

# Run Chart Guide

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# ImproveWell guide to interpreting run charts

The ImproveWell Good Day Measure (GDM) run chart is a helpful tool for analysing the responses to the question “Have you had a good day?”. It demonstrates the percentage of users that answered “Mostly Yes” to this question over a period of time, usually 30 days.

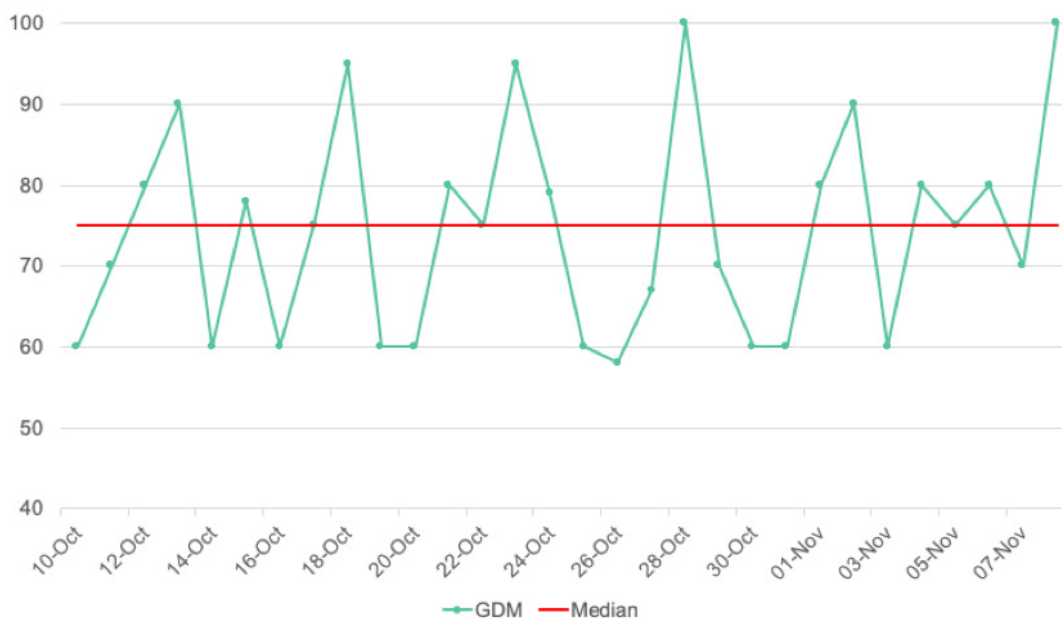
Run charts are simple to use and highly valuable tools in Quality Improvement. They allow you to:

- Monitor the performance of one or more processes over time to detect trends, shifts or cycles.
- Compare performance before and after implementation of a solution to measure its impact.
- Focus attention on truly vital changes in the process.
- Assess whether improved performance has been sustained.<sup>1</sup>

Run charts are designed to detect changes over time. The GDM run chart can help identify early signs of improvement or decline of user sentiment.

## CHARACTERISTICS OF THE GDM RUN CHART<sup>1</sup>

- The X axis lists dates from the previous 30 days.
- The Y axis shows the percentage of users that submitted a response.
- The median line represents the median percentage of “Mostly Yes” responses.



# Four rules for interpreting the GDM run chart

There are four simple rules you can use to objectively analyse a run chart. If one (or more) of the rules are met in your run chart, it is a sign that there is non-random change occurring.

