



## QI Essentials Toolkit:

# Run Chart & Control Chart

A **run chart** is a graph of data over time. It is a simple and effective tool to help you determine whether the changes you are making are leading to improvement.

Run charts help improvement teams formulate aims by depicting how well (or poorly) a process is performing, understand the value of a particular change, and begin to distinguish between common and special causes of variation.

Common-cause variation is the natural or expected variation inherent in a process. Special-cause variation arises because of specific circumstances that are not inherent in the process.

A **control chart**, which includes an upper control limit (UCL) and a lower control limit (LCL), goes further to help teams distinguish between common and special causes of variation within a process. Use a control chart when you have more than 15 data points and want more insight into your data.

Control charts help improvement teams identify special-cause variation in a process, identify early signs of success in an improvement project, and monitor a process to ensure it is holding the gains from a quality improvement effort.

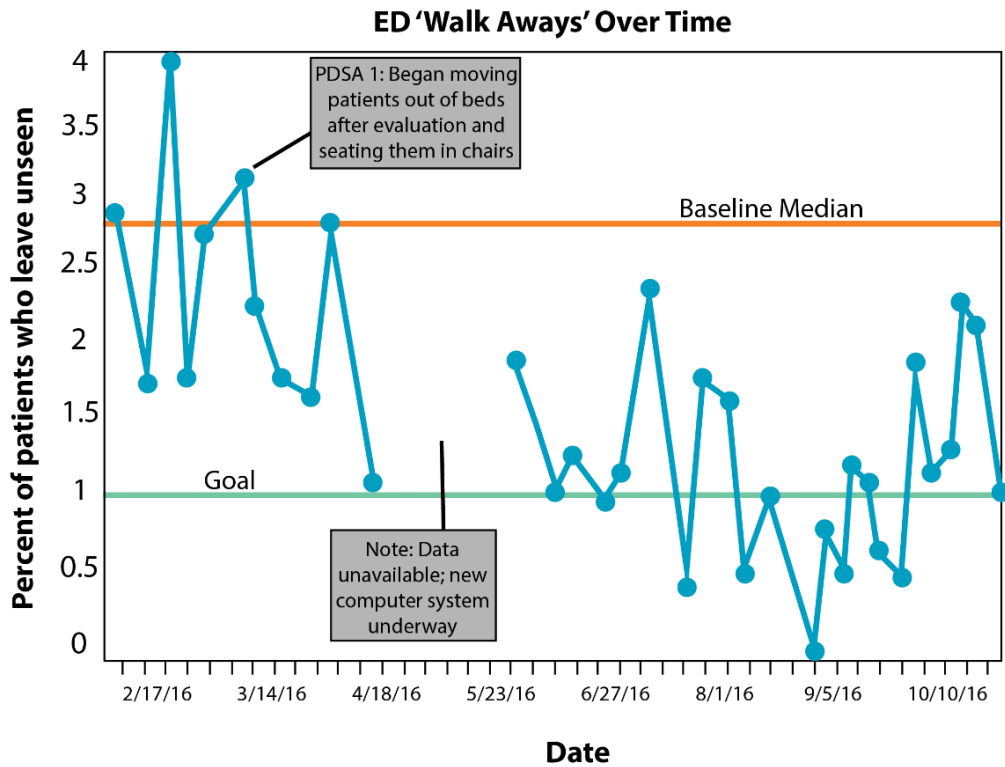
**IHI's QI Essentials Toolkit** includes the tools and templates you need to launch and manage a successful improvement project. Each of the nine tools in the toolkit includes a short description, instructions, an example, and a blank template. NOTE: Before filling out the template, first save the file on your computer. Then open and use that version of the tool. Otherwise, your changes will not be saved.

