Graphics Principles Cheat Sheet v1.0

Communication
Effective visualizations communicate complex statistical and quantitative information facilitating insight, understanding, and decision making.

But what is an effective graph?
This cheat sheet provides general guidance and points to consider.

Planning

Why
Clearly identify the purpose of the graph, e.g. to deliver a message or for exploration?

What
Identify the quantitative evidence to support the purpose

Who
Identify the intended audience (specialists, non-specialists, both) and focus the design to support their needs

Where
Adapt the design to space or formatting constraints (e.g. clinical report, slide deck or publication)

Effective visualizations communicate complex statistical and quantitative information facilitating insight, understanding, and decision making.

Principles of Effective Graphic Design

Proximity – group related elements together
Alignment – elements on the same vertical or horizontal plane are perceived as having similar properties
Simplicity – cut anything superfluous, only include elements that add value, limit to 2-3 colors or fonts
White space (empty space) – use white space to minimize distraction & provide clarity
Legibility – sans serif fonts are easier to read, use color for emphasis instead of a new typeface
Color – select colors that present enough contrast to make the graph legible. Choose monochromatic color schemes to prevent clashing. Use dark colors and accent colors to emphasize important information
Visual Hierarchy – use color, font, image size, typeface, alignment & placement to create a viewing order
Focal Points – primary area of interest that immediately attracts the eye, emphasize the most important concept and make it your focal point.

Effectiveness Ranking
A graph is a representation of data that visually encodes numerical values into attributes such as lines, symbols and colors. The Cleveland-McGill scale can be used to select the most effective attribute(s) for your purpose.

Example plots categorized by purpose

Selecting the right base graph
Consider if a standard graph can be used by identifying suitable designs based on the:
(i) purpose (i.e. message to be conveyed or question to answer) and (ii) data (i.e. variables to display).

Facilitating Comparisons

Proximity improves association
Place labels next to data instead of using legends
Group together elements to be compared directly

Ease visual inspection
Order values to help compare across many categories
Judgments are easier to make on a common vertical scale

Reduce mental arithmetic
Plot the final comparison e.g. mean difference not two means
Exception: if comparator is of interest in itself

Color for emphasis or distinction

Restrained use of color is highly effective in organizing a narrative and calling attention to certain elements.

Think carefully before introducing additional color. Do you really need it?

Do not use color to differentiate between categories of the same variable

Use colors or shades to represent meaningful differences such as positive/negative values, treatments or doses

Be consistent, use the same color to mean the same thing in a series of graphs (e.g. treatment, dose)

Use a bold, saturated or contrasting color to emphasize important details.

Emphasize the data by minimizing unnecessary ink, e.g. soften gridlines with a light color

Utilize existing resources for selection of appropriate palettes such as Color brewer or Munsell
Effective graphs stand alone. They use titles, annotations, labels, shapes, colors, and textures to deliver important information.

Label axes with clear measurement units and provide annotations that support the message.

Use font size to create hierarchy (e.g. set titles 2pt larger than all other labels to make them more prominent).

Do not type too small or too condensed. Break long titles into two lines. Shift or adjust size of labels that overlap.

Keep the font style simple – sans serif is easier to read.

Display text with enough contrast to be visible. Favor the use of dark on light instead of light on dark whenever possible.

Bold or italics should only be used for layering or emphasis. Emphasizing everything means nothing gets emphasized.

Try not to set text at an angle, as this decreases readability. Think of alternative solutions such as transposing the graph.

Are the same colors used to mean the same thing in a series of graphs?

Are all elements in the graph have a purpose?

Are number of patients by group reported if possible?

Is the correct graph type used?

Are graphical elements displayed in a dark color on a light background?

Are grid lines drawn with a thin line and a light color such as grey?

Are colors used sparingly (e.g. max 3)?

Do all elements in the graph have a purpose (e.g. colors, textures, grid lines)?

Are the same colors used to mean the same thing in a series of graphs?

Are the estimates of interest plotted (e.g. mean differences with confidence intervals)?

Can the plot be read without doing mental calculations?

Are elements to be compared grouped together?

Are the patterns/relationships easily identified?

Is the graph tailored to its primary purpose and audience?

Is it easy for someone unfamiliar with the data to interpret the graph?

Are multiple panels plotted on the same scale?

Are data across a disconnected time scale kept disconnected?

Can the font be read without eye strain or effort?

Are common baselines used wherever possible?

Does the orientation of the axes aid interpretation?

Are grid lines drawn with a thin line and a light color such as grey?

Are labels placed next to data instead of in legends?

Does the aspect ratio allow the reader to see variations in the data?

Are data spaced proportionally to the actual time interval (instead of according to visit number)?

Are data and inferences plotted to support stories about models?

Are multiple panels plotted on the same scale?