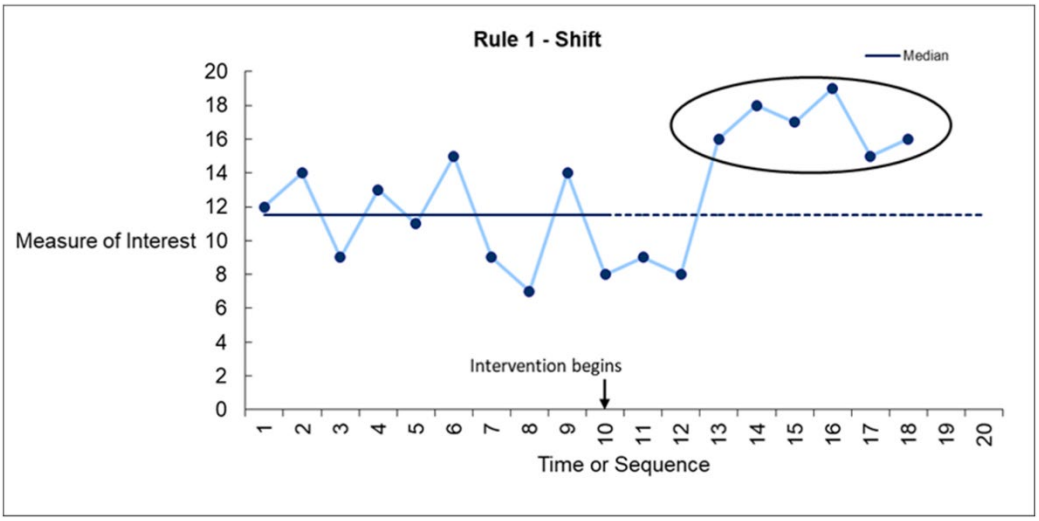
Improvement Science *in a Minute*
Four Rules for Interpreting Run Charts

Applying statistical knowledge to run charts helps answer the question, "Is the observed variation in data purely random or does it display non-random variation?" If the chart displays non-random variation, then a change in performance is detected. There are four rules improvement teams can apply to run charts to help determine the presence of non-random variation.

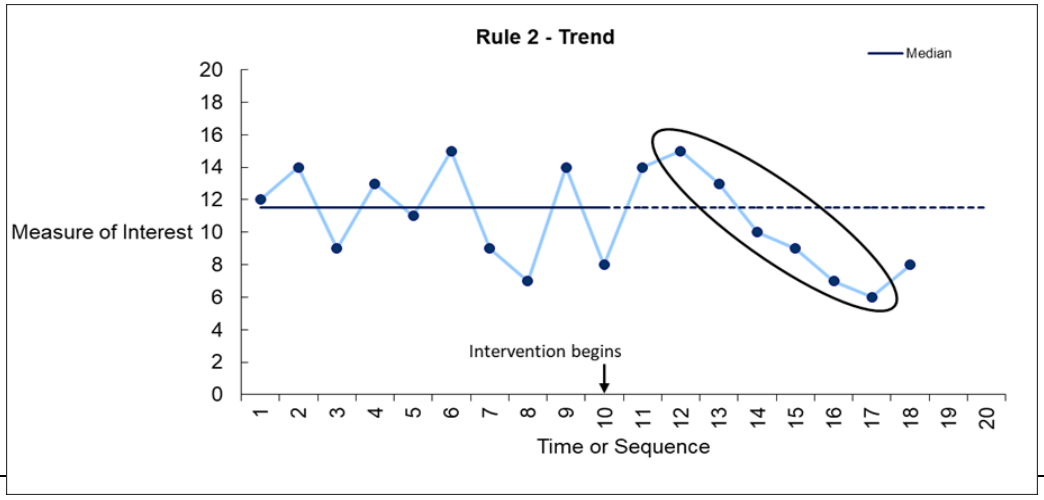
1

Rule 1: Shift. A shift occurs when 6 or more consecutive data values fall above the median or below the median. Data points falling directly on the median do not count towards the presence of a shift, nor do they count against the presence of a shift; they are ignored.



2

Rule 2: Trend. A trend occurs when 5 or more consecutive data values are all increasing or all decreasing. It is possible for two or more consecutive values to have exactly the same value. In these cases, the second point is ignored.



3

Rule 3: Too Many or Too Few Runs. A run is defined as one or more consecutive data points on one single side of the median. Each time the data line crosses the median, a new run is begun. If a data point falls exactly on the median, that point does not break the run. It is ignored. Use the corresponding table to understand if there are more than or less than the expected number of runs.

Total count of number of data points displayed on the run chart (excluding any data points falling exactly on the median)	Minimum number of runs needed for random variation (if there are fewer than this number, non-random variation is detected)	Maximum number of runs allowed for random variation (if there are more than this number, non-random variation is detected)
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

Values described by Swed and Eisenhart, 1943, summarized by both Ott, 1975 and Provost and Murray 2011

4

Rule 4: Astronomical Value. An Astronomical Value occurs when a single data value is blatantly, or obviously different, from the performance of the rest of the data points plotted. This rule is the only rule not based on a calculation of probability and is dependent on the subjective application of subject matter expertise to the data presented.