

Getting the JMP[®] on your Clinical Trial Analysis

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AGENDA

Part 1:

Drug Discovery and Development Process
CDISC Data Standards
Clinical Trial Review Process
JMP Clinical Overview and Architecture
Live Demonstration

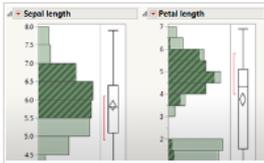
Part 2:

Clinical Reports for Early Efficacy in Oncology
JMP Virtual Joins and JSL Implementation
Customizing JMP Clinical Reviews

Part 1

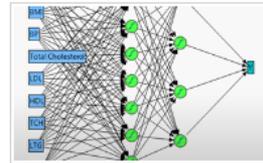
Drug Discovery, JMP Clinical Overview and Introduction

JMP Clinical is Part of the JMP Family for Statistical Discovery . . .



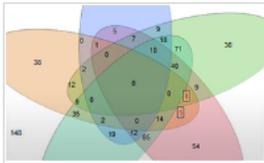
> JMP

Statistical discovery software from SAS. Links dynamic data visualization with powerful statistics, in memory and on the desktop.



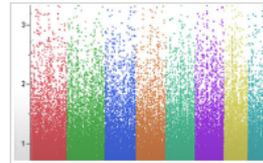
> JMP Pro

Takes statistical discovery to the next level with all the tools in JMP plus advanced features for more sophisticated analyses.



> JMP Clinical

Shortens the drug development process by streamlining analysis of clinical trials data using JMP and SAS.



> JMP Genomics

Leverages JMP, SAS and customized applications for visualizing and analyzing vast genomics data sets.

New Chemical Entity Timeline

From Discovery to Launch



Phase I trials are the first stage of testing in human subjects. Normally, a **small (20-100) group of healthy volunteers** will be selected. This phase includes trials designed to assess the safety, tolerability, pharmacokinetics, and pharmacodynamics of a drug.

Phase II trials are performed **on larger groups (20-300)** and are designed to assess how well the drug works, as well as to continue Phase I safety assessments in a larger group of volunteers and patients.

Phase III studies are randomized controlled **multicenter trials on large patient groups (300–3,000 or more** depending upon the disease/medical condition studied) and are aimed at being the definitive assessment of how effective the drug is. Time consuming and expensive.

Approval and Launch is where clinical data needs to be submitted to medical authorities for approval before bringing the drug to market. After approval, post marketing surveillance is carried out.

CDISC submission

FDA announcements since 2004

FDA Final Binding Guidance on Standards Now Available



FDA N

FOR IMMEDIATE RELEASE
P04-73
July 21, 2014

FDA Ann

The Food and Drug Administration

The announcement

"The importance of this data

SDTM re

<http://>

17 December 2014

The FDA has just published the long-awaited binding guidance documents regarding submission of study data in standardized formats.

The [Guidance on Providing Regulatory Submissions in Electronic Format](#) requires submissions be submitted in an electronic format specified by the FDA beginning 24 months from the issuance of this document, and is [available here](#).

The [Guidance on Standardized Study Data, available here](#), states:
"After the publication of this guidance, all studies with a start date 24 months after the publication date must use the appropriate FDA-supported standards, formats, and terminologies specified in the Catalog (see section II.C) for NDA, ANDA, and certain BLA submissions."

The current [FDA Data Standards Catalog](#) specifies use of the CDISC SDTM, SEND, ADaM and Define-XML standards as well as CDISC Controlled Terminology. The catalog can be [accessed here](#).



standards research

technology

far too valuable



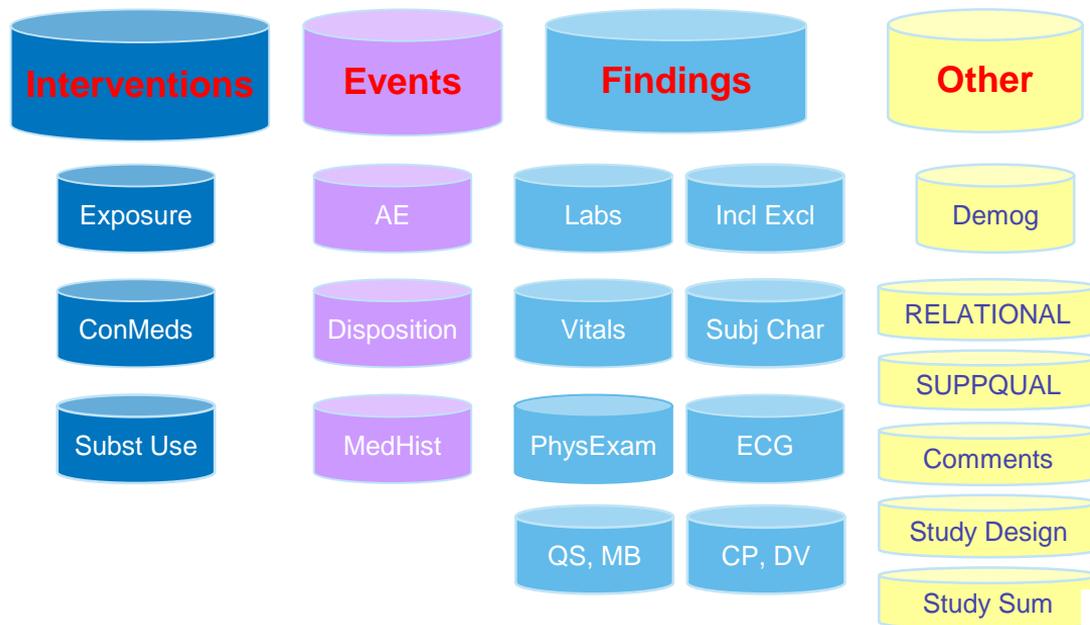
CDISC submission standard

What is CDISC???

