

Make Exploring Data Analysis More Enjoyable And Efficient

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CONTENTS

01 | Why need clinical data visualization?

02 | What is the excellent clinical data visualization?

03 | How to improve the efficiency of clinical data visualization?

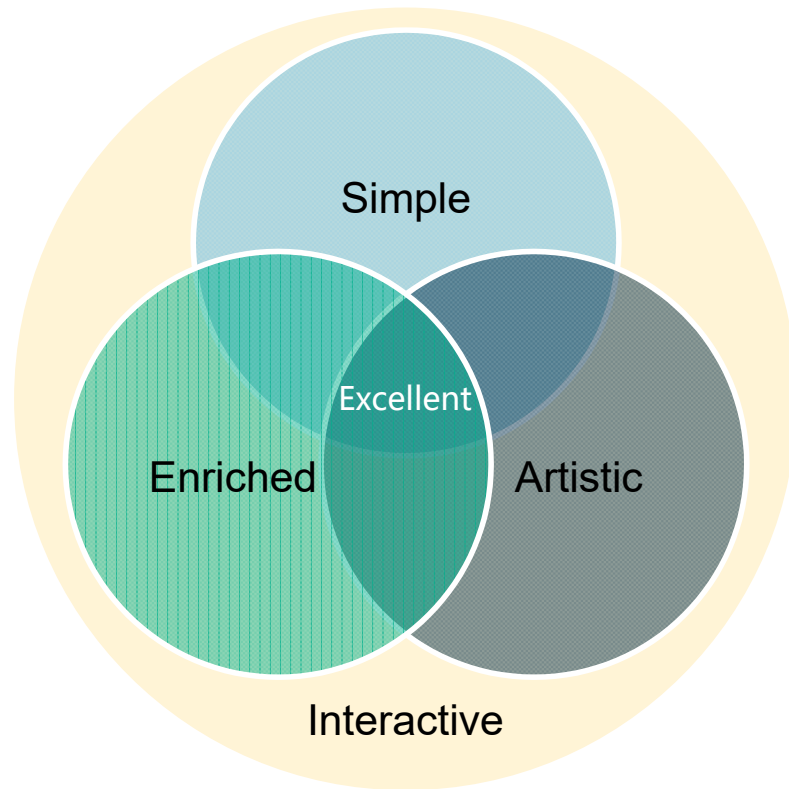
Why Need Clinical Data Visualization?

- Data visualization is primarily intended to communicate information clearly and efficiently through the graphic representation of data
- Advantages of clinical data visualization
 - ✓ Real time data presentation
 - ✓ Faster and high-frequency insight into data, more helpful in exploring analysis and data cleaning
 - ✓ Reduce information omissions
 - ✓ Strengthen communication and collaboration between statisticians and clinicians and other colleagues
 - ✓



What is the Excellent Clinical Data Visualization?

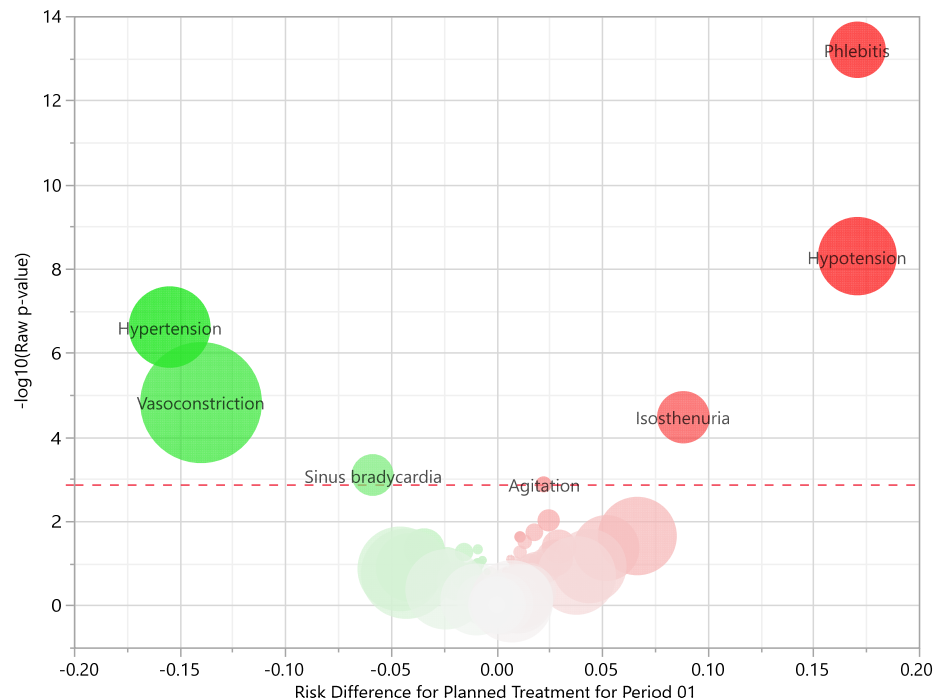
- Data visualization is both an art and a science
- Features of excellent data visualization
 - ✓ Simple
 - ✓ Enriched
 - ✓ Artistic
- Other features of excellent clinical data visualization
 - ✓ Contain the appropriate indicators, e.g. spec limits
 - ✓ Intuitively compare the results between the arms
 - ✓ Interactive linkage for association and extraction



