

Run charts

Overview

Observing patterns of data over time can help us understand how well a process or system is performing and if any improvements are being sustained. Run charts (sometimes called trend charts or time series charts) are a simple tool that display data over time. They are one of the most important tools in quality improvement. Using run charts has a variety of benefits:

- They help teams formulate aims by depicting how well (or poorly) a process is performing.
- They make progress visible for key improvement measures.



- They help determine if changes have resulted in improvement.
- They help determine if improvements have been sustained over time.

How to create a run chart

Run charts can be created in many ways – the simplest is to simply draw one on a white board or paper. They can be started with only one data point.

Elements of a run chart

X-axis – time series, for example, week, month or year

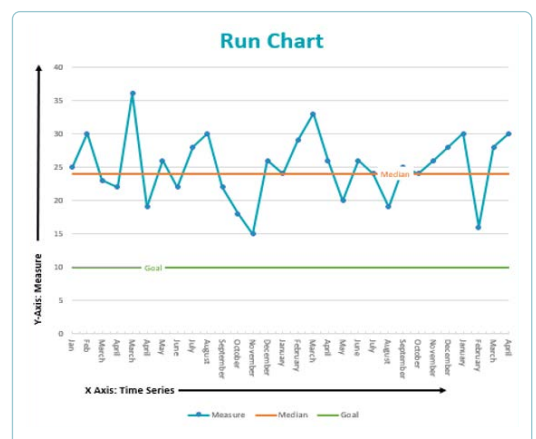
Y-axis – the measure you are focusing on

The centre line is a horizontal **median line**. The median represents the middle value of the data set and is only added to a run chart once 10 data points are available.

A **goal line** (aspirational target) can also be included as a horizontal line to indicate the desired direction and target of the chart.

A run chart works best if there are at least 10 data points, for example, 10 days of data or 10 audits/observations.

Figure 1. Anatomy of a run chart



Rules for interpreting a run chart

Run charts use statistical principles to begin to differentiate between common and special cause variation, providing a systematic approach for understanding the impact of changes in a process or system over time.¹

- **Shift:** a shift in the process is indicated by **six** or more consecutive data points all either above or below the centre median line. Skip values that fall on the median and keep counting (values on the centre line/median do not add to or break a shift).
- **Trend:** a trend is indicated by **five** or more consecutive data points all going up or down. If the value of two or more consecutive points is the same, ignore one of the points when counting (like values do not add or break a trend).

- **Astronomical point:** a data point that is an obviously, unusually, and blatantly different value (an outlier). Remember, every data set will have a highest and lowest data point – this does not make them astronomical points.

A shift, trend or astronomical data point are all 'signals' special cause variation and should be investigated to gain a better understanding of the process under review.

For a more statistically robust understanding of your system, its stability or if you have more than 30 data points a control chart is required. For more information see understanding variation and control chart resources

