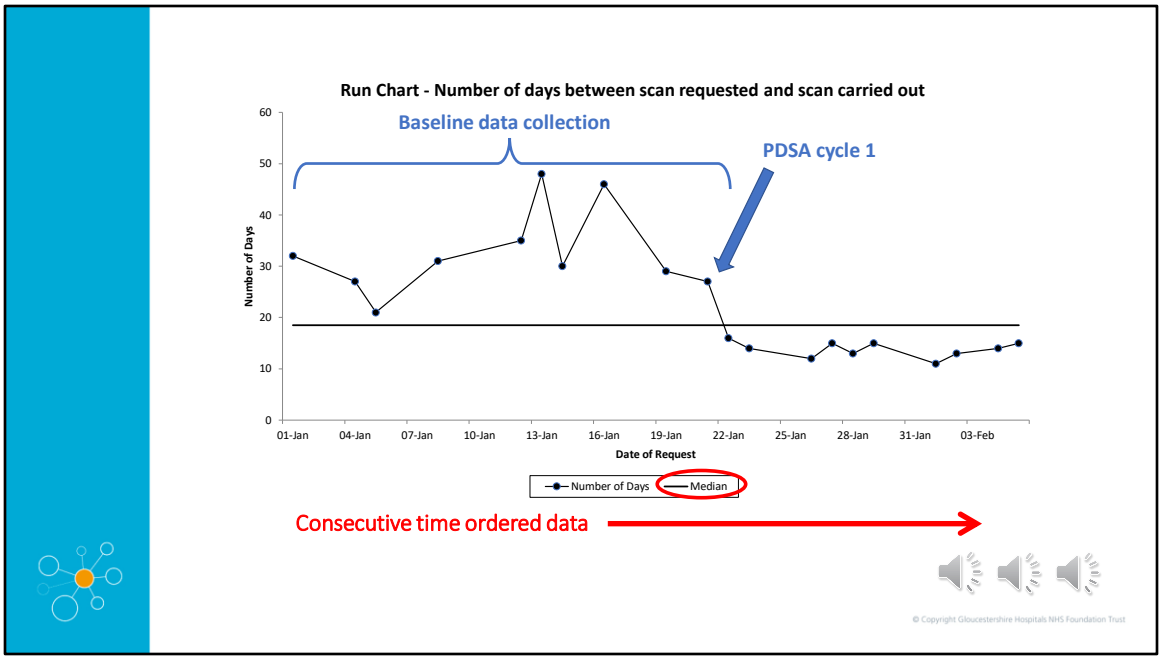
Welcome to this 'Run Chart' session, part of the GSQIA Measurement Module.

NHS
Gloucestershire Hospitals
NHS Foundation Trust

Session Contents

- Run charts for Quality Improvement
- Run chart rules – for analysis
- How to create a run chart (Excel)

In this session we will look at the use of Run Charts in Quality Improvement to track data and respond using data driven insights. We will look at the rules that can be applied to see if a change has occurred, or whether the pattern is likely to have happened by chance. And finally we will look at how a run chart is created in excel, including the formula used to find the median of a data set.