- Cause and Effect Diagram
- Driver Diagram
- Failure Modes and Effects Analysis (FMEA)
- Flowchart
- Histogram
- Pareto Chart
- PDSA Worksheet
- Project Planning Form
- **Run Chart & Control Chart**
- Scatter Diagram

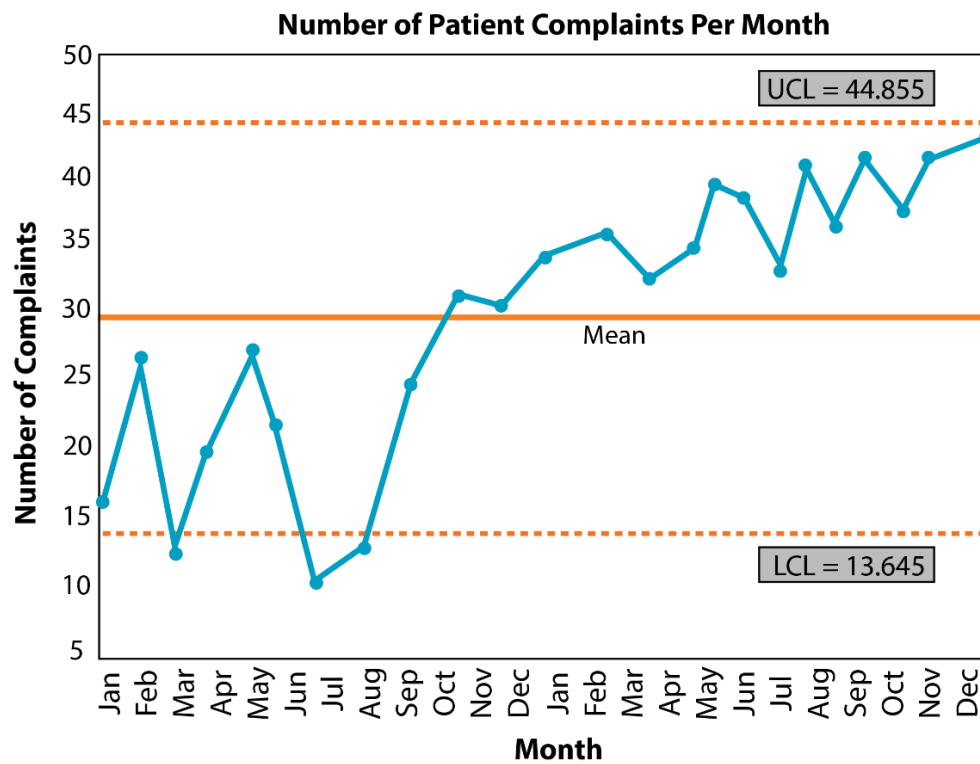
# Instructions

- 1) Obtain a set of data points in their natural timesequence.
- 2) Draw the vertical and horizontal axes, leaving room on all sides to title and label the graph.
- 3) Label the vertical (Y) axis with the name of the value being measured (e.g., Percent of Births by C-section, Number of Days to Third Next Available Appointment, etc.).
- 4) Label the horizontal (X) axis with the unit of time or sequence in which the numbers were collected (e.g., April, May, June, etc., or Quarter 1, Quarter 2, etc.).
- 5) Determine the scale of the vertical axis. The scale should extend from a number 20 percent larger than the largest value to a number 20 percent smaller than the smallest value. Label the axis in equal intervals between these two numbers.
- 6) Plot the data values in the sequence in which they occurred.
- 7) Draw lines to connect the data points on the graph.
- 8) Calculate the median (the data point half way between the highest and the lowest data point) of the plotted numbers and draw the line on the graph.
  - Note: For a control chart, complete these two steps:
    - a) Instead of calculating the median, calculate the mean or control limit (the average) of the plotted numbers and draw the line on the graph.
    - b) Calculate and then draw upper and lower control limits that correspond to  $\pm 3$  sigma limits from the mean. (We recommend doing this in Microsoft Excel or another software program.)
- 9) Title the chart, and note the goal line and the sample size.
- 10) Annotate the chart, indicating when tests of change were initiated, so that it is easy to see the effect of changes on the measure. Also indicate any external events that may have affected the performance of the process.

## Example: Run Chart



## Example: Control Chart



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## Template: Run Chart or Control Chart

