




# Quality and Safety Series

## Data Visualization 101

# OBJECTIVES

A close-up photograph of a person's hand, wearing a dark suit jacket and a white shirt cuff, pointing towards the text. The hand is positioned on the right side of the slide, with the index finger pointing towards the word 'OBJECTIVES'.

- Describe the basics of data visualization for your quality improvement and patient safety projects.
- Identify the best tool to effectively track and communicate quality and safety data.
- Achieve the appropriate balance between form and function.

# What Is Data Visualization?

- Graphical representation of information and data.
- Tools that provide an accessible way to see and understand trends, outliers, and patterns in data.



# Why Is Data Visualization an Important Step?

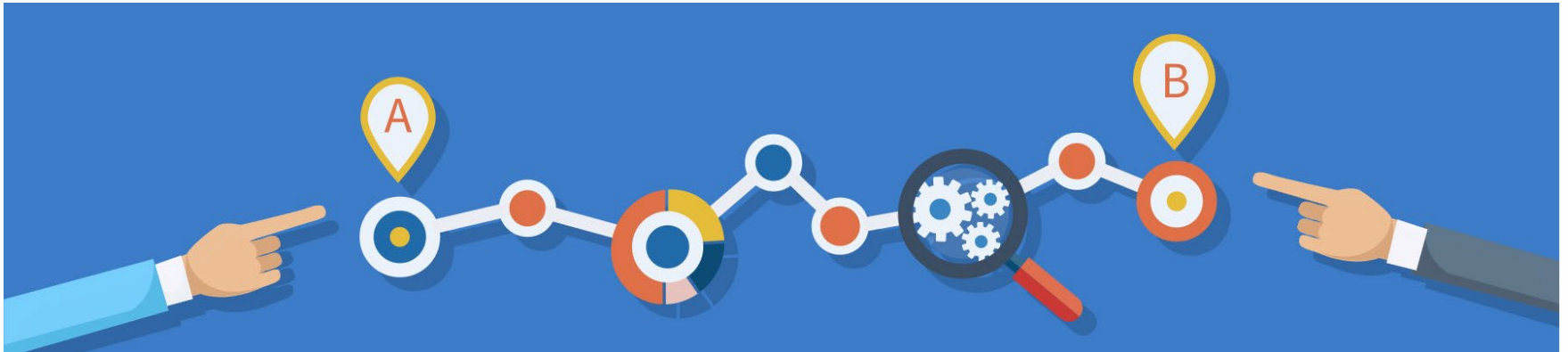
- Aids in tracking patient safety measures to:
  - Understand baseline performance.
  - Assess the effects/analyze the results of patient safety interventions.
  - Evaluate whether changes in performance are sustained over time.
- Helps users analyze and reason regarding data and evidence.



# Baseline Data/Baselining

*The measurement of outcome or performance prior to an intervention.*

- Confirm that the data reflect the current state.
- Use the measure definition.
- Ensure there are enough data points.
- Watch for seasonal impacts.



# Analyzing the Results

- Display the data.
  - Start with run charts.
  - Use control charts or SPC\* charts for more specific insight.
- Analyze the data.
  - Are these the predicted results?
  - Look for impact of the intervention.
- Examine change or variation.
  - Watch for 5–8 points above or below the mean.





# The Makes and Breaks

## The makes

- Make data more accessible, understandable, and usable.
- Communicate information clearly and efficiently.
- Stimulate viewer engagement and attention.

## The breaks

- Create elaborate data visualizations that fail to serve their main purpose—to communicate information.
- Might create misleading or erroneous conclusions.



# Best Practices for Graphical Displays



- Know your audience.
- Design graphics that can:
  - Stand alone outside the context of the report.
  - Communicate the key messages.



