

### **Incorporating a new and improved way to view data**

For the first time, in 2018, the HSE is visually presenting data using a method known as Statistical Process Control (SPC) charts to provide information in a format that enhances quality of care evaluation and promotes its improvement. This is collaboration between the Quality Improvement Division and the Corporate Reporting team.

There are two common mistakes in interpreting data:

1. Interpreting noise (or random variation within a normal range) as a signal requiring action.
2. Failing to detect (and react if appropriate) to a signal when it is present.

Methods such as comparing one time period against another can lead to these mistakes.

Previously, the HSE introduced time series charts (charts which display data over time) to help overcome this challenge. Statistical Process Control (SPC) methodology is the next step in this evolution. SPC charts facilitate better interpretation and can prevent both the mistake of overreaction and failure to react when necessary.

Rates of health care associated infections (S. aureus bloodstream infection and C. difficile infection) and admissions to Child & Adolescent Mental Health Units have been analysed and displayed using Statistical Process Control (SPC) methods. An SPC chart consists of data plotted in order, usually over time (months for the HCAI and CAMHS data). It includes a centre line based on the average of the data. It also includes upper and lower control limits based on statistical calculations (3 sigma deviations from the average).

SPC charts are used internationally in healthcare to distinguish between special and common causes of variation. Common cause variation is the expected or random variation that occurs throughout the healthcare system. Special cause variation is unusual or unexpected variation that can occur because of specific circumstances, and is unlikely to have occurred by chance alone. The probability of any data point falling outside of the control limits due to random variation is very small, and is a signal of special cause or unexpected variation. In addition to a point outside of the control limits, there are four other SPC rules which suggest variation very unlikely to occur by chance alone. Identifying and

examining special cause variation may provide an opportunity to learn from the cause of the variation and to take action that will lead to an improvement.

An SPC funnel plot is an SPC chart showing variation across a system (e.g. variation among hospitals). Data are ordered by denominator size rather than by time. In the case of the HCAI and CAMHS data hospitals are ordered by the total bed days used from lowest to highest. Data points that are above or below the control limits in a funnel plot are an indication of special cause variation.

Statistical Process Control methods are already in use in some hospitals and areas within the HSE. In addition the National Performance Oversight Group used SPC in the most recent performance review cycle. Feedback from these groups has been extremely positive with the Director General commenting – ‘once you understand the SPC, you will never want to go back to RAG or other methods of analysis and display’. Given the positive feedback on the usefulness and enhanced interpretation of data, QID will continue to work in partnership to extend the use of Statistical Process Control methods in HSE. Further information on SPC and resources are available on [www.hse.ie/eng/about/who/qid/](http://www.hse.ie/eng/about/who/qid/).

### HCAI Rates

Hospital acquired new cases of *S. aureus* bloodstream infection per 10,000 bed days used

Figure 1 below is a statistical process control chart showing the national rate of hospital acquired new cases of *S. aureus* bloodstream infection per 10,000 bed days used between January 2017 and June 2018. Pink data points indicate special cause variation i.e. variation that cannot be attributed to chance.

Figure 1: National rate of hospital acquired new cases of *S. aureus* bloodstream infection