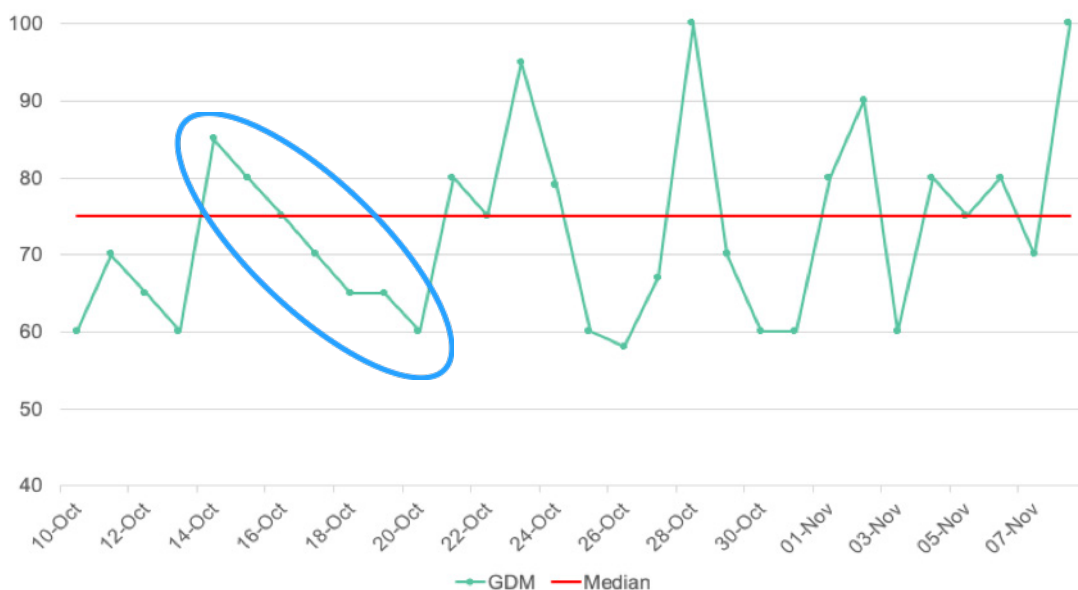
## RULE #1: SHIFT

A shift is when there are six or more data points in a row on either side of the median line. Note: points that fall on the median should not be counted, and do not impact the shift.



## RULE #2: TREND

A trend occurs when there are five or more consecutive points trending either up or down. A trend line can cross the median. Note: If there are two points with the same value, it is counted as one data point.



# Four rules for interpreting the GDM run chart

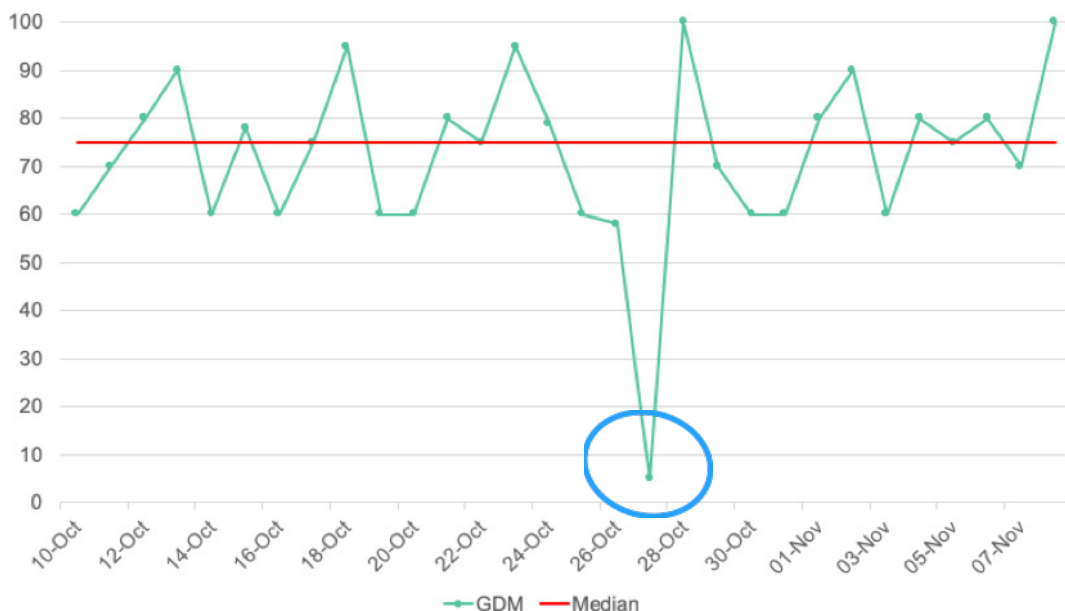
## RULE #3: NUMBER OF RUNS

A run is a series of points in a row on one side of the median. To calculate the number of runs, count the number of lines that cross the median and add one. Too many or too few runs are a sign of non-random variation. See Appendix 1 to determine the appropriate number of runs for a given number of data points.



## RULE #4: ASTRONOMICAL DATA POINT

An astronomical data point is a point that is clearly different from all others. Different people looking at the same graph would be expected to recognise the same data point as astronomical. While every chart has a highest and lowest point, that does not automatically classify those as astronomical points.



# Frequently Asked Questions

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## What is a median?

The median is calculated by determining the number in the middle of the data set when the data are reordered from the highest to the lowest value. If the number of observations is even, the median is the average of the two middle values.

## Why do we use a median?

We use the median because it is the point at which half of the data points will be above and half will be below it. Additionally, extreme values won't affect the median.

