

Run Charts

“A run chart is a graphical display of data plotted in some type of order” (*Provost et. al. 2008. Data Guide p3-1*). Run charts are primarily used to answer whether the change made has resulted in improvement. Their use in improvement activities are to:

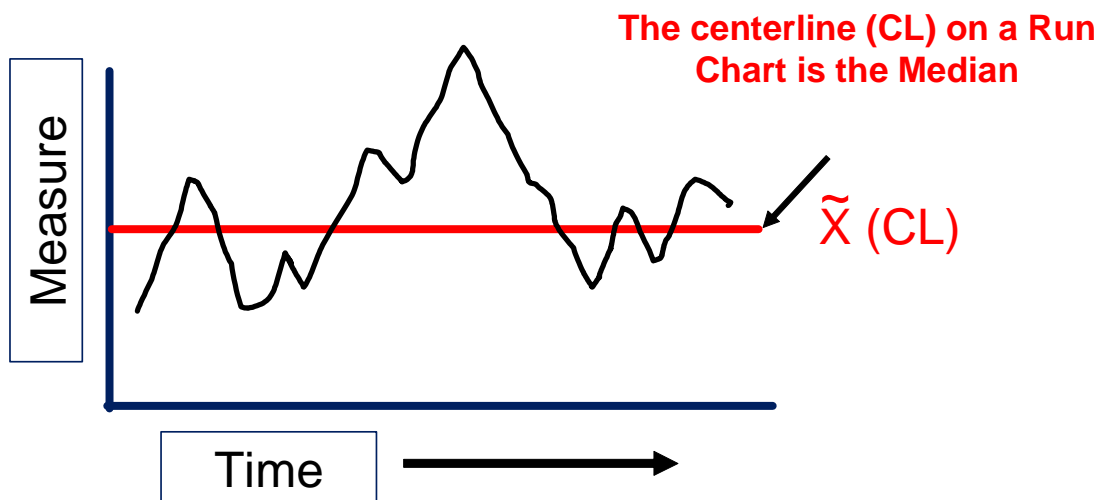
- Establish if a change resulted in improvement
- Display data to make process performance visible
- To inform if any improvement noted is being sustained
-

Elements of a Run Chart

A run chart demonstrates a measurement on the vertical or y-axis, for example the percent, rate or number. The horizontal or x-axis usually consists of a time scale. Examples of time scales plotted along the x-axis can be days, weeks or months etc.

Run charts also include a median or centre line (CL). The median is the middle number of the data set, when the data is put in order of highest to the lowest. A median is required when applying some of the data rules used to interpret a run chart. However, adding a median on a run chart that contains a small number of data points or a run chart with more than one data series can cause complexities when interpreting the run chart.