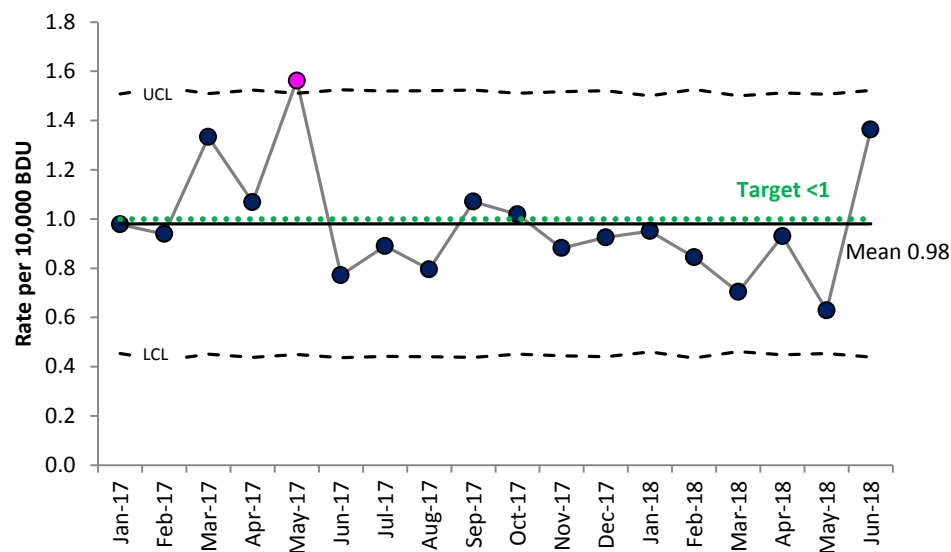


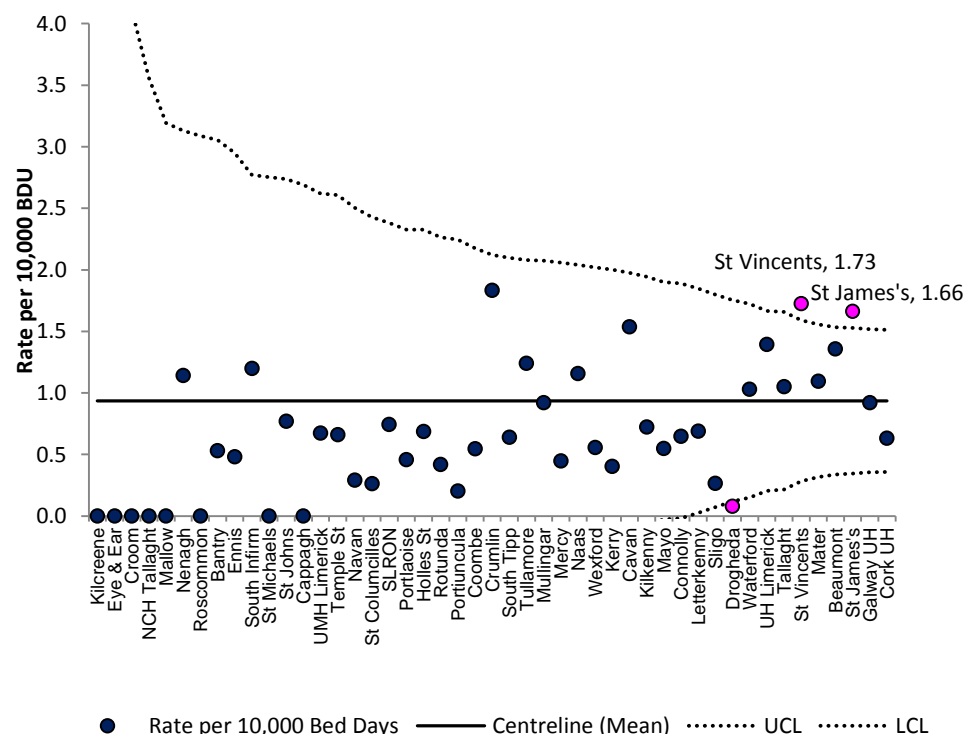
Figure 1 shows that the average rate of hospital acquired new cases of *S. aureus* bloodstream infection since January 2017 is 0.98 cases per 10,000 bed days used. This equates to an average of 30 cases per month. The target for 2017 is less than 1 case per 10,000 bed days.

The variation in the rate of hospital acquired new cases of *S. aureus* bloodstream infection from month to month is within the expected range with the exception of May 2017 where the rate of 1.57 cases per 10,000 bed days was above the upper control limit. This is a signal of special cause variation and indicates an unexpectedly high number of cases in that month. It is expected that the monthly rate will fluctuate between 0.45 and 1.5 cases per 10,000 bed days by chance

alone. The rate of 1.36 per 10,000 for the most recent month (June 2018) is within this expected range and does not indicate an unusual increase in the rate of *S. aureus* bloodstream infections in that month.

Figure 2 below is a funnel plot showing the variation in the rate of hospital acquired new cases of *S. aureus* bloodstream infection among hospitals for the past 12 months (July 2017 – June 2018).

Figure 2: Rate of hospital acquired new cases of *S. aureus* bloodstream infection by hospital



Note: Data for Louth County Hospital is not displayed due to the low number of bed days used.

The rates for all hospitals were within the expected range of variation for this indicator, with the exception of St Vincent's Hospital and St James's Hospital where the total rates of hospital acquired cases of *S. aureus* bloodstream infection over the past 12 months were above the upper control limit. This is unlikely to have occurred by chance alone and is an indicator of unexpected

variation. The rate for Our Lady of Lourdes Hospital Drogheda was below the lower control limit. The rates for all other hospitals were within the control limits.

### Hospital acquired new cases of C. difficile infection per 10,000 bed days used

Figure 3 below is a statistical process control chart showing the national rate of hospital acquired new cases of C. difficile infection per 10,000 bed days used between January 2017 and June 2018.

