and 2 are based on HIPE data and are published in the National Sepsis Report 2017.

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