Case Study - Volcano Plot

- Purpose
- ✓ Screening for statistically significant adverse events between groups
- ✓ Then more detailed analysis of these adverse events

Role	Definition
X-axis	• Risk Difference • ΔAE Incidence% (NIC.15 - Placebo)
Y-axis	• Statistical Difference between Groups • $-\log_{10}(\text{Raw p-value})$
Color	• Green: AE occurred more in Placebo group • Red: AE occurred more in NIC.15 group
Bubble Size	• AE Occurrence Count
Label	• AE Term
Reference line	• Statistical Difference



Case Study - Compound Plot

- Purpose
- ✓ Describe the incidence of the key adverse events and the relative risk between groups
- ✓ Longitudinal comparison between different adverse events

Role	Definition
X-axis	• Left: AE incidence percent • Right: $\log_2(RR)$, 0 means $RR=1$
Y-axis	• AE Term
Color	• Green: Placebo group • Red: NIC.15 group
Reference line	• Statistical Difference • Whether the 95% CI of RR contains 1

Dictionary-Derived Term

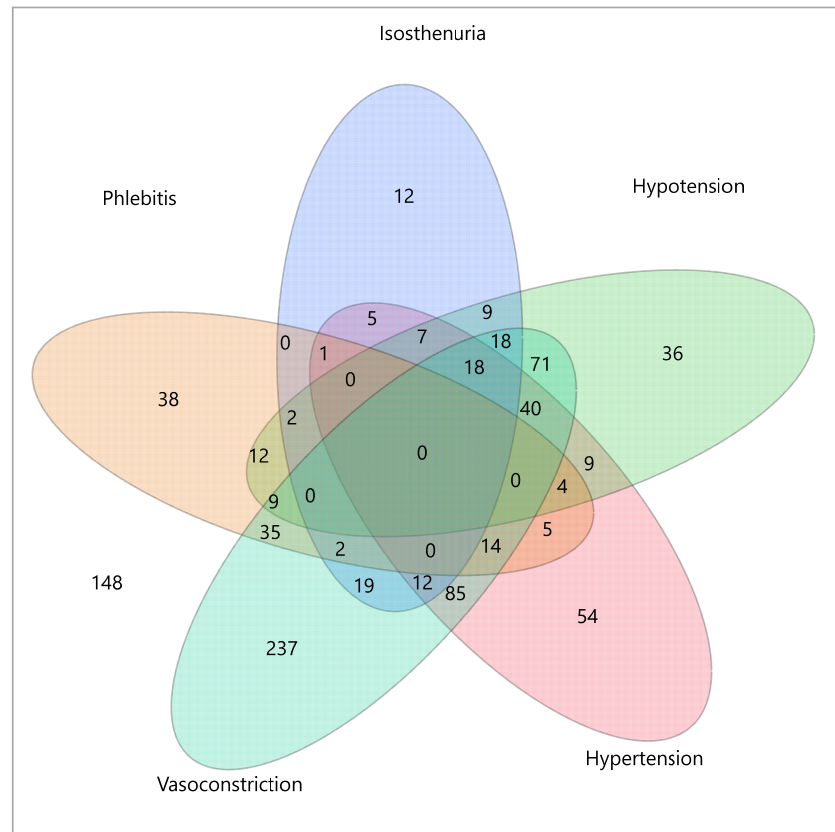


Case Study - Venn Diagram

- Purpose
- ✓ Study the merge occurrence of the key adverse events
- ✓ Inferring the root cause by observing the merge concurrency of adverse events

Role	Definition
Color and Ellipse	• 5 key Adverse Events
Number	• Un-overlapping part: Number of patients with this adverse event alone • Overlapping part: Number of patients with these adverse events merge occurrence

- Example
- ✓ Vasoconstriction occurred alone in 237 cases
- ✓ Vasoconstriction and Hypotension merge occurred in 71 cases

