Measurement – Interpreting Run Charts

What Is a Run Chart?

A run chart is a graph of data plotted over time. Capturing data on a run chart is a simple and effective way of determining whether a change is translating into improvement. Run charts can show how well a process is performing; display an observable pattern of data; and provide information about the value of a particular change.[1]

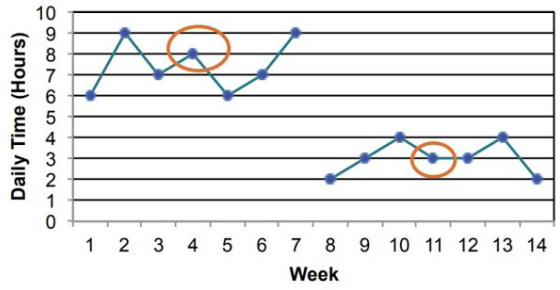
Run charts should be set up at the start of a QI project and updated with new data as the project unfolds. A run chart is a graph that illustrates changes in quality over time. Measurements are taken at frequent points in time and connected with a line.

Sample Run Charts

The charts below portray 4 scenarios tracking a 14-week period in which a change is made in week 7.

a) The change had a downward effect on the metric tracked.
b) There was no obvious improvement after the change was made.
c) A rate of steady improvement occurred, but not as a result of the change in week 7.
d) An initial improvement and then a return to pre-change conditions by week 14.

A



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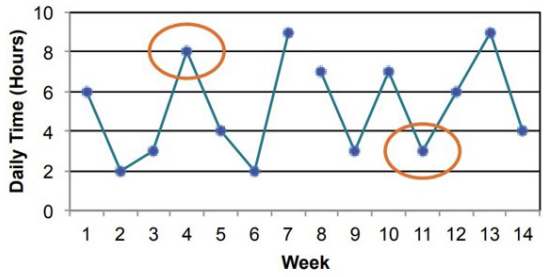

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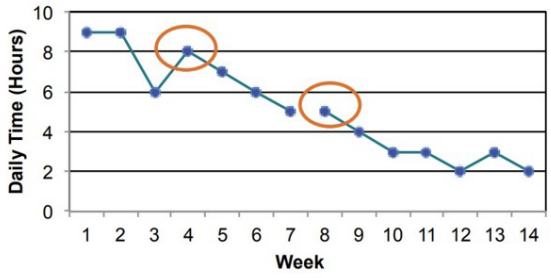

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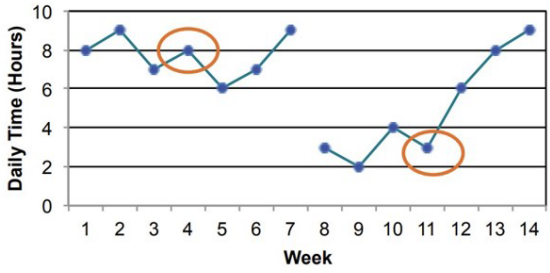

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How Do I Interpret a Run Chart?

Types of Variation

Common Cause

Common cause is the term used for variation that is inherent in the system. A system that has only common cause variation is said to be stable because the process is predictable within statistically established limits. For example, if a patient's systolic blood pressure is consistently between 160 and 170 mmHg, this might be considered stable and predictable (in this example, the system may be stable and predictable, but still not desirable).

Special Cause

Special cause is the term used for variation that is not part of the system and that arises from specific circumstances that are not necessarily predictable. Special cause variation indicates that a process is not stable. The impact of a flu outbreak on infection rates would be an example of special cause variation (special cause variation need not be negative, such as the variation effect on infection rates caused by activities promoting hand hygiene).

