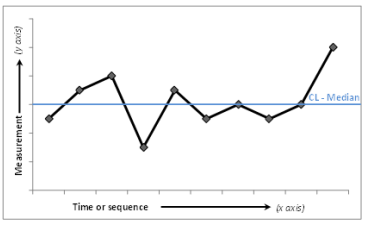
Statistical Process Control (SPC) Charts: A Primer

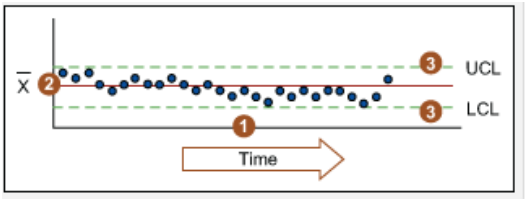


A ***run chart*** is not a type of SPC chart. It is a graph that displays observed data in a time sequence. To create a run chart:

1. Decide on the measure to be analyzed
2. Gather the data—minimum of 10 data points
3. Draw a graph and label vertical axis: variable measured
4. Calculate the mean/median and draw it as horizonal line
5. Plot the data in sequence

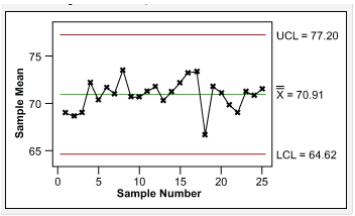
The run chart is a simple and effective improvement tool. It is not a replacement for the Shewhart control charts but it is an easy-to-use tool for identifying process variation.

SPC charts are a tool to monitor process stability and control. When a process is stable and in control, it displays *common cause variation*—i.e. variation that is inherent to the process.



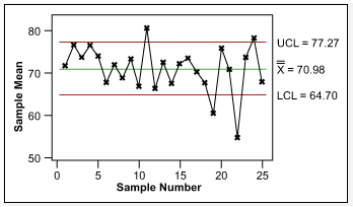
Elements of a control chart

1. A control chart begins with a time series graph.
2. A central line (X) is added as a visual reference for detecting shifts or trends.
3. Upper and lower control limits (UCL and LCL) are computer from available data.



Controlled Variation

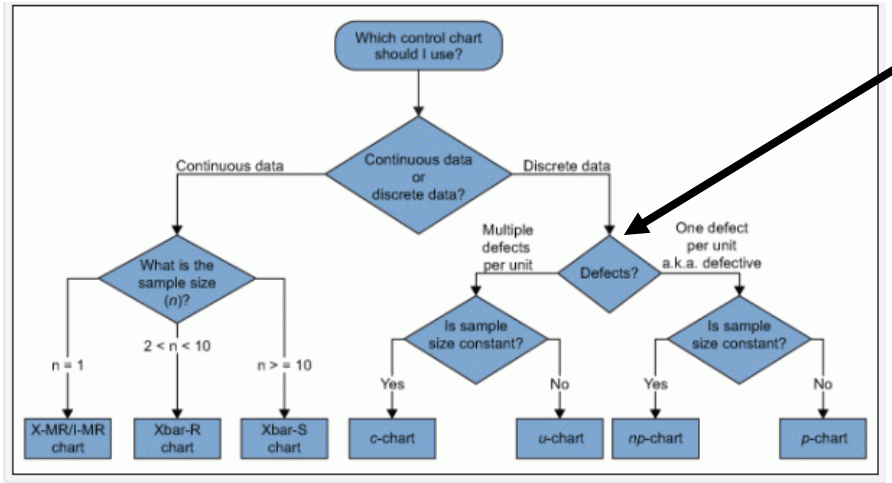
Controlled variation is characterized by a stable and consistent pattern of variation over time, and is associated with common causes. A process operating with controlled variation has an outcome that is predictable within the bounds of the control limits.



Uncontrolled Variation

Uncontrolled variation is characterized by variation that changes over time and is associated with special causes (i.e. outside the UCL and LCL).

How do I pick a chart?

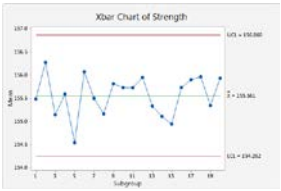


Defects=events (i.e. episodes of sepsis)
Defectives=subjects (i.e. children with sepsis)

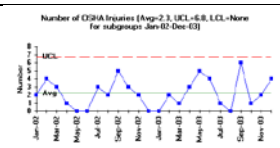
Types of SPC Charts

Continuous Data

Xbar Chart: The *Xbar chart* is used to evaluate consistency of process averages by plotting the average of each subgroup. It is efficient at detecting relatively large shifts in the process average.

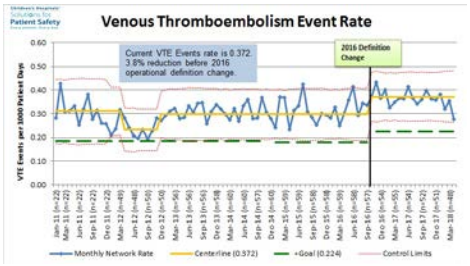


Discrete Data



C-Chart: Used when identifying the total count of defects per unit (*c*) that occurred during the sampling period, the *c*-chart allows the practitioner to assign each sample more than one defect. This chart is used when the number of samples of each sampling period is essentially the same.

U-Chart: Similar to a *c*-chart, the *u*-chart is used to track the total count of defects per unit (*u*) that occur during the sampling period and can track a sample having more than one defect. However, unlike a *c*-chart, a *u*-chart is used when the number of samples of each sampling period may vary significantly.



P-Chart: Used when each unit can be considered pass or fail – no matter the number of defects – a *p*-chart shows the number of tracked failures (*np*) divided by the number of total units (*n*).

Notes and application:

Examples	Type of Chart	Why?
Average temperature at admission	X	Measured continuous variable
Number of sepsis huddles		
Code Events/1000 patient days		
Febrile post-CPR patients/All post-CPR patients		
Complaints/Patient		