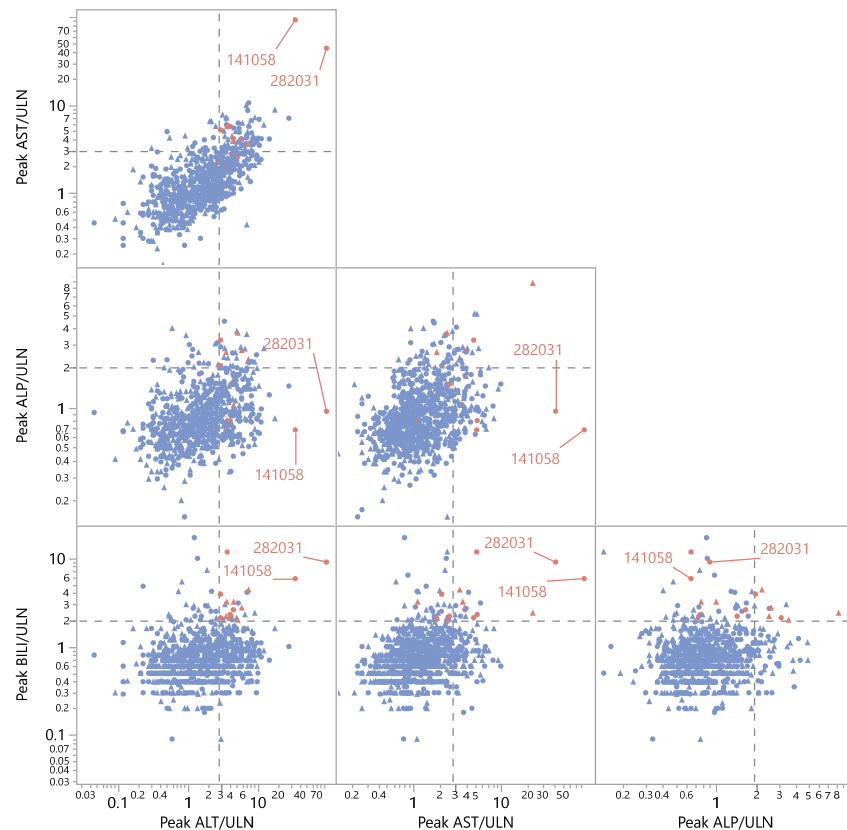


Case Study - Scatter Plot

- Purpose
- ✓ Hepatic toxicity assessment is an important part of laboratory test and often includes 4 indicators:

Indicator	Chinese Description
AST	谷草转氨酶
ALT	谷丙转氨酶
ALP	碱性磷酸酶
BILI	胆红素

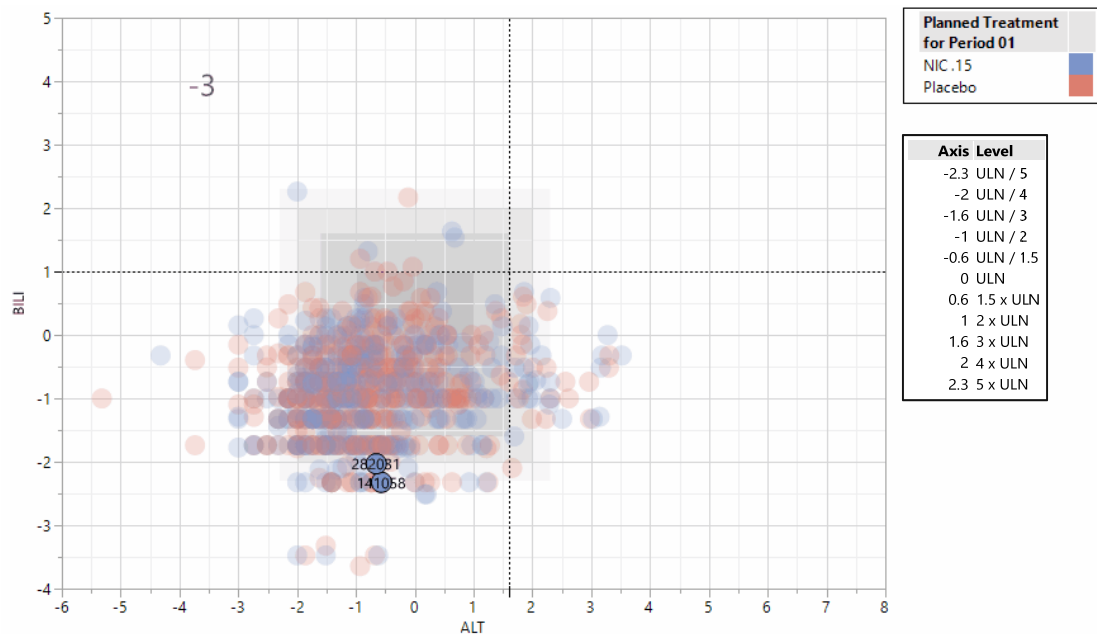
- ✓ Hy's law is an important indicator for predicting severe hepatotoxicity in clinical trials
 - ✓ The Peak Scatterplot Matrix flag the possible Hy's law cases:
1. ALT or AST $\geq 3 \times \text{ULN}$ and BILI $\geq 2 \times \text{ULN}$ within 0 Days of ALT/AST elevation
 2. ULN: Upper Limited Normal



Case Study - Dynamic Bubble Plot

- Purpose
- ✓ Describe the dynamic trends of laboratory test indicators

Role	Definition
X-axis	• ALT Indicator
Y-axis	• BILI Indicator
Color	• Red: Placebo group • Blue: NIC.15 group
Bubble	• 1 Bubble = 1 Subject
Dynamic by	• Time