Elements of a Run Chart

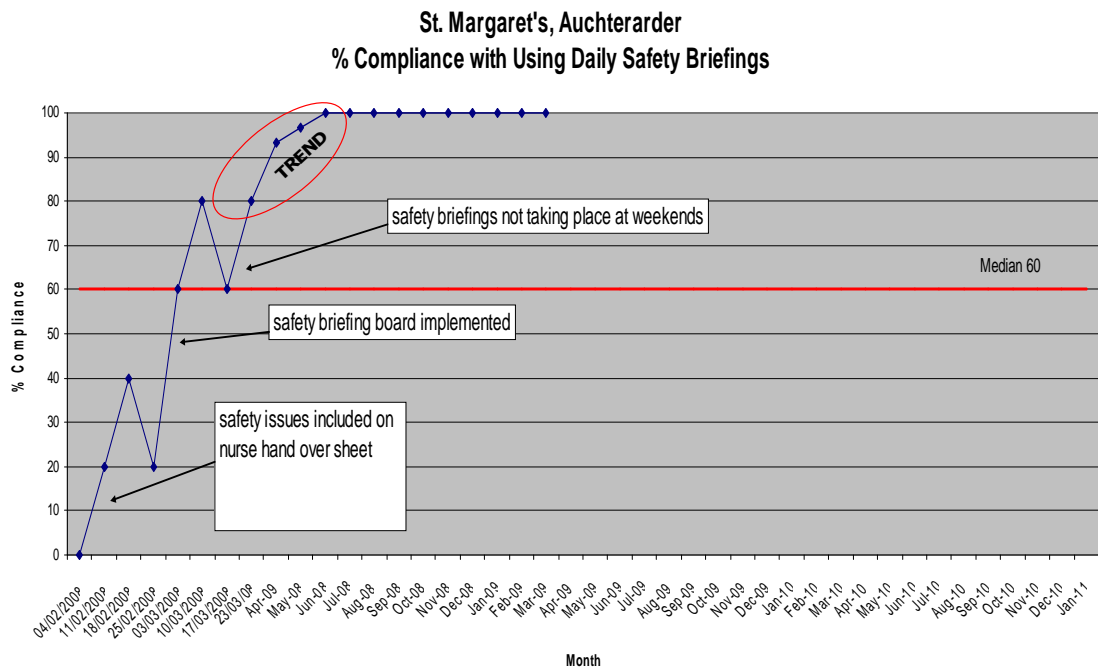


Elements of a Run Chart

When creating a run chart it is useful practice to label several future increments on the x-axis, in other words extend the time scale beyond the time frame even though no data exists yet. The scale should cover the time period of interest, not just the time when data are currently available.

Additional information can be added to the chart. A goal or target line may be appropriate to add. Annotation of unusual events, changes that are being tested or other pertinent information can also be added to the chart to 'tell the story'. Annotations allow learning from run charts, for example to find out what impact the changes have had on the system or process.

Example of run Chart with annotations:



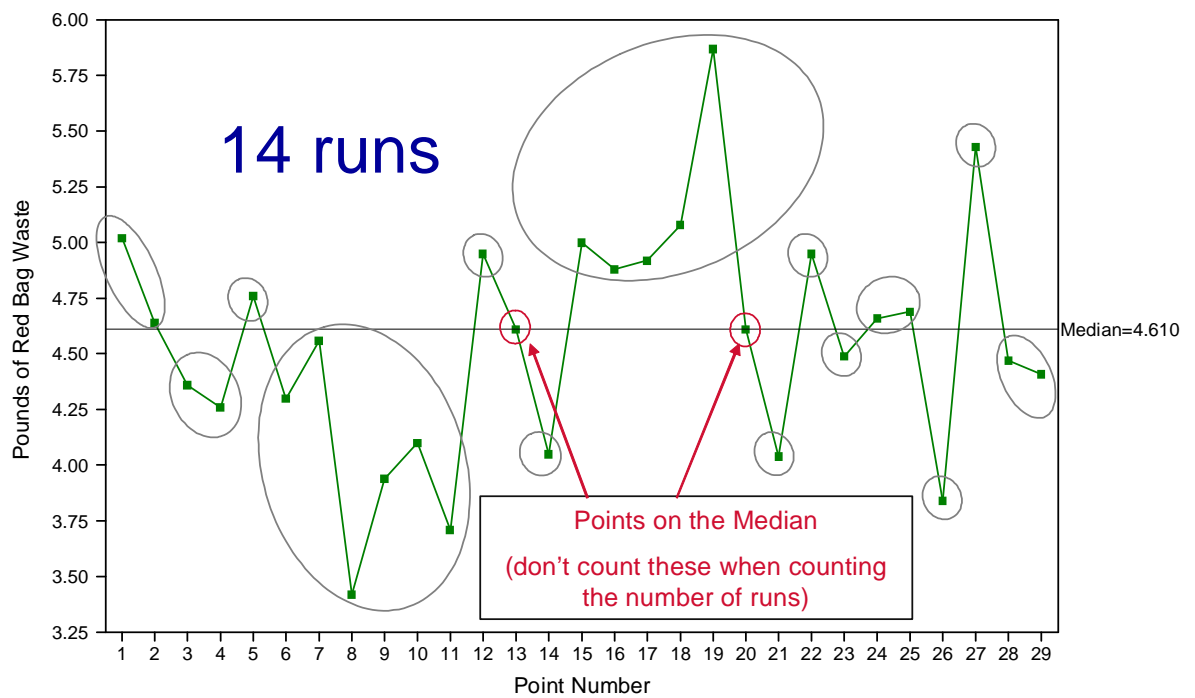
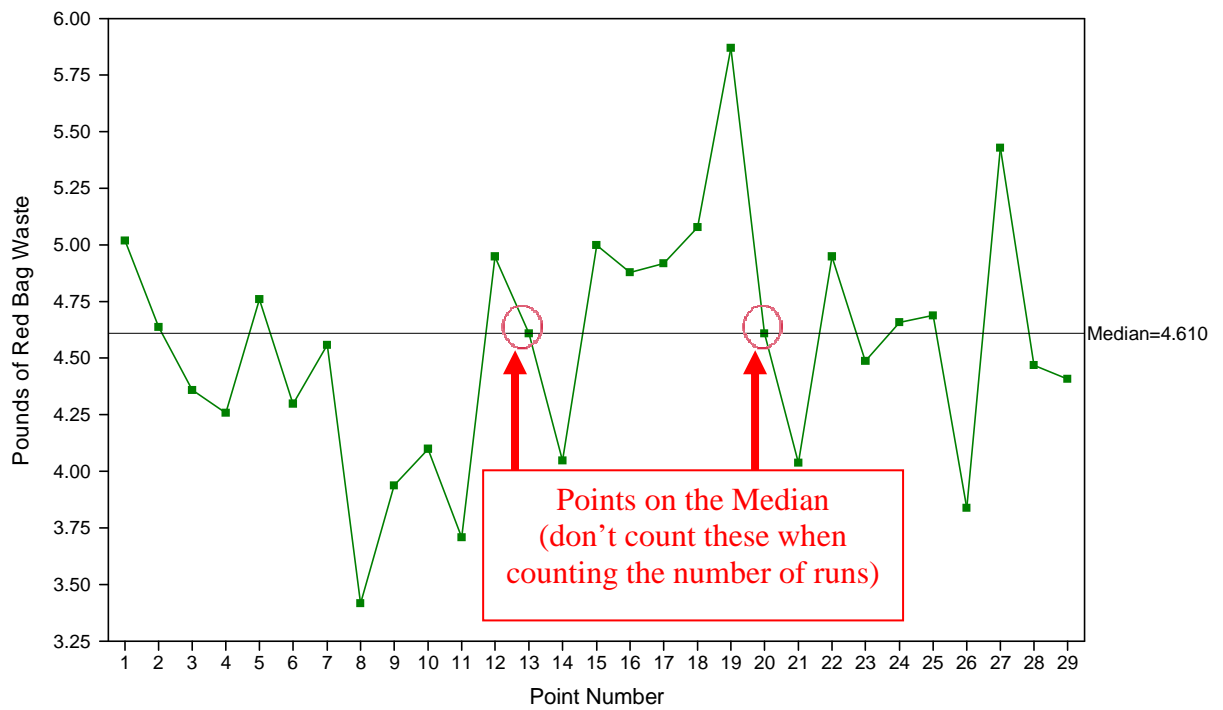
What is a run?