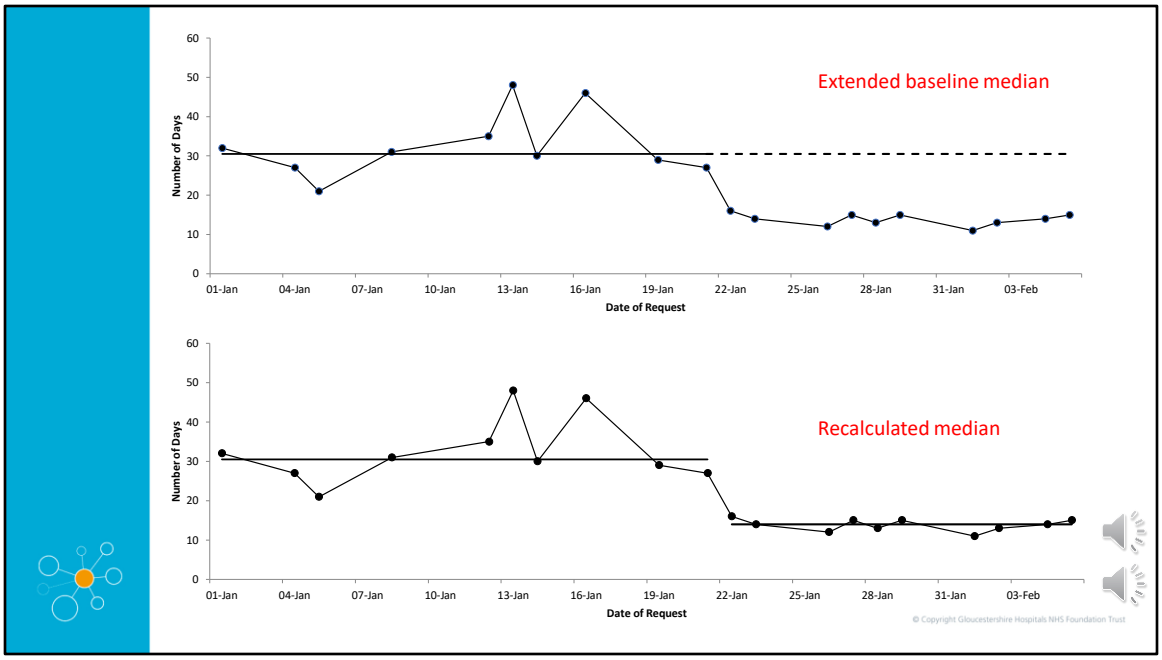


Here is an example of a typical run chart. This one shows how many days it has taken to carry out a scan from the date it was requested.

A Run Chart uses consecutive, time ordered data, always from an earlier point in time through to a later point in time. This allows evidence of the whole change process to be viewed, from baseline performance to the testing and implementation of change ideas with the use of PDSA cycles, and also shows ongoing assurance that any positive changes that have been implemented are being maintained.

A run chart will also always have a median line through the data. The median shows where the middle of the data set is if it were ranked from smallest to largest. The median is used as it removes the influence of extreme data points.

In this example the first 10 data point are the baseline showing a higher number of days between scan request and date the scan is carried out. The next 10 data points were collected after the implementation of a successful PDSA cycle



To show a clearer change in the data it is possible to create a median of just the baseline and extend out.

Or after a successful change has been implemented you can create a median of the baseline data and a median of the data after the change to reflect the new performance level.

Run Chart Rules

When viewing charts, data points can be seen to go up, down or remain constant with small or large variation in the level of performance seen.

The following ‘rules’ allow an analysis of the data to show whether a real change is present in the data set, or if a ‘normal’ pattern can be observed.

Each of these rules are based on the probability of these patterns occurring by chance.

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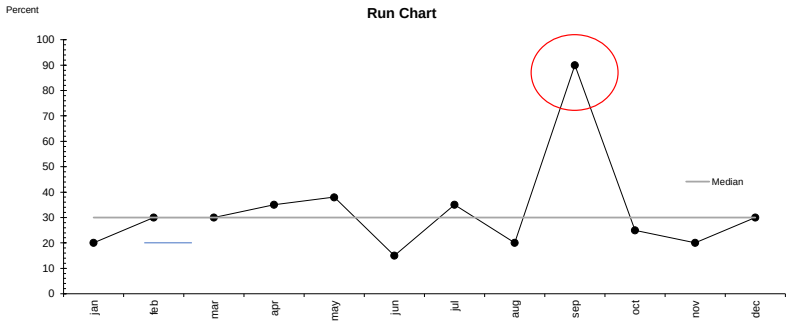
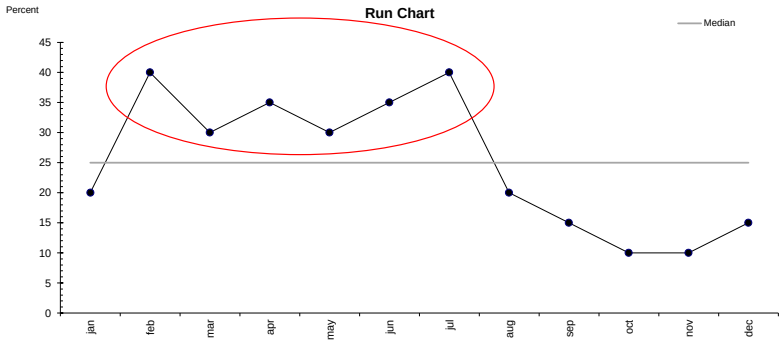
Astronomical Data Point