Figure 3: National rate of hospital acquired new cases of C. difficile infection

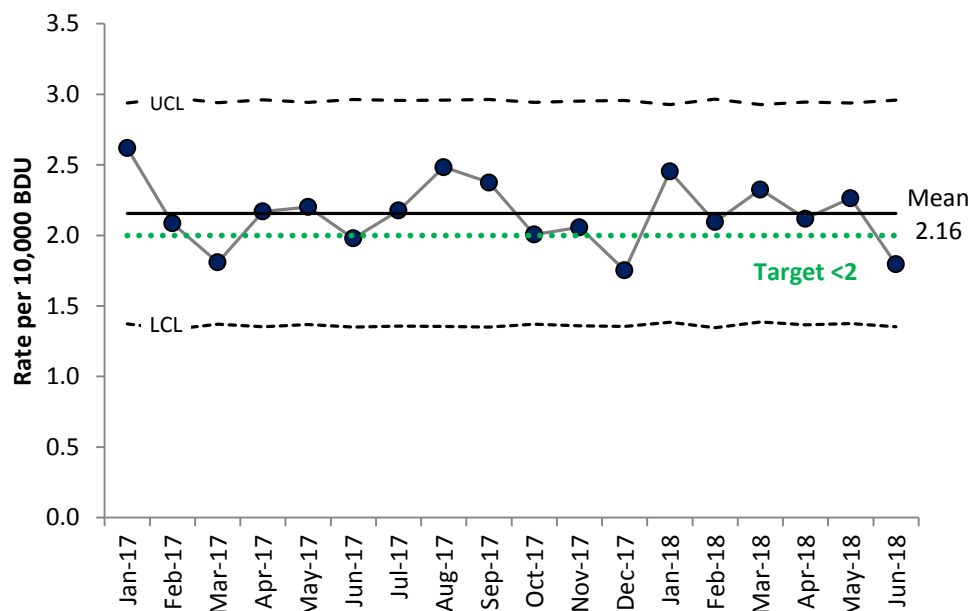
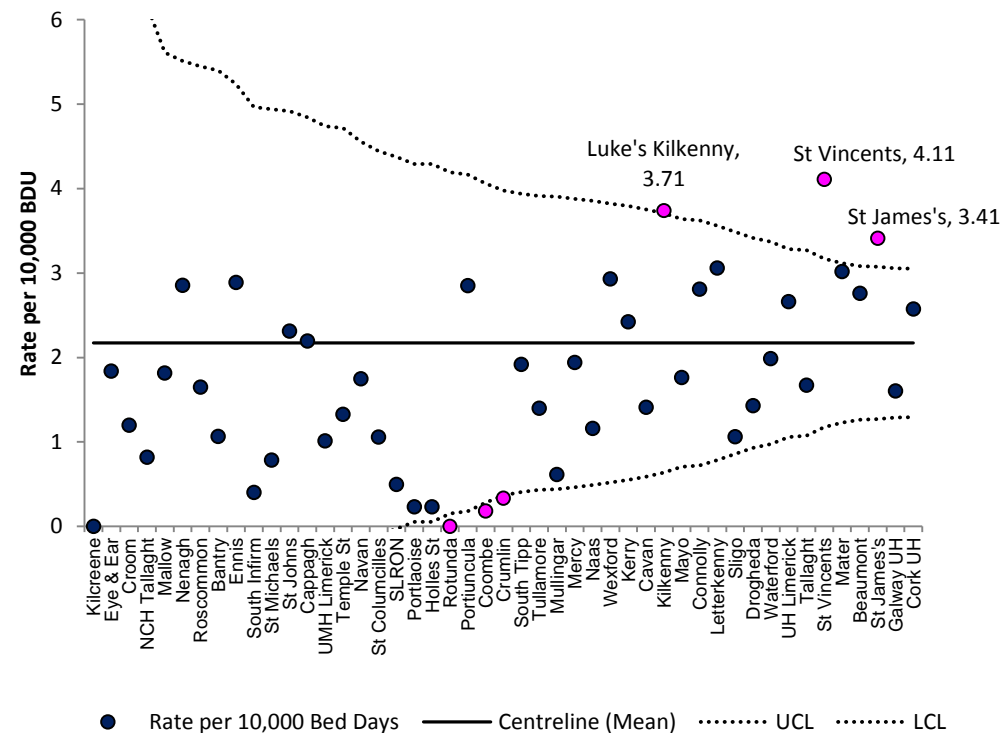


Figure 3 shows that the average rate of hospital acquired new cases of C. difficile infection since January 2017 is 2.16 cases per 10,000 bed days used. This equates to an average of 66 cases per month. The target for 2017 is less than 2 cases per 10,000 bed days.