# General Types of Data Visualization

- **Charts**

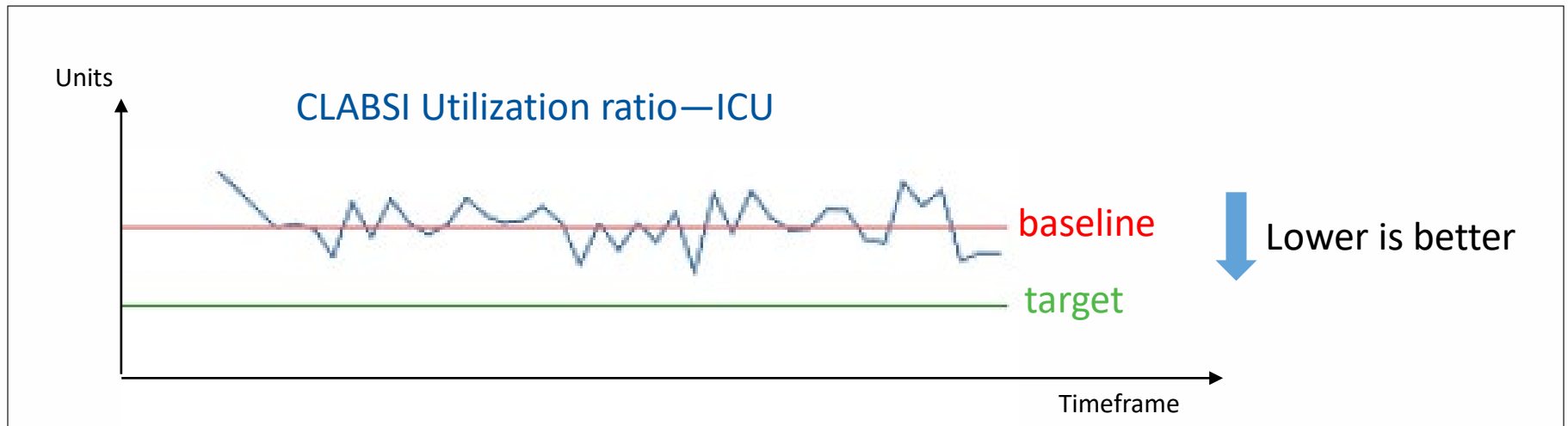
*(Most prevalent type in acute care settings)*

- Tables
- Graphs
- Maps
- Infographics
- Dashboards



# Run Chart

- A standard quality tool used to display trends over time.

