Clinisys Analytics

# DATA VISUALIZATION PRINCIPLES

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# PURPOSE

These principles establish the minimum standards for representing data accurately, consistently, and clearly across Clinisys data visualizations.

They apply to visualization design, implementation, and review. They are intended to ensure that changes in chart type, scale, units, visual encoding, formatting, or interaction do not alter the meaning of the underlying data or create misleading comparisons.

The principles apply regardless of the visualization type, data source, product, or implementation platform.

## 01 REPRESENT THE DATA TRUTHFULLY

A visualization must accurately represent the values, relationships, and differences present in the underlying data. Visual appearance must not take precedence over quantitative accuracy.

### PRESERVE PROPORTIONAL MAGNITUDE

The visual magnitude of a value must correspond to its numerical magnitude. Length, position, area, size, and other quantitative encodings cannot be adjusted to create a more visually balanced composition.

If A = 1,000, B = 24, and C = 8, their visual representation must preserve those differences.

### PRESERVE SCALE AND BASELINE INTEGRITY

Axis ranges, intervals, and baselines must accurately represent differences in the data. They should not be changed to exaggerate, minimize, or visually equalize differences.

When a truncated or non-zero baseline is necessary, it must be apparent to the user and appropriate for the visualization.

### DO NOT CONCEAL MEANINGFUL VARIATION

Aggregation and chart selection should not obscure distributions, ranges, outliers, or other variation when that information materially affects interpretation.

### DISTINGUISH ZERO FROM MISSING DATA

A value of zero is data. Missing, unavailable, not applicable, suppressed, and not yet collected data represent different conditions and must not be presented as zero or treated as equivalent states.

## 02 MAKE COMPARISONS VALID

When a visualization invites comparison, the data and its representation must support that comparison.

### PRESERVE UNITS OF MEASUREMENT

Units must be explicit and consistent wherever values are intended to be compared.

Related visualizations should not change units merely to accommodate layout or implementation. If a unit changes, the change must be intentional, clearly identified, and appropriate to the comparison.

### Maintain comparable scales

Visualizations intended for comparison should use compatible scales and ranges when differences in scale would otherwise distort the comparison.

A value should not appear larger or smaller simply because two neighboring charts use substantially different scales without making that distinction clear.

#### MAINTAIN CONSISTENT TIMEFRAMES AND DEFINITIONS
Comparisons should use equivalent time periods, populations, calculations, denominators, and definitions unless the difference itself is part of what is being communicated.

#### MAKE AGGREGATION EXPLICIT
Count, sum, average, median, percentage, rate, range, minimum, and maximum describe different properties of data.

The aggregation being displayed must be identifiable and should remain consistent across comparisons unless there is a defined reason for it to change.

## 03 MATCH THE REPRESENTATION TO THE DATA

The visual representation should be determined by the relationship the user needs to understand, not by aesthetic preference or implementation convenience.

#### SELECT THE VISUALIZATION BASED ON THE RELATIONSHIP
Different questions require different representations.

Comparison, ranking, change over time, distribution, composition, deviation, and correlation should not be treated as interchangeable simply because they use the same underlying dataset.

Changing the visualization type is acceptable only when the alternative preserves the relationship the visualization is intended to communicate.

#### USE AXES CONSISTENTLY
The role of the X and Y axes should remain predictable across related visualizations.

Time, categories, measures, and other dimensions should not move arbitrarily between axes. Orientation should support the structure of the data and remain consistent when users are expected to compare multiple views.

#### USE VISUAL ENCODING CONSISTENTLY
Position, length, size, shape, color, and other visual properties should have defined meanings.

The same visual treatment should not represent one concept in one visualization and an unrelated concept in another without a clear reason.

## 04 PROVIDE THE CONTEXT NEEDED FOR INTERPRETATION

Accurate values can still be misleading when the information necessary to interpret them is absent.

#### IDENTIFY WHAT IS BEING MEASURED
Titles, labels, units, measures, dimensions, and timeframes should make clear what the visualization represents.

A user should not have to infer whether a value represents a count, percentage, duration, rate, average, or other measure.

#### PROVIDE MEANINGFUL REFERENCE POINTS
Targets, thresholds, benchmarks, previous periods, expected ranges, or other reference values should be included when they are necessary to determine whether a result is significant.

#### PRESERVE RELEVANT LIMITATIONS
Known limitations in coverage, completeness, latency, calculation, or interpretation should remain available when they materially affect what can be concluded from the visualization.

#### PROVIDE DATA PROVENANCE WHEN NEEDED

Source and last-updated information should be available when the origin or currency of the data affects interpretation or trust.

### 05 DESIGN FOR COMPREHENSION

A visualization should make the intended relationship easier to understand without changing the information being communicated.

#### PRIORITIZE LEGIBILITY OVER DECORATION

Every visual element should support comprehension.
Gridlines, borders, effects, labels, legends, and other elements should not compete with the data. At the same time, data must never be altered simply to produce a cleaner or more visually balanced chart.

#### USE COLOR INTENTIONALLY

Color should communicate a defined purpose such as category, sequence, status, comparison, or emphasis.

Color should be applied consistently across related visualizations and should not be used decoratively when it introduces unnecessary meaning or complexity.

#### DO NOT RELY ON COLOR ALONE

Information communicated through color should have another means of identification when necessary, such as labels, position, shape, pattern, or text.

#### MAINTAIN READABLE LABELING

Titles, axis labels, legends, values, annotations, and supporting text should remain legible and should provide enough information to interpret the visualization without unnecessary decoding.

#### DESIGN INTERACTION TO SUPPORT UNDERSTANDING

Filtering, highlighting, tooltips, drill-down, drill-through, and other interactions should help users investigate the data without altering the visualization's underlying meaning.

The default state must remain interpretable without requiring interaction to reveal information necessary to understand it.

## USING THESE PRINCIPLES

These principles should be applied at three points in the visualization lifecycle:

#### DESIGN

Evaluate whether the proposed representation accurately communicates the defined measures, dimensions, relationships, and context.

#### IMPLEMENTATION

Use the principles when technical or platform constraints require changes to the original design. An alternative implementation is acceptable when it preserves the intended meaning and remains consistent with these standards.

#### REVIEW

Validate the implemented visualization against the underlying data and these principles, not solely against visual similarity to the design specification.

A difference in styling or execution does not necessarily make an implementation incorrect. A difference that changes the apparent magnitude, comparison, relationship, measurement, or interpretation of the data does.

## GOVERNING STANDARD

**Implementation may change how a visualization is executed. It must not change what the data communicates.**