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Charts for Improvement and Reporting
A Guide

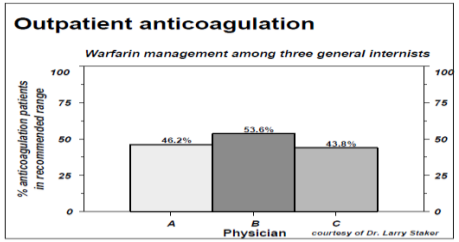
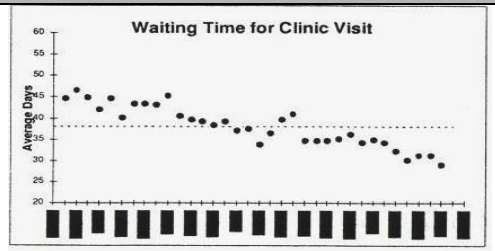
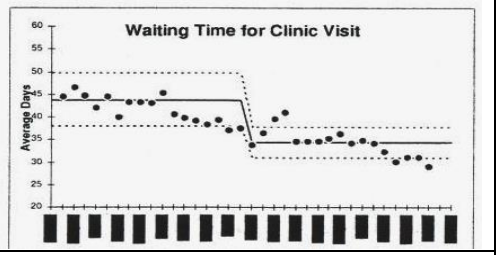
Introduction

Use of the correct chart for improvement and reporting is essential for accurate interpretation and the subsequent action steps. The following document outlines some basic recommended specifications and guiding principles for developing and analyzing charts. Measurement planning, including data display, is an essential component of every improvement activity.

Guiding Principles for Charts

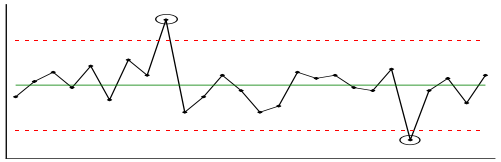
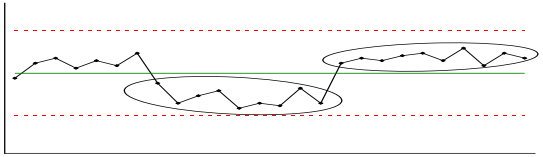
Use of a standard chart format/data display (Data display tools chart)
Charts should be easy to read and contain only essential detail
Core chart elements include: title, definitions, data source, x and y axis labels
Chart scale is determined by the (current and anticipated) data range

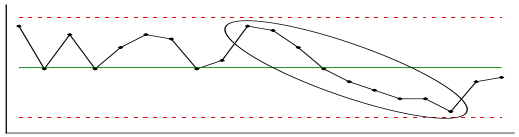
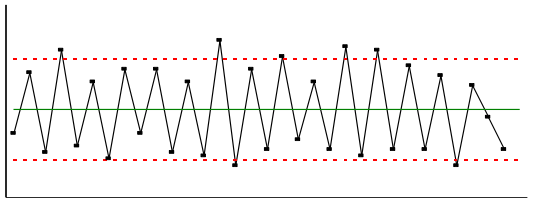
Data Display Tools

	Basic Chart	Run Chart	Control Chart
			
Minimum # data points required	1	10-12	16-20
Center line	n/a	Median	Mean
Control limits Upper Control Limit (UCL); Lower Control Limit (LCL)	n/a	n/a	3 sigma from the mean (UCL, LCL)
Goal line included	Yes	Yes	No
		Data points = solid black	Data points = solid black

Color convention	Data points = solid black Goal line = solid black with label	Goal line = solid black with label Median = solid green	Mean = solid green UCL/LCL = dashed red
Legends included	Yes	No	No
Maximum number of measures	Variable	Maximum of 2; preferable to limit to 1	1
X-Axis labels	Angled	Angled	Angled
Y-Axis labels	Use symbols when possible (%) Scale range TBD (0-100%)	Use symbols when possible (%) Scale range TBD (0-100%)	Use symbols when possible (%) Scale range TBD (0-100%)
Higher/Lower is better arrows	Yes, when appropriate	Yes, when appropriate	Yes, when appropriate
Maximum number of data points	24-30	16; consider converting to a control chart if process is stable	24-30
Background	No shading No grid lines	No shading No grid lines	No shading No grid lines

Special Cause Variation Detection Rules

	Basic Chart	**Run Chart**	**Control Chart**	**Control chart Special Cause Signal**
Points outside of LCL/UCL	n/a	n/a	Yes	
Shift - # of consecutive points that do not cross the mean. Points directly on the mean are not counted	n/a	6	7	

Trend - # of consecutive points that are ascending or descending. Data points identical to the preceding value are not counted	n/a	6	6	
See-Saw - # of points in an alternating direction	n/a	14	14	

Control limits and mean recalculation

When to consider recalculation
When a planned intervention leads to signals of a process change (e.g., a shift, trend or decrease in variation)
When an unplanned process change identified by above signals occurs

Process to determine if recalculation appropriate
Clinical team, improvement specialists and quality data management staff discuss using the following decision aide:

Decision Aide

Key considerations	**Appropriate actions**
1. Do the data display a distinctly different kind of behavior than in the past?	If **no**→ there is no need for new limits
2. Is the reason for this change in behavior known?	If **no**→ investigate for the special cause instead of tampering with the limits
3. Is the new process behavior desirable?	If **no**→ work to remove the detrimental assignable cause instead of tampering with the limits
4. Is it intended and expected that the new behavior will continue?	If **no**→ investigate for the special cause instead of tampering with the limits
If the answer to all **4** questions is **yes**→ revise the limits based on data collected since the change in the process	

Recalculation rules

Requires 6-8 data points following the process change to recalculate

Annotations

- Limited to key interventions or process changes
- Located in the chart plot area
- Displayed as 5-6 words maximum

Special Considerations

- Multiple types of control charts exist (u chart, p chart, etc). The selection of the correct chart is determined by the problem and how it is constructed. Consult with individuals skilled in control charts to select the correct control chart display.
- Displays of data with sub-group or seasonality implications are unique and generally require the input of specialists with improvement or quality data management skills to identify the most appropriate chart/data display to develop.

References

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Measuring Quality Improvement in Healthcare: A Guide to Statistical Process Control Applications. Raymond Carey, Robert Lloyd. 2001. ASQ Quality Press.

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