The rules for determining special cause are as follows:

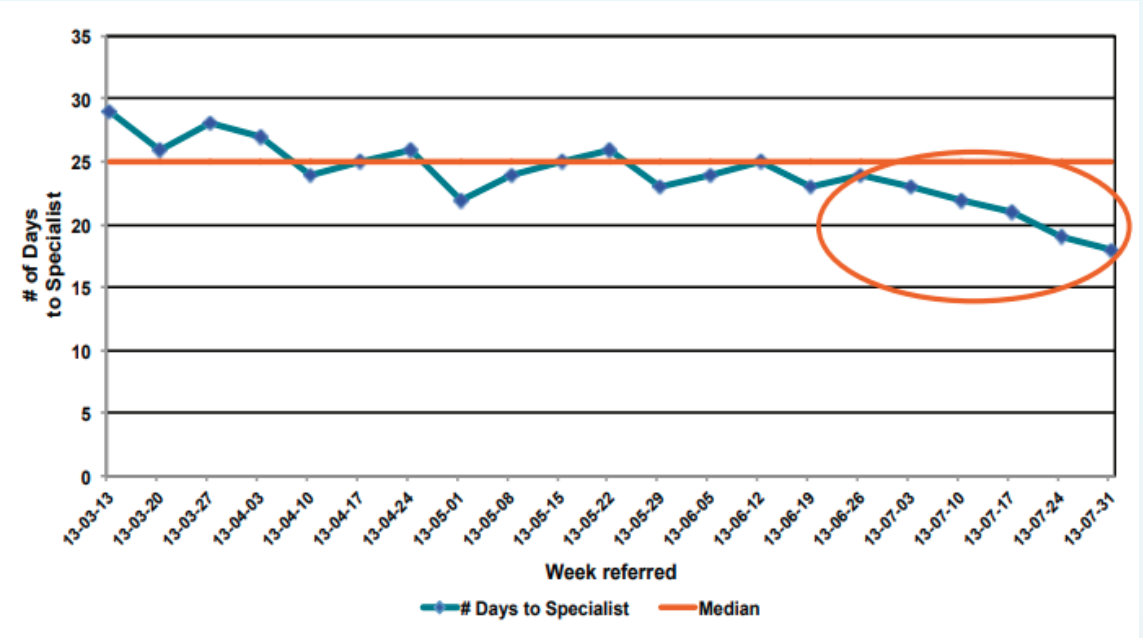
- A single point outside the control limits
- 8 or more points in a row on one side of the mean
- 6 consecutive points increasing or decreasing
- 2 of 3 points in the outside third of a control limit
- 15 consecutive points in the inner third (nearest the mean)

Rules for Interpretation

There are 3 rules for interpreting run charts. It is not necessary to find evidence of all 3 rules to determine that a change has occurred. The presence of any single rule is a nonrandom signal of change (there is a < 5% likelihood that the conditions of the rule will be met simply by chance).