## Why is my median at 100%?

A median at 100% means that the median percentage of "Mostly Yes" responses is 100%. For example, if 100% of users answered "Mostly Yes" on four or more days in a seven-day period, the median for that period will be 100%.

## What action should I take if my median is at 100%?

A median of 100% could indicate a low number of user responses. Try to increase the number of users submitting a response.

## What do the data points represent?

The data points represent the number of users that answered "Mostly Yes" on a particular day divided by the total number of users that responded on that day.

## What does a data point at 100% mean?

If a data point is plotted at 100%, it means that there were only "Mostly Yes" responses that day.

## What does a data point at 0% mean?

If a data point is plotted at 0%, it means that there were only "Mostly No" responses that day.

## What does an astronomical data point mean?

If you have an astronomical data point, it is useful to investigate the cause and determine what led to the outlier. Steps can then be taken to prevent or encourage reoccurrence, as needed.

## Why is there variation?

Variation is normal and expected. There may be all "Mostly Yes" responses one day and all "Mostly No" the next. However, it is important to take the number of respondents into consideration, as 0% or 100% days could result from only one response in total per day. For this reason, it is beneficial to have a high level of responses.

## What is non-random variation?

Non-random variation are variations in the data not previously seen. They are displayed by either pattern changes over time or a singular cause. The cause could be intentional or unintentional, as well as beneficial or not.

## How do I respond to non-random variation?

When non-random variation occurs, it is important to try and understand what the cause was. If it was beneficial to the ward or trust, consider maintaining or repeating that cause, where possible. If the variation was unfavourable, think about what can be done to prevent that from happening again.

# Appendix 1

The table below provides the appropriate number of runs for a given number of data point.<sup>1</sup>

| Total no. of data points on run chart not falling on median | Lower limit for no. of runs (< than this is "too few") | Upper limit for no. of runs (>than this is "too many") |
|---|--|--|
| 10  | 3  | 9  |
| 11  | 3  | 10   |
| 12  | 3  | 11   |
| 13  | 4  | 11   |
| 14  | 4  | 12   |
| 15  | 5  | 12   |
| 16  | 5  | 13   |
| 17  | 5  | 13   |
| 18  | 6  | 14   |
| 19  | 6  | 15   |
| 20  | 6  | 16   |
| 21  | 7  | 16   |
| 22  | 7  | 17   |
| 23  | 7  | 17   |
| 24  | 8  | 18   |
| 25  | 8  | 18   |
| 26  | 9  | 19   |
| 27  | 10   | 19   |
| 28  | 10   | 20   |
| 29  | 10   | 20   |
| 30  | 11   | 21   |
| 31  | 11   | 22   |
| 32  | 11   | 23   |
| 33  | 12   | 23   |
| 34  | 12   | 24   |
| 35  | 12   | 24   |

| Total no. of data points on run chart not falling on median | Lower limit for no. of runs (< than this is "too few") | Upper limit for no. of runs (>than this is "too many") |
|---|--|--|
| 36  | 13   | 25   |
| 37  | 13   | 25   |
| 38  | 14   | 26   |
| 39  | 14   | 26   |
| 40  | 15   | 27   |
| 41  | 15   | 27   |
| 42  | 16   | 28   |
| 43  | 16   | 28   |
| 44  | 17   | 29   |
| 45  | 17   | 30   |
| 46  | 17   | 31   |
| 47  | 18   | 31   |
| 48  | 18   | 32   |
| 49  | 19   | 32   |
| 50  | 19   | 33   |
| 51  | 20   | 33   |
| 52  | 20   | 34   |
| 53  | 21   | 34   |
| 54  | 21   | 35   |
| 55  | 22   | 35   |
| 56  | 22   | 35   |
| 57  | 23   | 36   |
| 58  | 23   | 37   |
| 59  | 24   | 38   |
| 60  | 24   | 38   |

# References

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1. Run Charts: Quality Improvement – East London NHS Foundation Trust [QI microsite]. qi.elft.nhs.uk 2018 [cited 20 November 2018]. Available from: <https://qi.elft.nhs.uk/resource/run-charts/>
2. Murray, S., Perla, R. and Provost, L. (2018). The run chart: a simple analytical tool for learning from variation in healthcare processes. [online] Qi.elft.nhs.uk. Available at: [https://qi.elft.nhs.uk/wp-content/uploads/2014/08/perla\\_provost\\_murray-run-charts-analytical-tool.pdf](https://qi.elft.nhs.uk/wp-content/uploads/2014/08/perla_provost_murray-run-charts-analytical-tool.pdf) [Accessed 20 Nov. 2018].
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