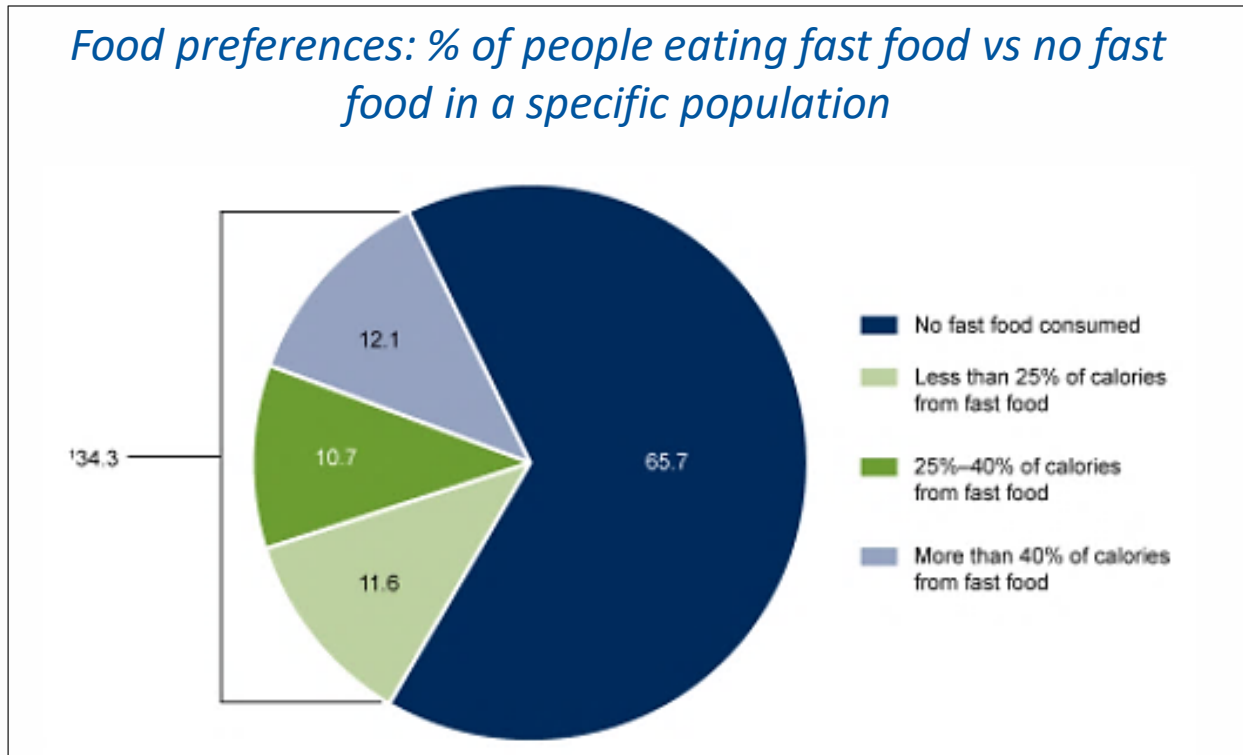


Useful to:

- Display variation.
- Discover patterns.
- Observe the effects of process improvement.

# Pie Chart

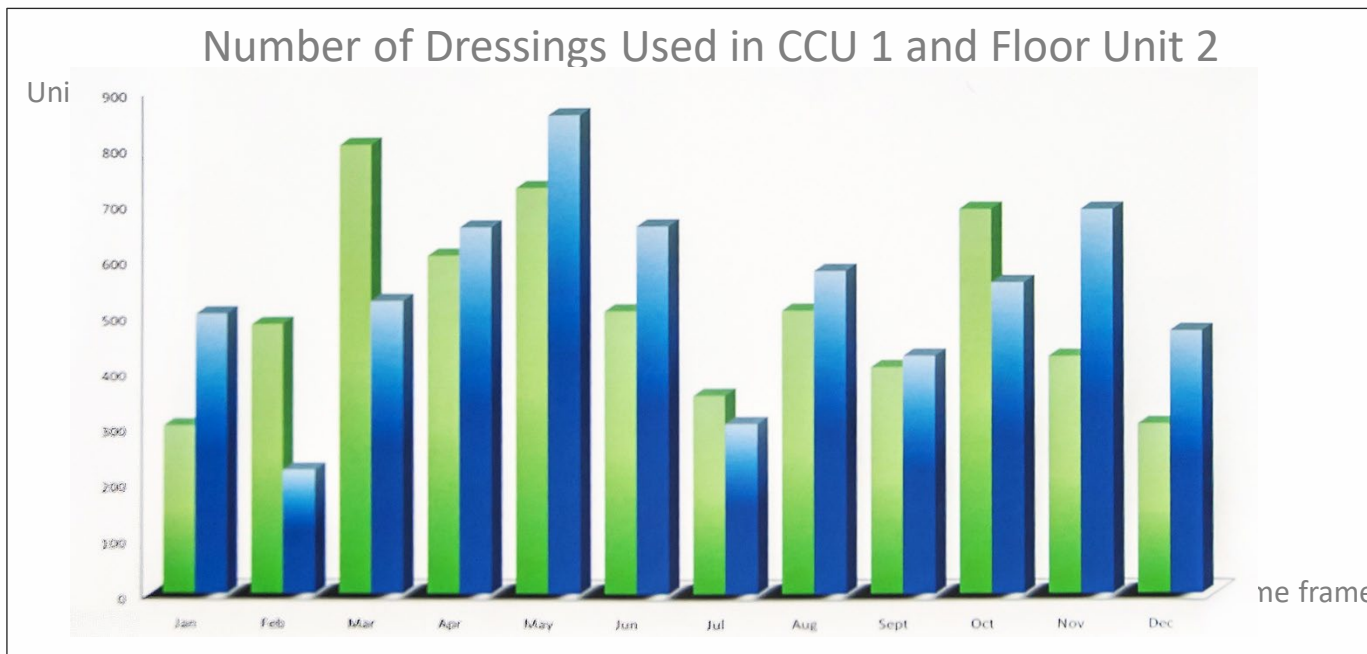
- A snapshot in time.
- Represents one variable, which is divided into slices to illustrate numerical proportion.