A run is defined as one or more consecutive data points on the same side of the median. Some points fall right on the median, making it hard to decide which run these points belong to. Data points that fall on the median are not included.

There are two methods for counting the number of runs:

- Draw a circle around each run and count the number of circles you have drawn
- Count the number of times the sequence of data points crosses the median and add "1"

How many runs are on this chart?

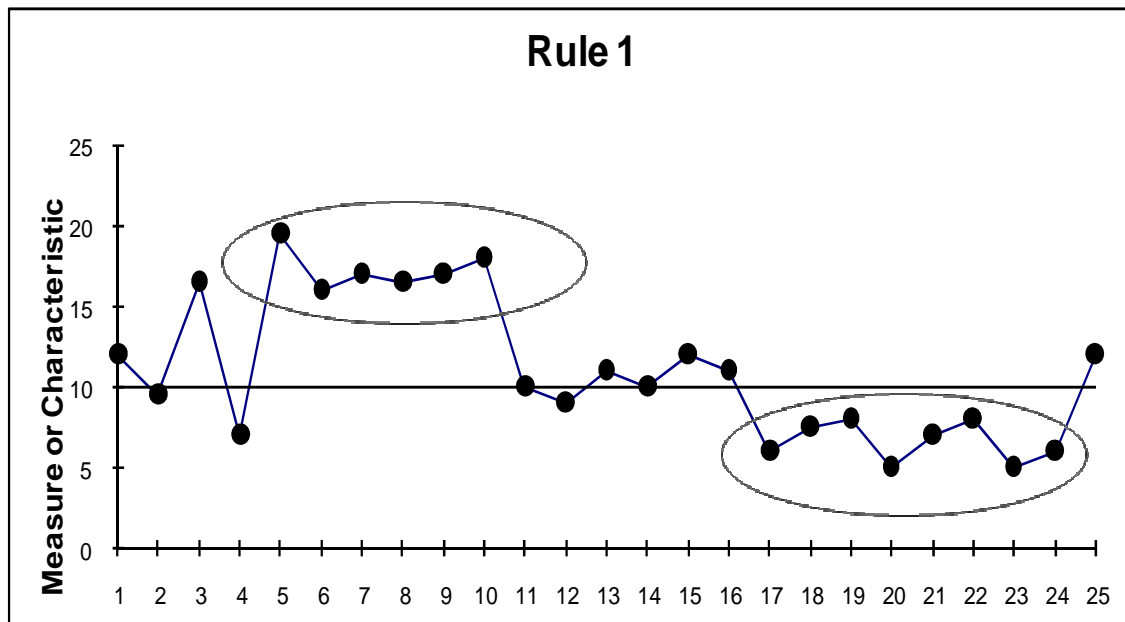


Run Chart Rules

A run chart should include at least 15 or more data points before applying any of the run chart rules.