The variation in the rate of hospital acquired new cases of C. difficile infection from month to month is within the expected range; i.e. the rate is stable. No data points fall outside the control limits. It is expected that the monthly rate will fluctuate between 1.4 and 3 cases per 10,000 bed days by chance alone.

Figure 4 below is a funnel plot showing the variation in the rate of hospital acquired new cases of C. difficile infection among hospitals for the past 12 months (July 2017 – June 2018).

Figure 4: Rate of hospital acquired new cases of C. difficile infection by hospital



Note: Data for Louth County Hospital is not displayed due to the low number of bed days used.

Figure 4 shows that the total rates of hospital acquired new cases of C. difficile infection over the past 12 months for St Vincent's Hospital, St Luke's Hospital Kilkenny and St James's Hospital were above the upper control limit, indicating an unexpectedly high number of cases. The rates for the Rotunda Hospital, the Coombe Women and Infants University Hospital, and Our Lady's Children's Hospital, Crumlin were below the lower control limit. The rates for all other hospitals were within the expected range of variation for this indicator.

## Child & Adolescent Mental Health Services (CAMHS)

Figure 5 below is a statistical process control chart showing the national rate of admissions of children to CAMHS inpatient units as a proportion of the total admissions of children to mental health inpatient units between January 2017 and June 2018.

Figure 5: National percentage of admissions of children to CAMHS

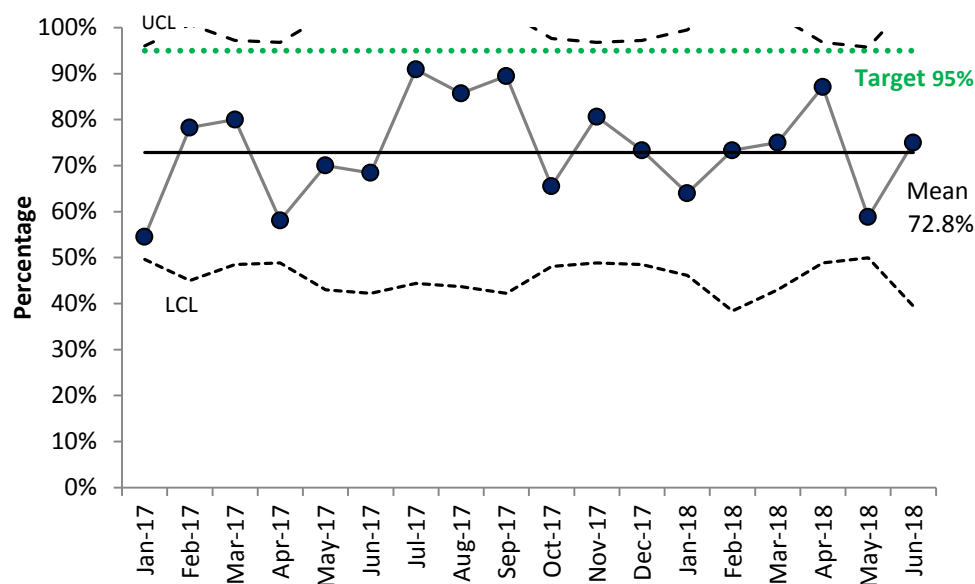


Figure 5 shows that the national rate of admissions of children to CAMHS inpatient units as a proportion of the total admissions of children to mental health inpatient units since January 2017 is 72.8%. There are an average of around 25 admissions of children per month to HSE mental health inpatient units, and so this equates to an average of almost 7 admissions of children to adult mental health inpatient units each month. The target for 2017 is for 95% of admissions of children to be to CAMHS units.

The variation in the rate of admissions of children to CAMHS units from month to month is within the expected range; i.e. the rate is stable, although below the target. No data points fall outside the control limits. Due to the relatively small number of admissions per month, it is expected that the monthly rate will fluctuate between approximately 45% and 100%. Therefore the target may be

achieved on occasion by chance alone and may not necessarily indicate a real improvement.

Figure 6 below is a statistical process control chart showing the national rate of bed days used in CAMHS inpatient units as a proportion of the total bed days of children in mental health inpatient units between January 2017 and June 2018.