Case Study

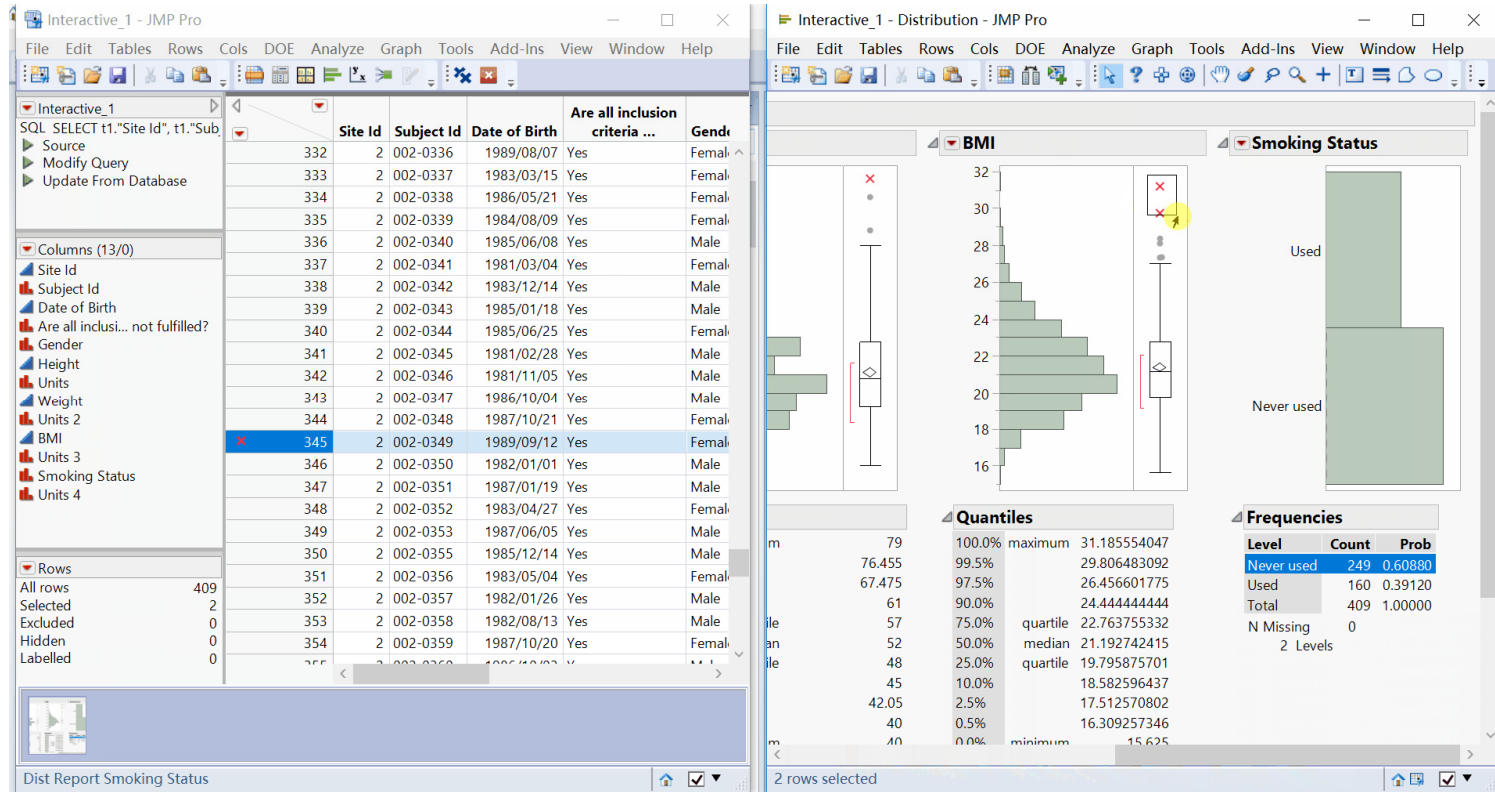
- Patient Profile

- Purpose
- ✓ Summary of subject personal safety information
- ✓ The right figure integrates safety-related information from one of the Hy's law case subjects, which can be intuitively seen:
 1. Concurrency of Adverse Events
 2. Concomitant Medications
 3. ECG Test Results
 4. Changes in Laboratory Test Results
 5. Changes in Vital Signs
 6. Time Relationship