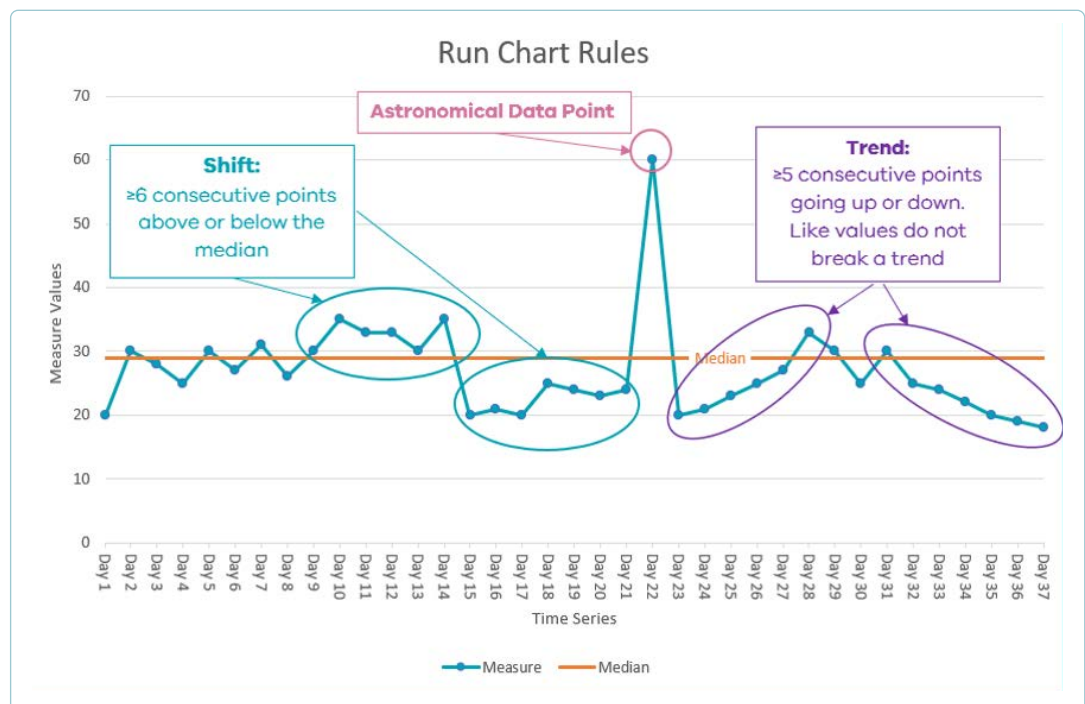


Figure 2: Run chart rules

¹This guide to the run chart rules is based on Lloyd & Provost (2011): The Health Care Data Guide – Learning from Data for Improvement, Chapter 3

How to interpret a run chart

In the example below (Figure 3), the infection rate of a particular ward is monitored every month. New systems and processes were introduced onto the ward in May and the team have set a stretch goal (an aspirational target they want to achieve) of 1% infections per month.

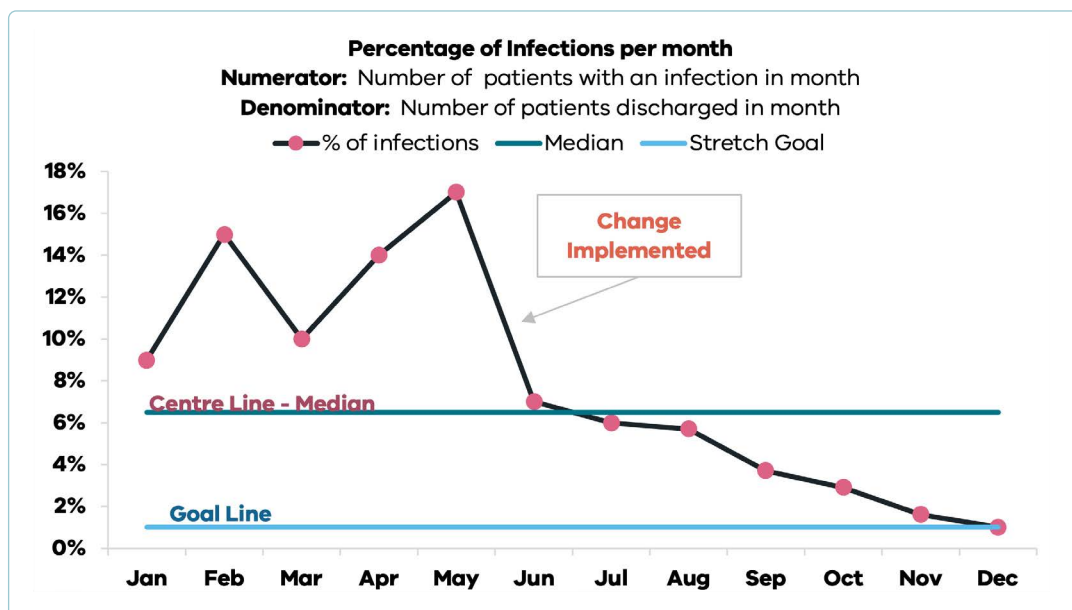


Figure 3: Run chart example – infection rate over time

Interpretation of the run chart:

- There was a **trend** from May – December where the rates decreased every month.
- There was a **shift** that occurred between July – December

The new systems resulted in a desired downward trend (decrease) in the infection rate. In December the team achieved their goal of 1% infection. Continued monitoring and more data will be needed to determine if the results are sustainable.

Additional resources

To learn more about Quality Improvement you can access the following resources:

- [SCV Quality Improvement Toolkit](#)
- [Institute for Healthcare Improvement website](#)
- [NSW Clinical Excellence Commission Quality Improvement Tools](#)

Video Resources

- [IHI Using Run and Control Charts to Understand Variation by Robert Lloyd](#) (56mins)

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