Open School

IHI Open School Course Summary Sheet

QI 104: Interpreting Data: Run Charts, Control Charts, and other Measurement Tools

Lesson 1: How to Display Data on a Run Chart

- A run chart is an essential improvement tool because it displays change over time.

- Steps for drawing a basic run chart include:

    - Plot time along the **X axis**.

    - Plot the key measure you're tracking along the **Y axis**.

    - Label both the X and Y axes, and give the graph a **useful title**.

    - Calculate and place a **median** of the data on the run chart.

    - Add other information as needed, such as a **goal line** and **annotations**.

- It's easy and often sufficient to build a run chart by hand.

- There are many computer programs, such as Microsoft Excel, Libre Office, or Google Docs that can help you draw a run chart.

- IHI has a **run chart template** for Microsoft Excel freely available at: http://app.ihi.org/LMS/Content/77a180e3-18be-4969-a23b-d0e96e57e39f/Upload/QI104_RunChartTemplate.xls

Lesson 2: How to Learn from Run Charts and Control Charts

- If you want a stable, predictable system, you need to separate common causes of variation from special causes of variation and remove the special causes.

    - **Common (random) causes** of variation are inherent to the system.

    - **Special (non-random) causes** of variation are due to irregular or unnatural influences on the system.

- Being able to identify and count runs is the first step for analyzing a run chart.

    - A **run** consists of one or more consecutive data points on the same side of the median, excluding data points that fall on the median.

- Applying four simple rules will allow you to identify four types of non-random patterns in the data displayed on a run chart:
  - o **Rule 1: A shift** is six or more consecutive points above or below the median.
  - o **Rule 2: A trend** is five or more consecutive points all increasing or decreasing.
  - o **Rule 3: Too many or too few runs** is a non-random number of runs based on a mathematical formula.
  - o **Rule 4: An astronomical data point** is a data point that appears far away from the others.
- A **Shewhart Chart (or control chart**) looks like a run chart but has the added feature of control limits. Data outside the limits indicates special cause variation.

Lesson 3: Histograms, Pareto Charts, and Scatter Plots
- A **histogram** is a special type of bar chart, used to display the variation in continuous data — such as time, weight, size, or temperature.
- The **Pareto chart (or ordered bar chart)** is a type of bar chart on which the various factors that contribute to an overall effect are arranged in order according to the **magnitude of their effect**.
  - o The **Pareto principle** refers to the idea that, in many situations, 20 percent of contributing factors account for 80 percent of the results.
- Ordering the factors by magnitude allows teams to distinguish between the "**vital few**" (factors in the 20 percent category) and the "**trivial many**" (factors in the 80 percent category).
  - o Focusing improvement efforts on the vital few will have the biggest payoff.
- A **scatter plot** is a graphic representation of the relationship between two variables. Scatter diagrams help teams identify and understand cause and effect relationships.