Useful to know and compare the importance of factors as a whole.

# Bar Chart

- Used to show patterns or relationships in the data for one or more variables.

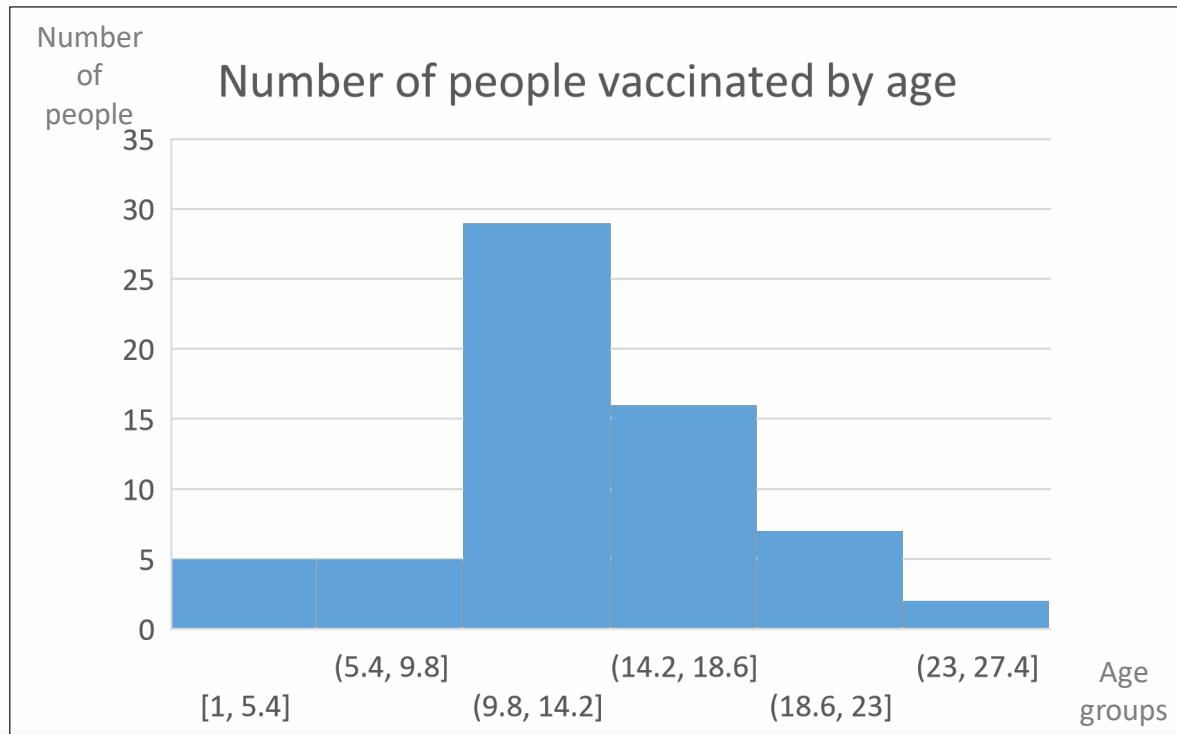


Useful to show:

- Comparisons among categories.
- Different units or sub-populations.

# Histogram

- An approximate representation of the distribution of numerical data.
- A specialized type of bar chart used to summarize groups of data.