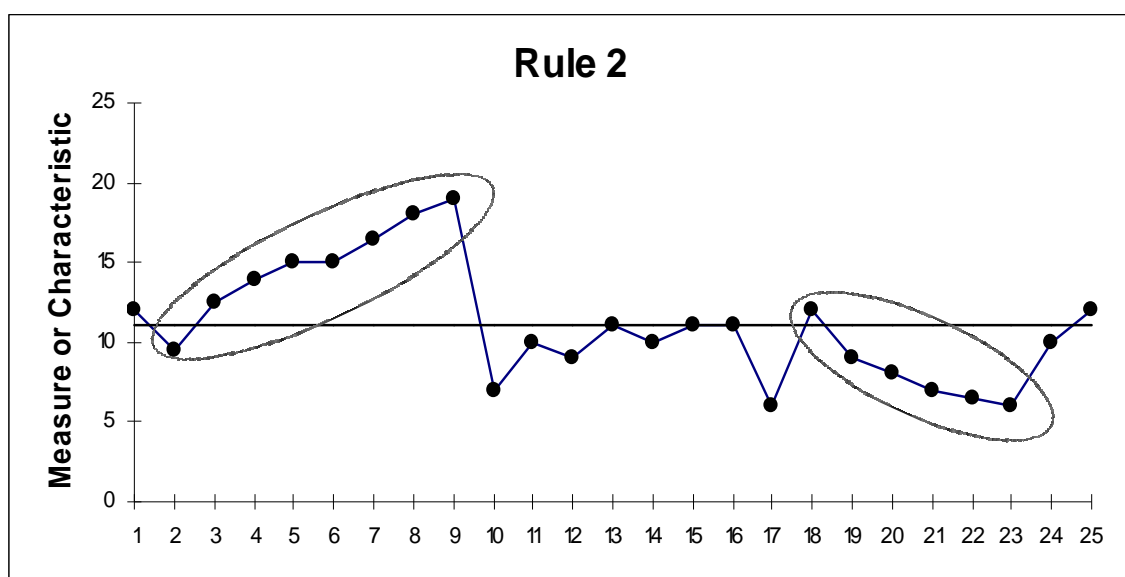
Rule One – Shift

A shift in the process, six or more consecutive points either all above or all below the median. Values that fall on the median do not add to nor break a shift. Skip values that fall on the median and continue counting.



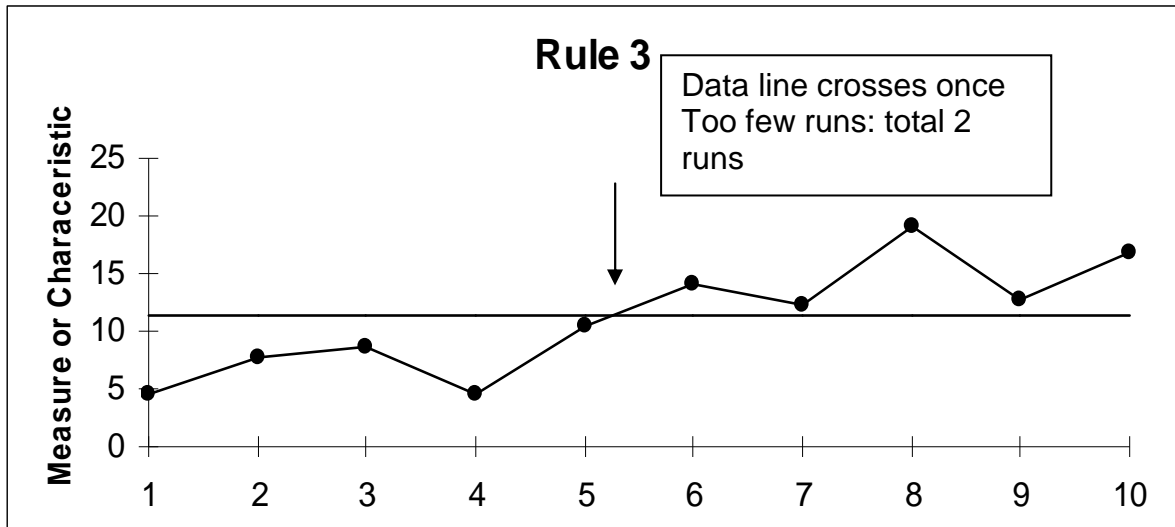
Rule Two - Trend

Five or more consecutive points all going up or all going down. If the value of two or more successive points is the same, ignore one of the points when counting. Like values do not make or break a trend.