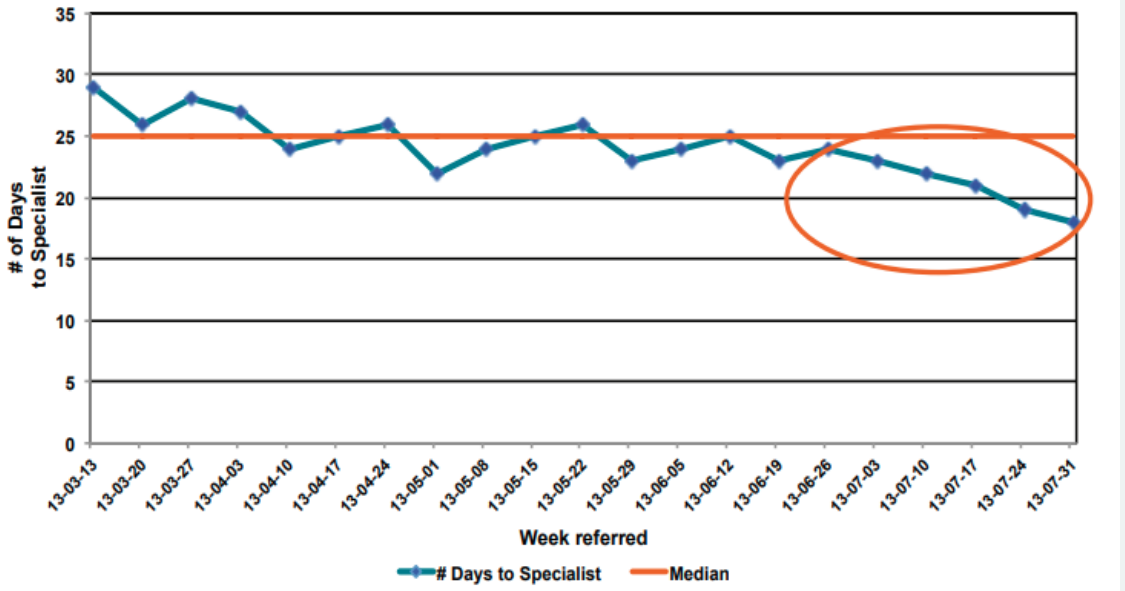
Rule 1: Shift

A shift (signalling change) is 6 or more consecutive points, either all above or all below the median. Values that fall on the median neither add to nor break a shift – skip them and continue counting.



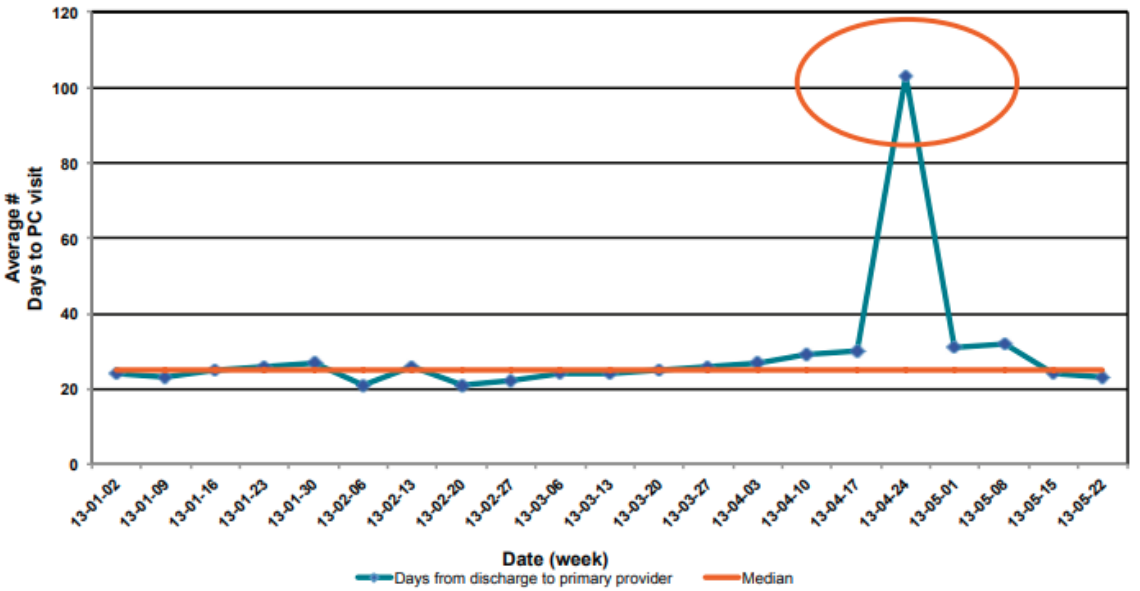
Rule 2: Trend

A trend is 5 or more consecutive points all going up or all going down (note: don't count the starting point). If the value of 2 or more consecutive points is the same, ignore 1 of the points and continue counting.



Rule 3: Astronomical Point

- Every data set will have a highest point and a lowest point, but they are not necessarily "astronomical."
- An astronomical data point is one that is so far out of line with the other data points that anyone studying the chart would agree that it is unusual.
- It is worth understanding the cause of an astronomical point. This will allow you to emulate it if it is positive or avoid or address it if it is negative.



Reference

1. Institute for Healthcare Improvement. (2024). *Run chart tool.* https://www.ihi.org/resources/tools/run-chart-tool

ISBN 978-1-4868-8020-1 (PDF)

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