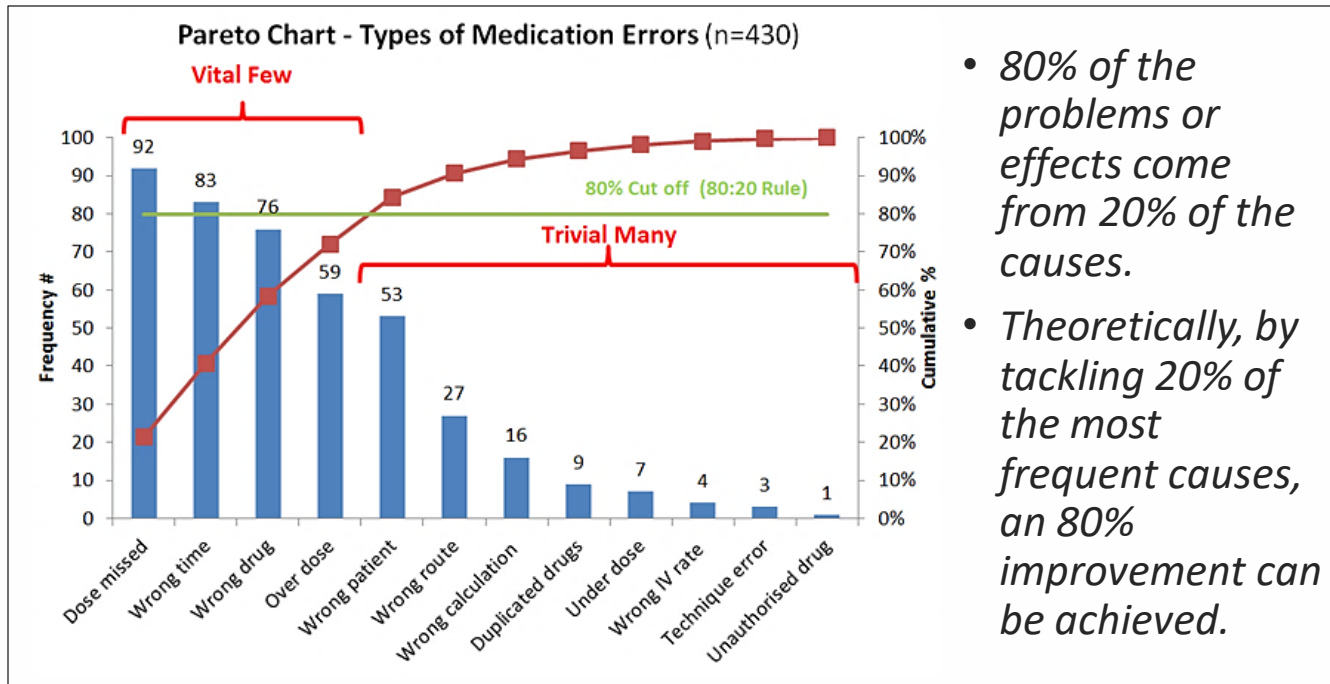
Useful to show:

- Data distribution or spread.
- Symmetric or skewed data.
- Extreme data values.



# Pareto Chart

- Displays a series of bars with which the priority for problem solving can easily be seen by the varying height of the bars.