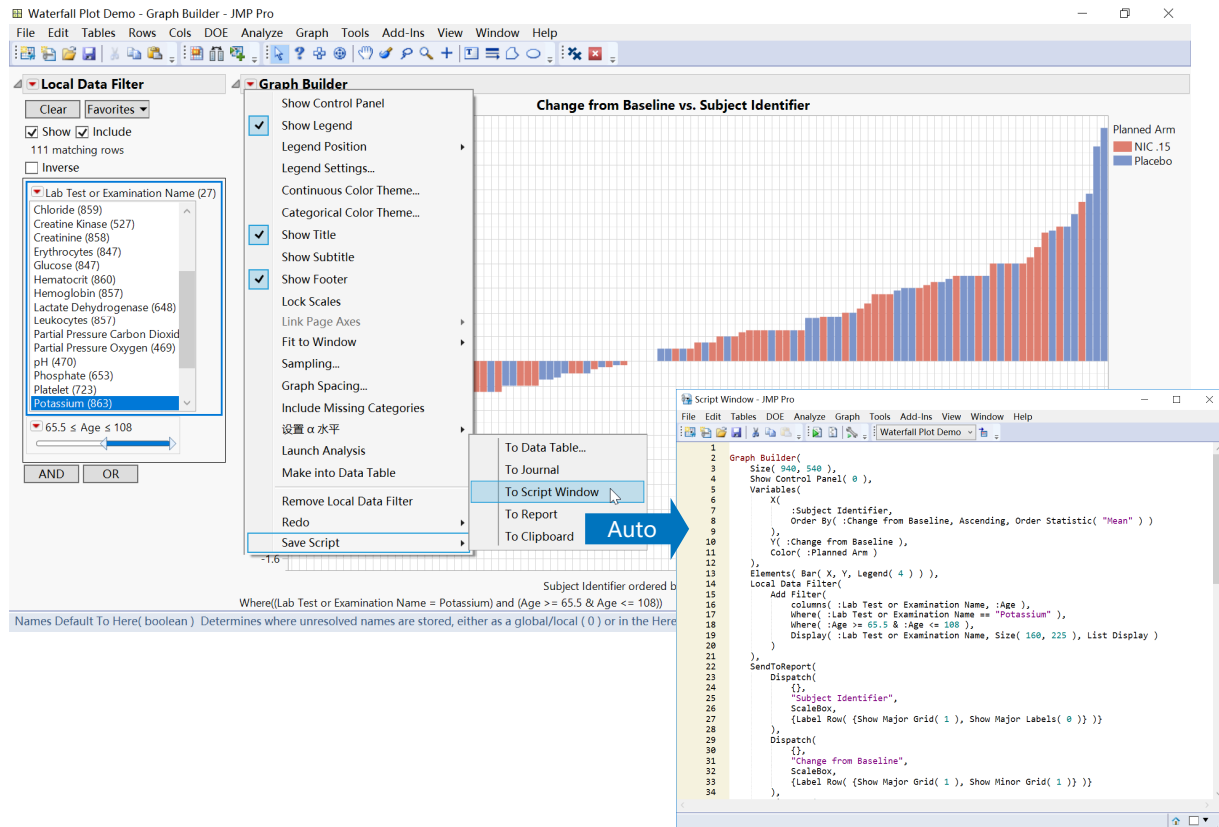
Case Study - Interactive linkage

Scenario: Explore Outliers

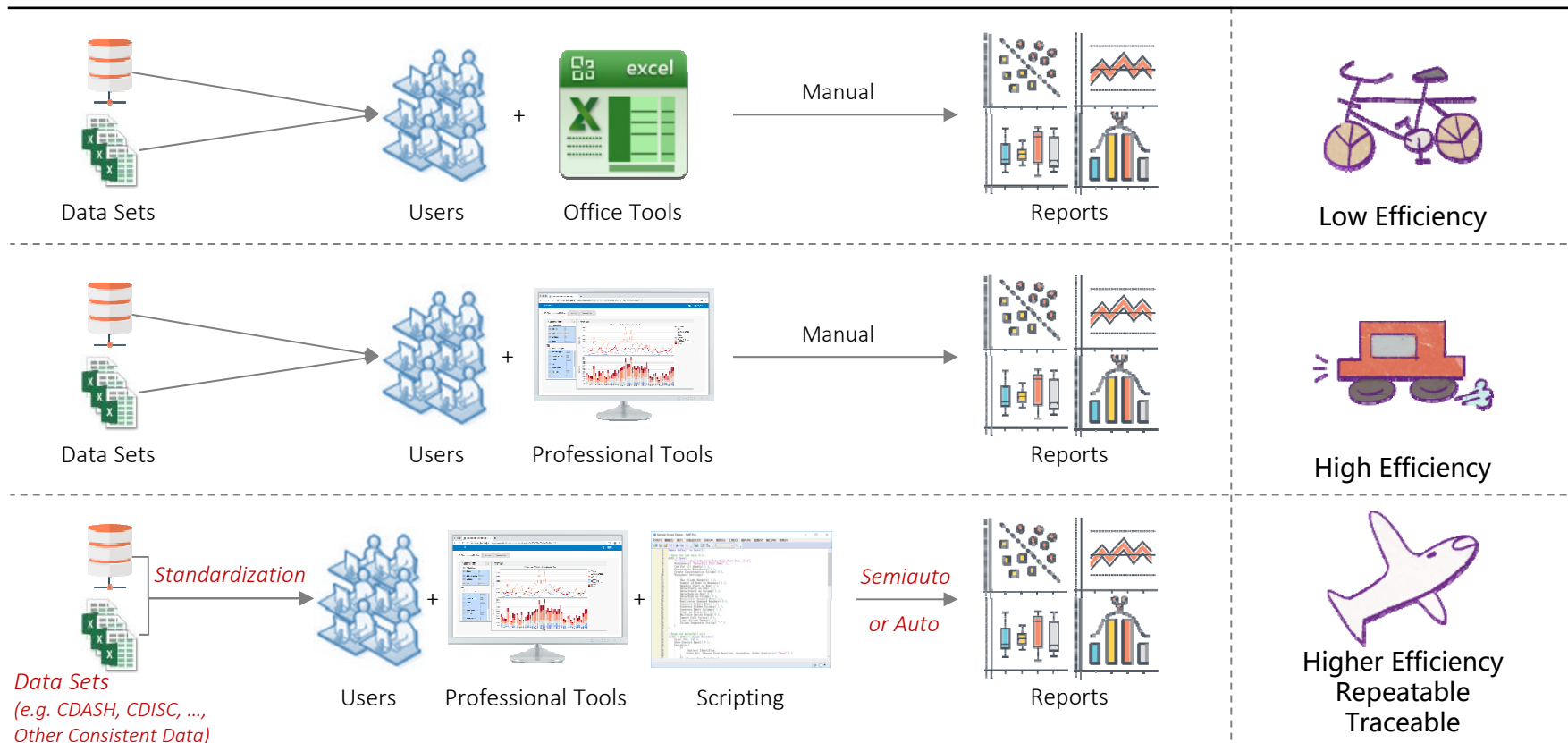


Clinical Data Visualization Challenges and Solutions

- Challenges
 - ✓ Clinical professional plot creation is inconvenient
 - ✓ Time-consuming
- Solutions
 - ✓ Professional tools support
 - ✓ Scripting



How to Improve the Efficiency of Clinical Data Visualization?



How to Improve the Efficiency of Clinical Data Visualization?