Rule Three - Runs

A non-random pattern or signal of change is indicated by too few or too many runs or crossings of the median line.



To Determine The Number of Runs Above and Below the Median:

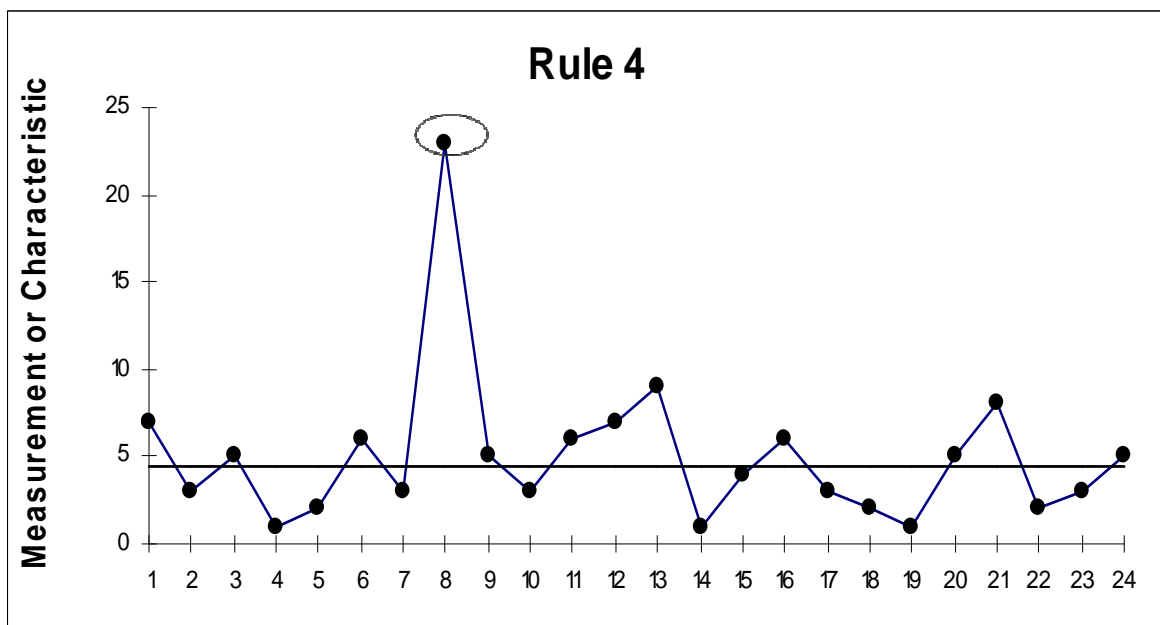
Remember! A run is a series of points in a row on one side of the median. Some points fall right on the median, which makes it hard to decide which run these points belong to. So, one way to determine the number of runs is to **count the number of times the data line crosses the median and add one.**

Statistically significant change signaled by too few or too many runs. A table (**appendix 1**) is used in conjunction with this rule to identify the lower and upper limit for the number of runs.

Rule Four – Astronomical Point

This rule aids in detecting unusually large or small numbers

- An **obviously, blatantly** different value
- Anyone studying the chart would agree that is unusual
- **Caution:** Every data set will have a highest and lowest data point, this does not mean the high and low are astronomical.



Run Chart Rule 3

Expected Number of Runs

Tests for Number of Runs Above and Below the Median					
Number of Data Points	Lower Limit for Number of Runs	Upper Limit for Number of Runs	Number of Data Points	Lower Limit for Number of Runs	Upper Limit for Number of Runs
10	3	8	34	12	23
11	3	9	35	13	23
12	3	10	36	13	24
13	4	10	37	13	25
14	4	11	38	14	25
15	4	12	39	14	26
16	5	12	40	15	26
17	5	13	41	16	26
18	6	13	42	16	27
19	6	14	43	17	27
20	6	15	44	17	28
21	7	15	45	17	29
22	7	16	46	17	30
23	8	16	47	18	30
24	8	17	48	18	31
25	9	17	49	19	31
26	9	18	50	19	32
27	9	19	60	24	37
28	10	19	70	28	43
29	10	20	80	33	48
30	11	20	90	37	54
31	11	21	100	42	59
32	11	22	110	46	65
33	11	22	120	51	70

Run Chart Rules

Appendix 2