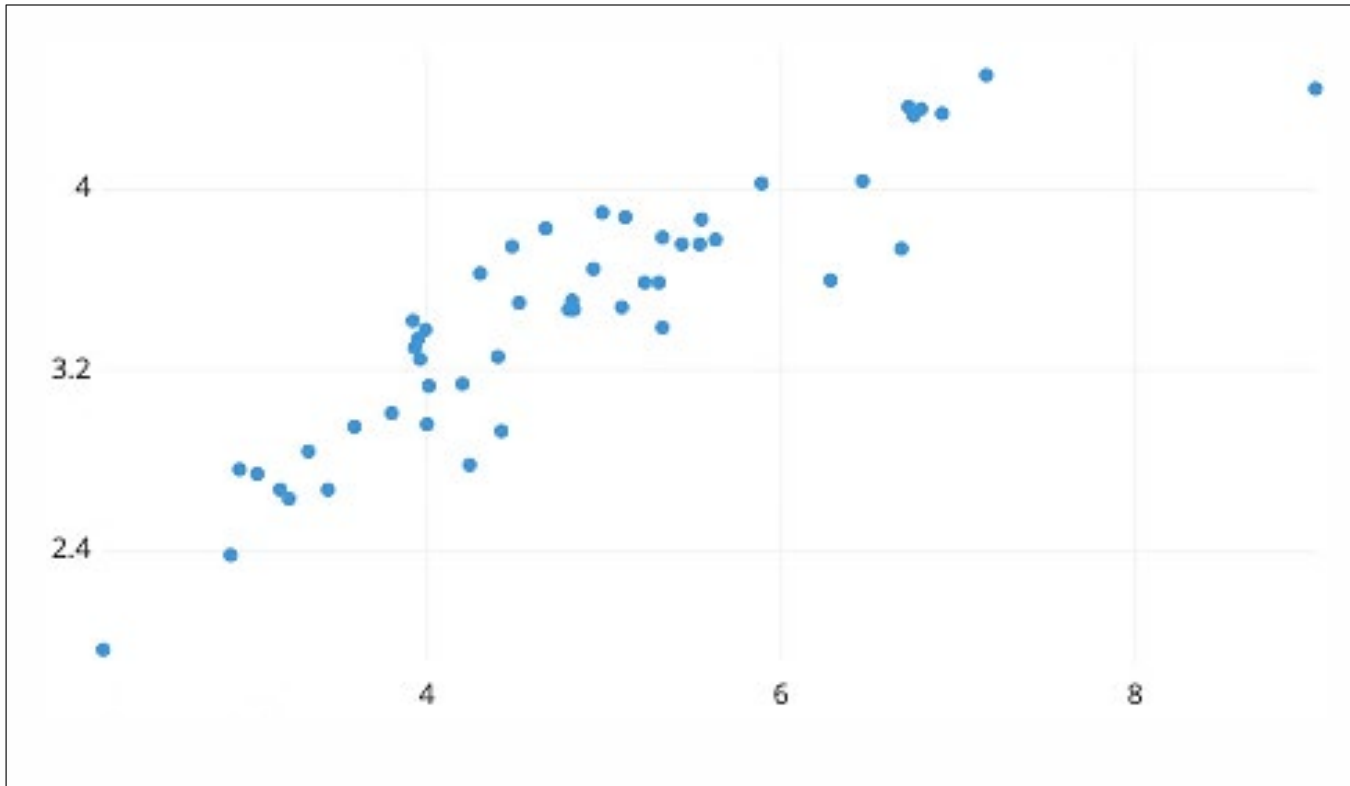


- *80% of the problems or effects come from 20% of the causes.*
- *Theoretically, by tackling 20% of the most frequent causes, an 80% improvement can be achieved.*

The tallest bars are the most frequently occurring issues.