- Simple Scripting Demo

Step-1 Import Data

Waterfall Plot Demo - JMP Pro

File Edit Tables Rows Cols DOE Analyze Graph Tools Add-Ins View Window Help

Waterfall Plot Demo

Source

Columns (10/0)

- Study Site Identifier
- Subject Identifier
- Lab Test or Examination Name
- Change from Baseline
- Sex
- Race
- Pooled Race Group
- Age
- Age Group
- Planned Arm

Rows

All rows 19,279

Selected 0

Excluded 0

Hidden 0

Labelled 0

Study Site Identifier	Subject Identifier	Lab Test or Examination Name	Change from Baseline	Sex	Race	Pooled Race Group	Age	Age Group	Planned A
1	10	Potassium	0.8000002	F	WHITE	WHITE	63	< 65	Placebo
						WHITE	66	>= 65	NIC.15
						NON-WHITE	31	< 65	Placebo
						WHITE	48	< 65	NIC.15
						WHITE	67	>= 65	Placebo
						NON-WHITE	32	< 65	Placebo
						WHITE	67	>= 65	NIC.15
						NON-WHITE	38	< 65	NIC.15
						NON-WHITE	48	< 65	Placebo
						NON-WHITE	33	< 65	NIC.15
						WHITE	49	< 65	Placebo
						WHITE	32	< 65	Placebo
						WHITE	74	>= 65	NIC.15
						WHITE	47	< 65	Placebo
						NON-WHITE	78	>= 65	NIC.15
						WHITE	35	< 65	NIC.15
						WHITE	18	< 65	Placebo
						WHITE	79	>= 65	NIC.15
						WHITE	46	< 65	NIC.15
						WHITE	72	>= 65	Placebo
						WHITE	80	>= 65	Placebo
						WHITE	53	< 65	Placebo
						WHITE	43	< 65	NIC.15
						WHITE	56	< 65	Placebo
						WHITE	65	>= 65	NIC.15
						WHITE	44	< 65	Placebo
						WHITE	27	< 65	NIC.15
						WHITE	33	< 65	Placebo

Script for Waterfall Plot Demo - JMP Pro

Name: Source

Script:

```
1 Open(
2   C:\Users\sbj\l\Desktop\Waterfall Plot Demo.xlsx",
3   Worksheets( "Waterfall Plot Demo" ),
4   Use for all sheets( 1 ),
5   Concatenate Worksheets( 0 ),
6   Create Concatenation Column( 0 ),
7   Worksheet Settings(
8     1,
9     Has Column Headers( 1 ),
10    Number of Rows in Headers( 1 ),
11    Headers Start on Row( 1 ),
12    Data Starts on Row( 2 ),
13    Data Starts on Column( 1 ),
14    Data Ends on Row( 0 ),
15    Data Ends on Column( 0 ),
16    Replicated Spanned Rows( 1 ),
17    Replicated Spanned Headers( 0 ),
18    Suppress Hidden Rows( 1 ),
19    Suppress Hidden Columns( 1 ),
20    Suppress Empty Columns( 1 ),
21    Treat as Hierarchy( 0 ),
22    Multiple Series Stack( 0 ),
```

