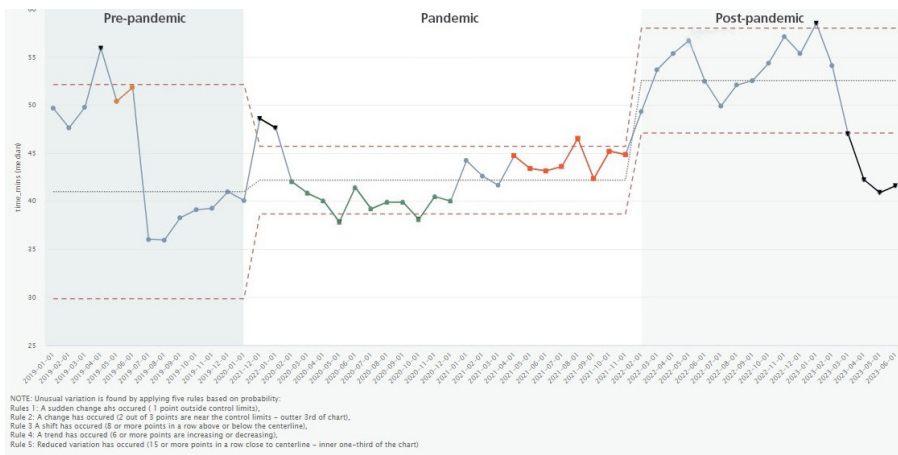




Highlighting meaningful change

Frequently asked questions about statistical process control



New!

The charts are built so you can detect **meaningful change** amid the unique circumstances (pre-pandemic; pandemic; and post-pandemic) at emergency departments in recent years.

1. What is statistical process control (SPC)?

Statistical process control is an advanced analytical technique that the Health Quality Council of Alberta uses on our FOCUS on Healthcare website. SPC is used to help you determine what variation is worth investigating so you know where to direct your quality improvement effort.

2. What is the purpose of using statistical process control to analyze the data?

Statistical process control, or SPC, is a methodology that allows you to learn from patterns of variation. It can be used to make evidence-informed decisions about actions. In an environment where our systems are complex and constantly changing, where everything varies to some extent, and where improvements happen over time, SPC can show you when change is meaningful and worth paying attention to.

3. What are control charts and why should we use them?

Control charts are the SPC tools by which evidence-informed knowledge is built. Control charts allow us to plot data over time, and differentiate between results that vary naturally/randomly (i.e., **expected variation**) and results that indicate a meaningful change has occurred (i.e., **unexpected/unusual variation**). Expected variation is natural to the system and outside of your control, so investigating and taking action on expected variation is not helpful and can be wasteful. Unusual variation results from things that are not usually part of the system. These changes are worth investigating further and potentially acting on to deliver or sustain improvements. Unusual variation arises because of specific circumstances and, as they aren't naturally part of the system, they can be identified and either eliminated (if the change is negative) or maintained (if the change is desirable).



4. What do the lines on the chart mean?

Each control chart has three reference lines to help you learn from variation in the data. The reference lines are:

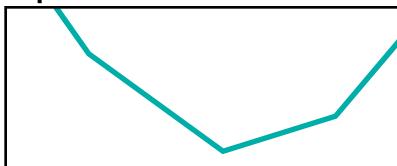
- **Centre reference line:** The average, represented by the mean of the data points on the chart.
- **Upper and lower reference lines:** The control limits, which define the range of expected variation for each control chart.

Control limits are also known as process limits. Limits are not set by user judgement – they are objectively calculated by measuring the average variability in the data for the measure being reported.

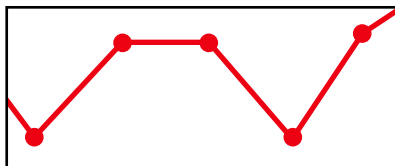
5. How do you know if the data shows expected or unusual variation

If the data shows expected variation, the results line in the chart will be blue. If the data indicates unusual variation, that section of the results line will be red. The legend below indicates how this appears on the charts:

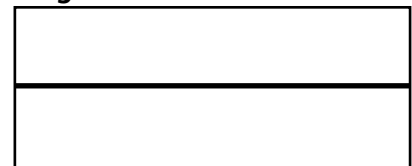
Expected variation



Unusual variation



Target line



Unusual variation is found by applying five rules based on probability. The rules are:

- 1) **A sudden change has occurred:** 1 point outside the control limits
- 2) **A change has occurred:** 2 out of 3 points are near the control limits (in the outer one-third of the chart)
- 3) **A shift has occurred:** 8 or more points in a row above (or below) the centreline
- 4) **A trend has occurred:** 6 or more points in a row increasing or decreasing
- 5) **Reduced variation has occurred:** 15 or more points in a row close to the centreline (in the inner one-third of the chart)

Note: We've adopted the five rules listed above because they are recommended for general use with control charts displaying healthcare data (Health Care Data Guide: Learning from Data for Improvement. Provost LP, Murray SK. Page 116).

6. Does expected variation mean that everything is good?

No, when a chart displays expected variation it just means that, if nothing changes, you can expect your data to continue varying randomly between the plotted control limits into the future. Whether the current levels of performance are acceptable is a discussion that should consider targets, benchmarks, factors specific to the service area, etc.