- An obviously different value that anyone studying the chart would agree was unusual

The first rule is an 'Astronomical data point' this is a data point that is obviously unusual. It would be worthwhile to conduct a review around the circumstances surrounding when this data point occurred – if it's a positive result can anything be done to recreate those circumstances, or if it is something that is negative, what can be done to stop this happening again?

A Shift



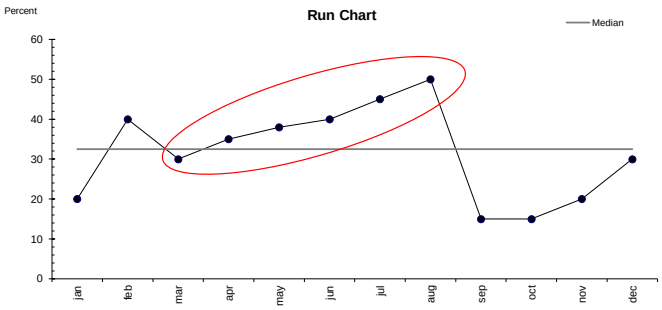
- Six or more consecutive points above or below the median.
- Points on the median do not add to or break a shift

The second rule is called a 'Shift' and this is where 6 or more consecutive data points are found either above or below the median line. The likelihood of 6 data points being one side or the other of the median is less than 5%.

If this pattern occurs it is likely that a change that has been implemented during the QI project has caused this impact.

If one of the data points is on the median, this doesn't break the shift, but an additional consecutive data point is needed on the same side of the median to count.