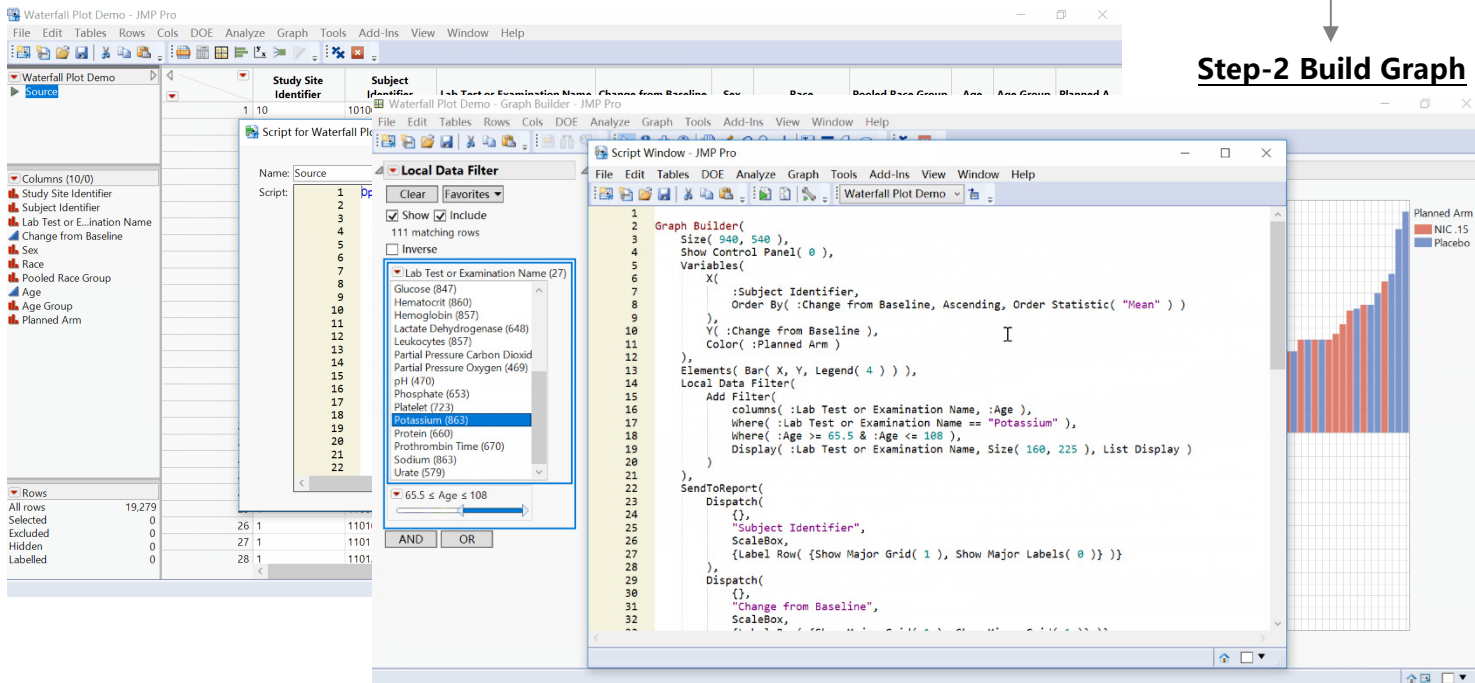
OK Run Debug Script Save Cancel

How to Improve the Efficiency of Clinical Data Visualization?

- Simple Scripting Demo

Step-1 Import Data

Step-2 Build Graph



How to Improve the Efficiency of Clinical Data Visualization?

- Simple Scripting Demo

Step-1 Import Data

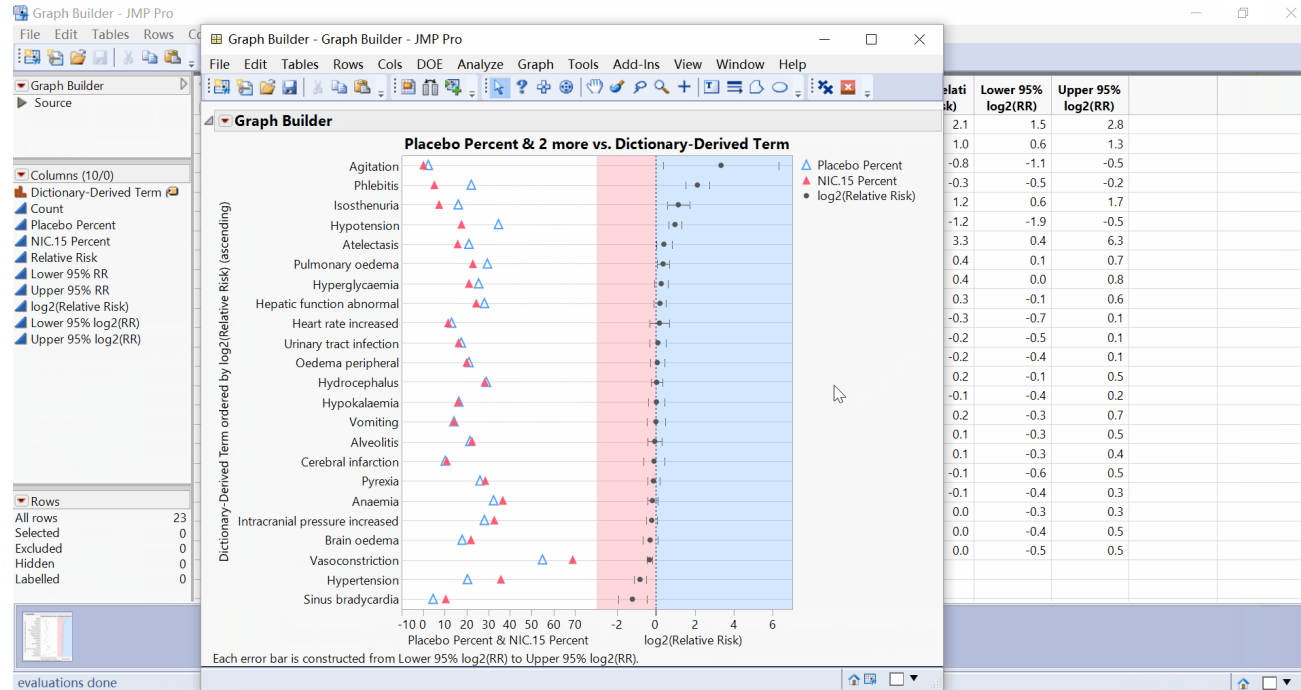
Step-2 Build Graph

Step-3 Script Integration

```
1 //Open the raw data file
2 dtb1 = Open(
3   "C:\Users\bjalx\Desktop\Waterfall Plot Demo.xlsx",
4   Worksheets( "Waterfall Plot Demo" ),
5   Use for all sheets( 1 ),
6   Concatenate Worksheets( 0 ),
7   Create Concatenation Column( 0 ),
8   Worksheet Settings(
9     1,
10    Has Column Headers( 1 ),
11    Number of Rows in Headers( 1 ),
12    Headers Start on Row( 1 ),
13    Data Starts on Row( 2 ),
14    Data Starts on Column( 1 ),
15    Data Ends on Row( 0 ),
16    Data Ends on Column( 0 ),
17    Replicated Spanned Rows( 1 ),
18    Replicated Spanned Headers( 0 ),
19    Suppress Hidden Rows( 1 ),
20    Suppress Hidden Columns( 1 ),
21    Suppress Empty Columns( 1 ),
22    Treat as Hierarchy( 0 ),
23    Multiple Series Stack( 0 ),
24    Import Cell Colors( 0 ),
25    Limit Column Detect( 0 ),
26    Column Separator String( "-" )
27  )
28 );
29
30 //Draw the waterfall plot
31 obj01 = dtb1 << Graph Builder(
32   Size( 940, 540 ),
33   Show Control Panel( 0 ),
34   Variables(
35     X(
36       :Subject Identifier,
```


