STEP 3: RUN CHARTS

Run charts allow you to:
- Display data to make process performance visible
- Determine if a change resulted in improvement
- Assess whether improved performance has been sustained

Run charts are line graphs where a measure is plotted over time, often with a median (the middle value of those plotted so that half are above and half are below). Changes made to a process are also often marked on the graph so that they can be connected with the impact on the process.

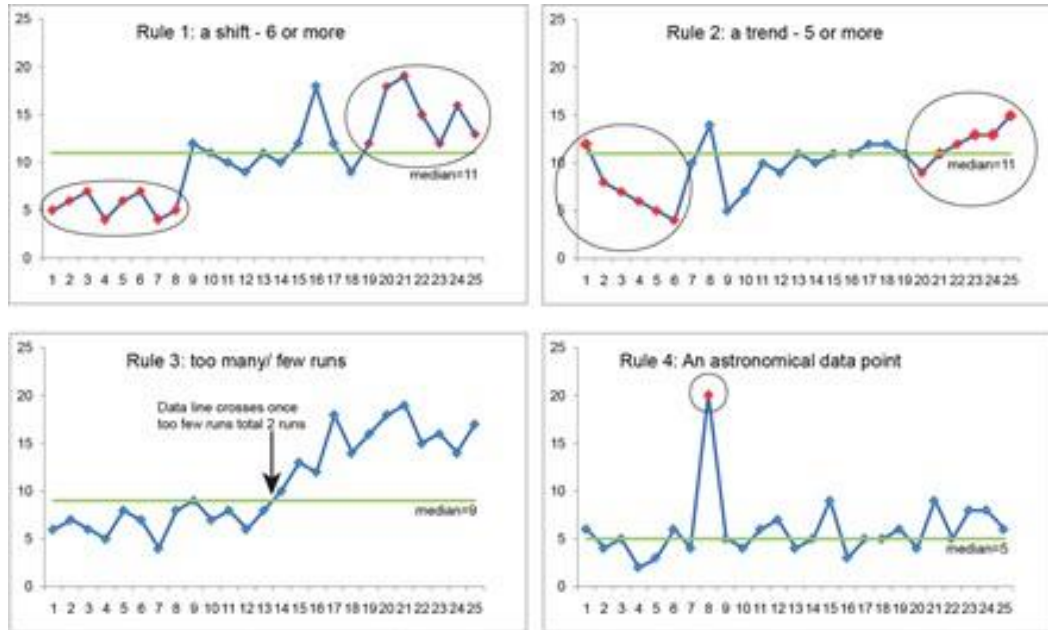Average length of stay (ALOS) in Intensive Care Unit (days)
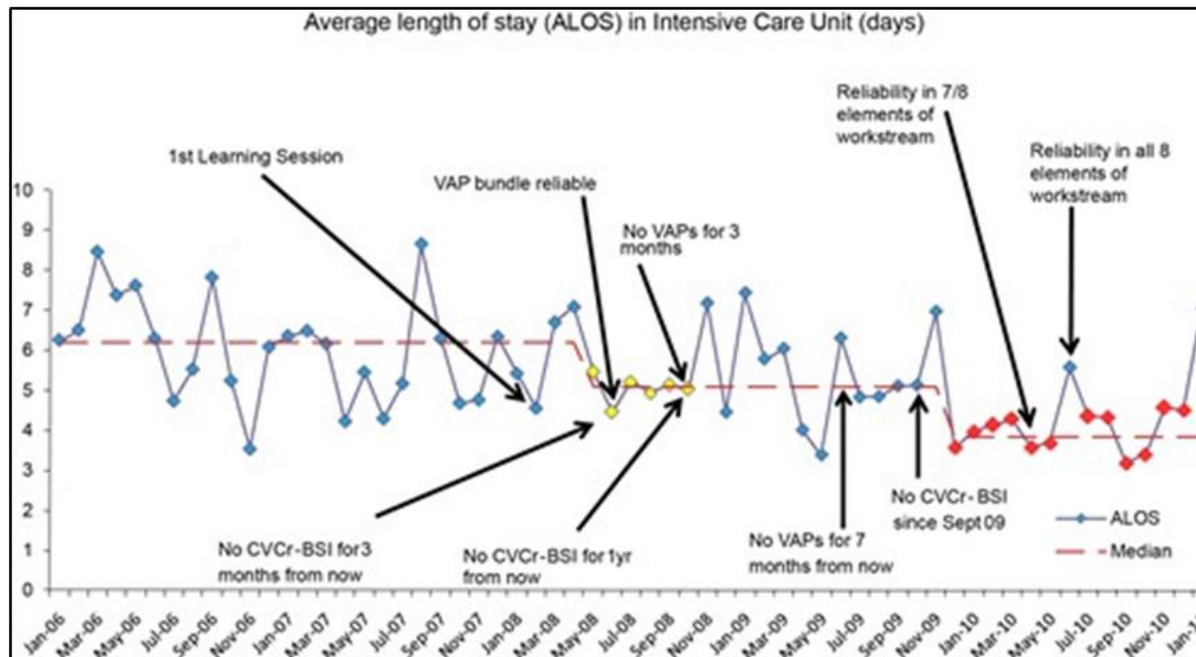
This is an example of a run chart. The average length of stay in intensive care unit is plotted for each month. During the months, comments and arrows are added when certain interventions or tests of change (Covered in **STEP 4**) are introduced. Visually, this will show you if a reduction/increase is occurring due to the change put in place. However, there are some rules you need to follow when determining if a change is actually the cause of improvement. These rules are listed below.

Rules for identifying non-random variation

If we have at least 10-12 data points on our graph, run charts can also be used to distinguish between random and non-random variation using four simple rules.

Non-random variation can be recognised by looking for:

1. **A shift:** Six or more consecutive data points either all above or below the median. Points on the median do not count towards or break a shift.
2. **A trend:** Five or more consecutive data points that are either all increasing or decreasing in value. If two points are the same value ignore one when counting.
3. **Too many or too few runs**: A run is a consecutive series of data points above or below the median. If there are too many or too few runs (i.e. the median is crossed too many or too few times) that's a sign of non-random variation. You need to look up a statistical table (see Perla et al, 2011) to see what an appropriate number of runs to expect would be. An easy way to count the number of runs is to count the number of times the line connecting all the data points crosses the median and add one.
4. **An astronomical data point**: A data point that is clearly different from all others. This relies on judgement. Every data set has a highest and lowest. They won't necessarily be an astronomical data point. Different people looking at the same graph would be expected to recognise the same data point as astronomical.

Rule 1: a shift - 6 or more
median=11

Rule 2: a trend - 5 or more
median=11

Rule 3: too many/ few runs
Data line crosses once
too few runs total 2 runs
median=9

Rule 4: An astronomical data point
median=5

Since using these rules requires you to have 10-12 data points at least on your run chart it is important to collect data as frequently as possible. If you collect data only once a month that would be 10 months, if weekly, 10 weeks (2½ months). However this needs to be balanced with keeping denominators (the number of values contributing to each data point) for percentages (or rates) above ten or so to minimise random variation due to small sample size.