Figure 6: National bed days used in CAMHS units as a percentage of total bed days

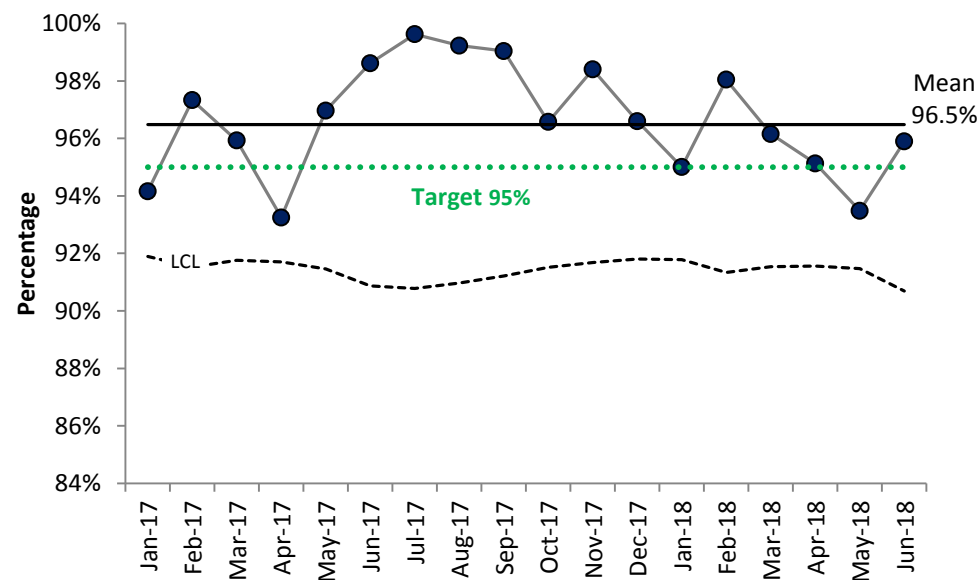


Figure 6 shows that since January 2017, 96.5% of bed days used by children in HSE mental health inpatient units have been in CAMHS inpatient units. This is above the target of 95%. This equates to an average of around 1,700 bed days of children per month in HSE mental health inpatient units, with 60 of these spent in adult mental health inpatient units each month.

The variation in the proportion of bed days in CAMHS units from month to month is within the expected range; i.e. the rate is stable. No data points fall below the lower control limit (there is no upper control limit in this chart). The average rate of 96.5% is above the target of 95%, but it can be expected that the monthly rate

will fluctuate between approximately 91% and 100%. This means that the rate may occasionally fall below the target while remaining above the lower control limit due to chance alone.

Figure 7 below is a funnel plot showing the variation in the rate of bed days used in CAMHS inpatient units as a proportion of the total bed days rate among CHOs for the most recent 3 months (April - June 2018).

**Figure 7: Bed days used in CAMHS units as a percentage of total bed days by CHO**

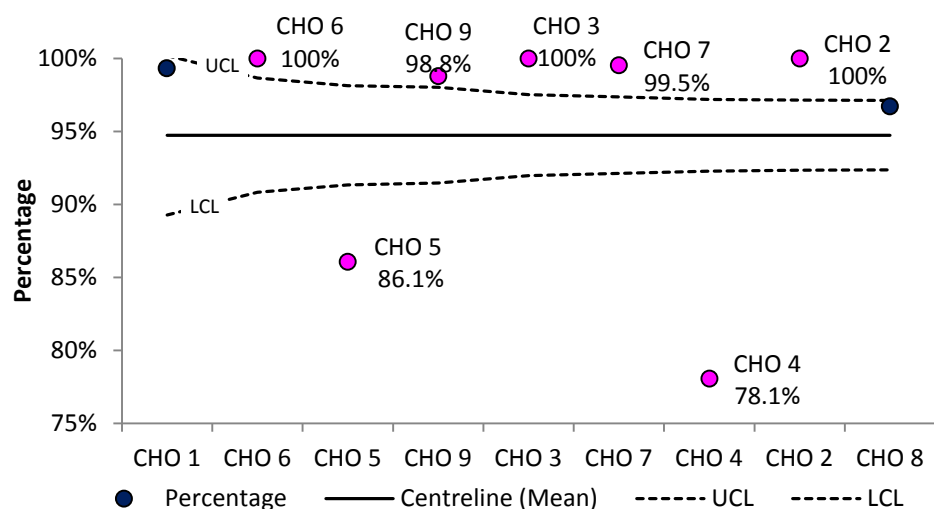


Figure 7 shows that the variation in the proportion of bed days used in CAMHS units among CHOs over the last 3 months is greater than expected, with the rates for 7 of the 9 CHOs falling outside the control limits. The rates for CHOs 2, 3, 6, 7 and 9 were above the upper control limit indicating performance that is better than expected relative to the national average. The rates for CHOs 4 and 5 are below the lower control limit indicating an unexpectedly low rate of bed days used in CAMHS unit as a percentage of total bed days in these CHOs. This variation is unlikely to have occurred by chance alone.