The Features of Ideal Clinical Data Visualization Tools

- Necessary Features
- Support most types of data files
 - Support access to the database
 - Powerful graphics capabilities
 - Flexible
 - Interactivity
 - Scriptable
 - Easy to learn and use



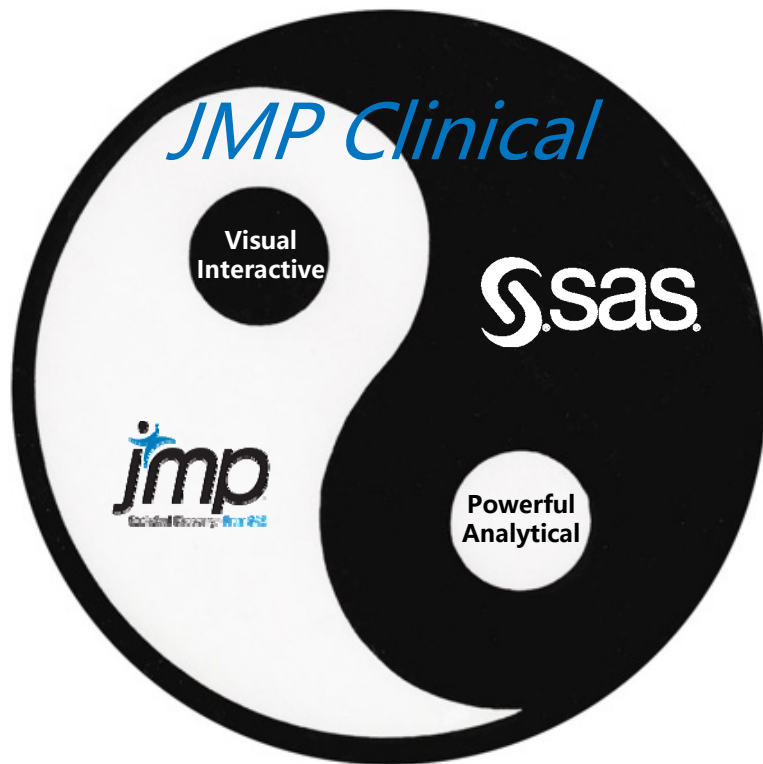
JMP - Leading Professional Statistics Software for Data Sciences

- **Analytical**
 - ✓ Deep statistical and analytical capability
 - ✓ Statistical transformation and modeling through visualization
 - ✓ Dynamic model selection according to data
- **Graphical**
 - ✓ Drag and drop to create graphics
 - ✓ Interactive graphic for every statistical results
 - ✓ Statistical model application on the fly
- **Practical**
 - ✓ Communication hub
 - ✓ Easy to learn and use without coding
 - ✓ Seamless connection between graphic and data table
- **Magical**
 - ✓ Beginning to End: design, prepare, analyze, mining and report
 - ✓ Instant discovery for meaningful conclusion
 - ✓ Statistical approach for every industry and every job function associated with data



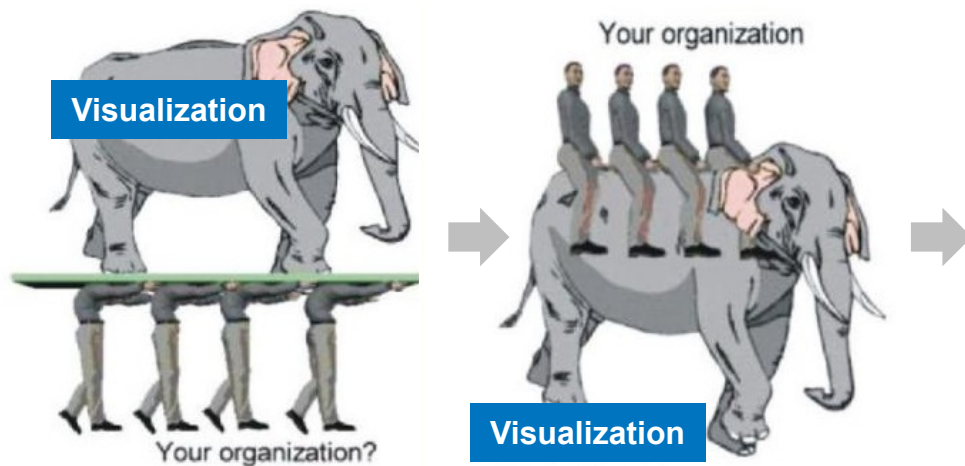
<https://www.jmp.com>

JMP Clinical - Clinical Data Science Solution



Summary

- Data visualization greatly helps researchers gain insight into clinical data and deliver information more clearly and efficiently
- Standardization of clinical data helps drive automation of clinical data visualization to further increase efficiency
- Professional and powerful data visualization tools are essential



Do **More** with Less

THANK YOU

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All the Results were Generated and Displayed in
JMP Clinical