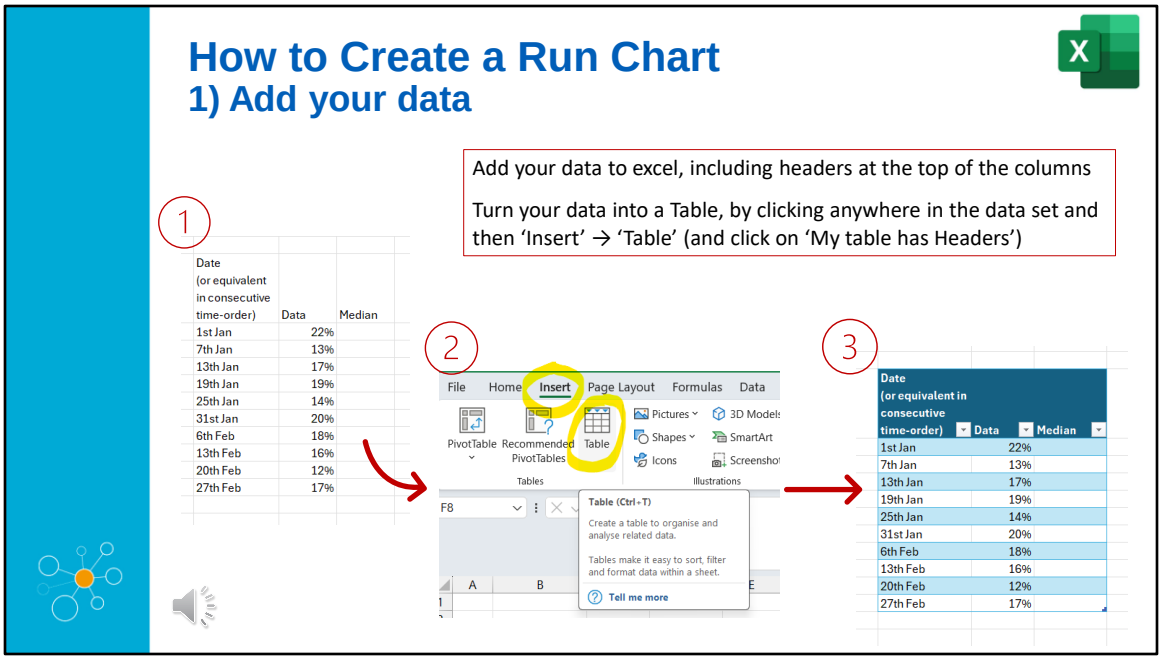
A Trend



- Five or more consecutive points all going up or all going down.
- Like values do not add to or break a trend

The third rule is called a 'Trend' this is where there are 5 or more consecutive data points which are all going up or all going down. Similar to the 'shift' it is very unlikely that this pattern would occur by chance, so again it is likely that a test of change during a QI project has caused this to occur.

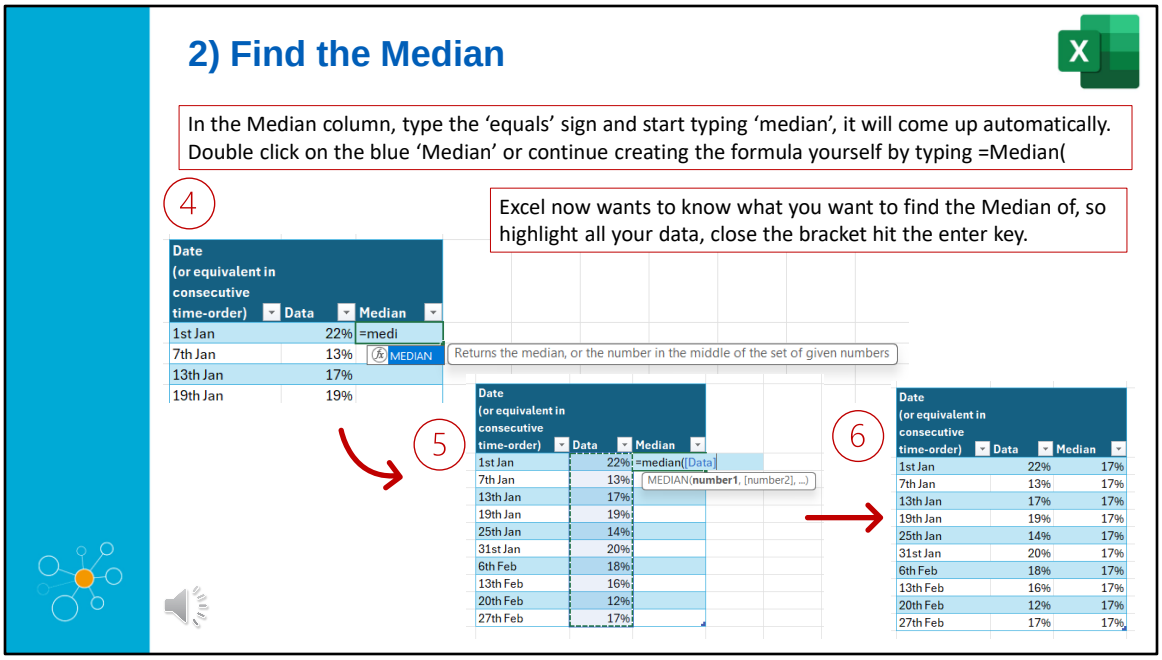
If the trend includes consecutive values that are exactly the same, this doesn't break the trend, but an additional data point continuing the trend is required to count.