# Scatter Diagram

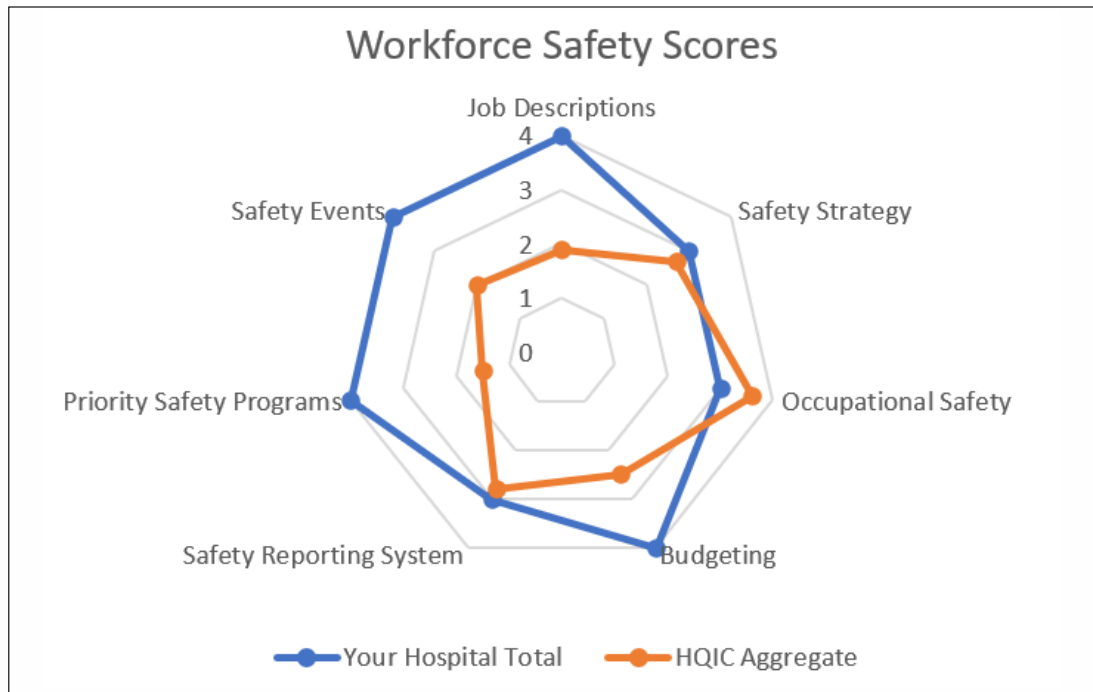
- Displays values for typically two variables for a set of data.



Useful to highlight the correlation between variables.

# Radar or Spider Chart

- A two-dimensional chart designed to plot one or more series of values over multiple quantitative variables.
- Each variable has its own axis. All axes are joined in the center of the figure.



Useful to display and easily compare multiple categories.

# Key Take-Aways

- Choose the most appropriate type of data visualization to engage your audience.
- Keep it simple!
- Limit the number of visual tools used for your staff.
- Limit the number of visual effects to facilitate understanding.



# References

- Langley GJ, Moen RD, Nolan KM, Nolan TW, Norman CL, Provost LP. *The Improvement Guide: A Practical Approach to Enhancing Organizational Performance*. Publisher: Jossey-Bass, Hoboken NJ; 2nd edition (April 20, 2009).  
<http://www.ihl.org/resources/Pages/Publications/ImprovementGuidePracticalApproachEnhancingOrganizationalPerformance.aspx>
- Institute for Healthcare Improvement (IHI). *Quality Improvement Essentials Toolkit*. 2021. Institute for Healthcare Improvement. Boston, MA. <http://www.ihl.org/resources/Pages/Tools/Quality-Improvement-Essentials-Toolkit.aspx>.
- Ulfat S. *Strategies and Approaches for Tracking Improvements in Patient Safety Patient Safety Primer*. Last Agency for Healthcare Research and Quality (AHRQ). Updated April 2021.  
<https://psnet.ahrq.gov/primer/strategies-and-approaches-tracking-improvements-patient-safety>.





# Thank you!

Questions: [hospitalquality@hsag.com](mailto:hospitalquality@hsag.com)

This material was prepared by Health Services Advisory Group (HSAG), a Hospital Quality Improvement Contractor (HQIC) under contract with the Centers for Medicare & Medicaid Services (CMS), an agency of the U.S. Department of Health and Human Services (HHS). Views expressed in this material do not necessarily reflect the official views or policy of CMS or HHS, and any reference to a specific product or entity herein does not constitute endorsement of that product or entity by CMS or HHS. Publication No. XS-HQIC-QI-05262022-01