The creation of a run chart can be done in excel, or there are templates available on the academy website and online.
To create in excel, start by adding your consecutive, time ordered data into columns, with descriptive headers at the top. You can also use Excel to order the data if needed.

Next, turn your data into a Table, by clicking 'Insert' and then 'Table' without forgetting to click on 'My table has Headers'.

Using the Table function allows the linked graph and the formula that calculates the median to automatically update when new data is added.



Next, we need to ask excel to calculate the median of the data set. Click into the table, on the first row of the median column. Start typing the formula using the equals symbol and start typing the word median. The formula will come up and can be selected, or you can continue to type the word and add an open bracket. Excel now wants to know what you want to find the median of, so highlight the full column of your data (not the header), close the bracket and hit enter. The table function recognises the whole column so will name the selection whatever the header describes it as, in this case 'Data'.

3) Create the Run Chart

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Date (or equivalent in consecutive time-order)	Data	Median
1st Jan	22%	17%
7th Jan	13%	17%
13th Jan	17%	17%
19th Jan	19%	17%
25th Jan	14%	17%
31st Jan	20%	17%
6th Feb	18%	17%
13th Feb	16%	17%
20th Feb	12%	17%
27th Feb	17%	17%

Highlight the whole table…
……then click on 'Insert' → '2D Line'

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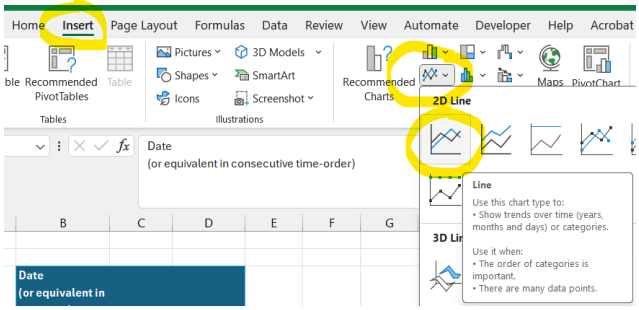
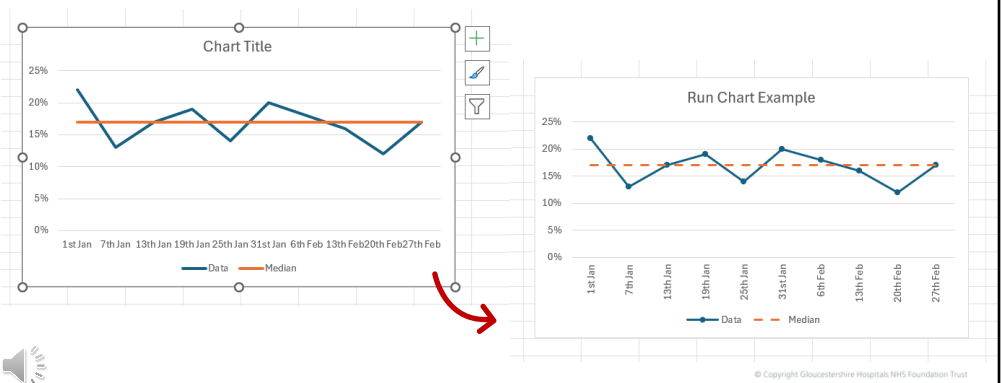


To create the graph, highlight the whole table, including the headers then go to insert, 2 D line.

3) Create the Run Chart - continued

The graph will create automatically. You can then format the lines, titles and axes as you wish.

Convention states that the data line should have point markers, which can be added to clearly view the data.



The graph should appear automatically, and you can then format the lines, titles and axes as you wish.

- Your facilitator / Gold coach and GSQIA are here to support – please get in touch ghn-tr.gsqia@nhs.net
- Additional resources that are available around data and measurement:
  - A one page guide to the rules
  - SPC session and templates
  - Measures session: Outcome / Process / Balancing