- CDISC: Clinical Data Interchange Standards Consortium (<http://www.cdisc.org/>)
- SDTM: Study Data Tabulation Model
 - standard for interchange of collected data
- ADaM: Analysis Data Model
 - standard for interchange of analysis data (derived data from SDTM)
- **Points about CDISC**
 - Mandatory! FDA only accept this form for submissions **since 2016**
 - System incredibly flexible and only requires a just a handful of variables
 - Conversion is NOT as difficult as it seems

Motivation: Convert your data so that your analyses are performed exactly how the FDA will review them!

CDISC SDTM Domains Example



Data are saved in separate domain tables, each with a two-letter name.



From [CDISC SDTM Overview & Impact to AZ](#), 2004, by Dan Godoy, presented at the first CDISC/SDM meeting 20 October 2004

Review Process



User personas

Report Creators

Clinical or Statistical
Programmers



Cleanse and prepare data for
other groups

Statisticians
Biostatisticians
Biometrician



Reporting safety and efficacy
(effectiveness)

Data Monitors/
Data Managers



(Clinical Operations Department):
Concerned with Data Quality and Fraud

Medical Reviewers/ Medical
Writers/
Medical Monitoring
Clinicians



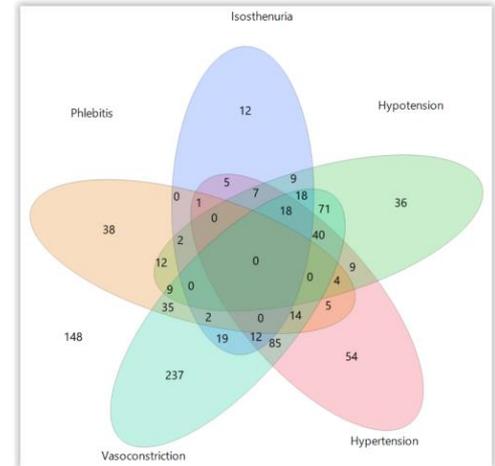
Concerned with bad side effects
(adverse events)

Report Consumers

Why JMP Clinical?

- Data Review Best Practices

- Streamline the clinical trials data review process by having on the shelf all the analytical tools in place
- Moving from obsolete medical review process (listings) to interactive statistically-driven dashboard coupled with effective data visualization key to efficient data review that medical reviewers, data managers and biostatisticians can employ
- Based on industry standard tools (JMP and SAS)
- Uses standard data (CDISC: SDTM & ADaM; SEND)
- Open architecture, strategic adaptability to customer needs: medical monitoring, medical writing, data integrity and moves to a variety of therapeutic areas

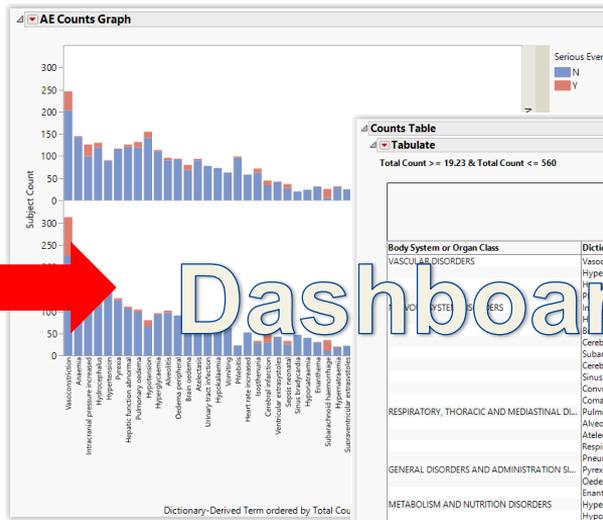


Moving from obsolete Medical review process

*AE Event Occurrence & Proportion Report for Treatment Reporting Events with at least Overall 4% Occurrence
Nocardipine: All Event Types for All Subjects Chosen*

	Planned Treatment for Period 01		
	NIC_15	Placebo	Total
	Count (%)	Count (%)	Count (%)
Total	N=447	N=455	N=902
BLOOD AND LYMPHATIC SYSTEM DISORDERS	159(35.6%)	174(38.2%)	333(36.9%)
Anaemia	145 (32.4)	167 (36.7)	312 (34.6)
Platelet destruction increased	29 (6.5)	15 (3.3)	45 (5.0)
CARDIAC DISORDERS	41 (9.2)	124 (27.3)	165 (18.4)
Cardiac failure congestive	1 (0.2)	1 (0.2)	2 (0.2)
Sinus bradycardia	1 (0.2)	1 (0.2)	2 (0.2)
Supraventricular extrasystoles	25 (5.6)	22 (4.8)	47 (5.2)
Ventricular extrasystoles	42 (9.4)	43 (9.5)	85 (9.4)
GASTROINTESTINAL DISORDERS	63(14.1%)	64(14.1%)	127(14.1%)
Vomiting	63 (14.1)	64 (14.1)	127 (14.1)
GENERAL DISORDERS AND ADMINISTRATION SITE CONDITIONS	201(45%)	198(43.5%)	399(44.2%)
Enanthema	32 (7.2)	31 (6.8)	63 (7.0)
Oedema peripheral	94 (21)	91 (20)	185 (20.5)
Pyrexia	117 (26.2)	130 (28.6)	247 (27.4)
HEPATOBIILIARY DISORDERS	126(28.2%)	111(24.4%)	237(26.3%)
Hepatic function abnormal	126 (28.2)	111 (24.4)	237 (26.3)

Listings



Dashboards

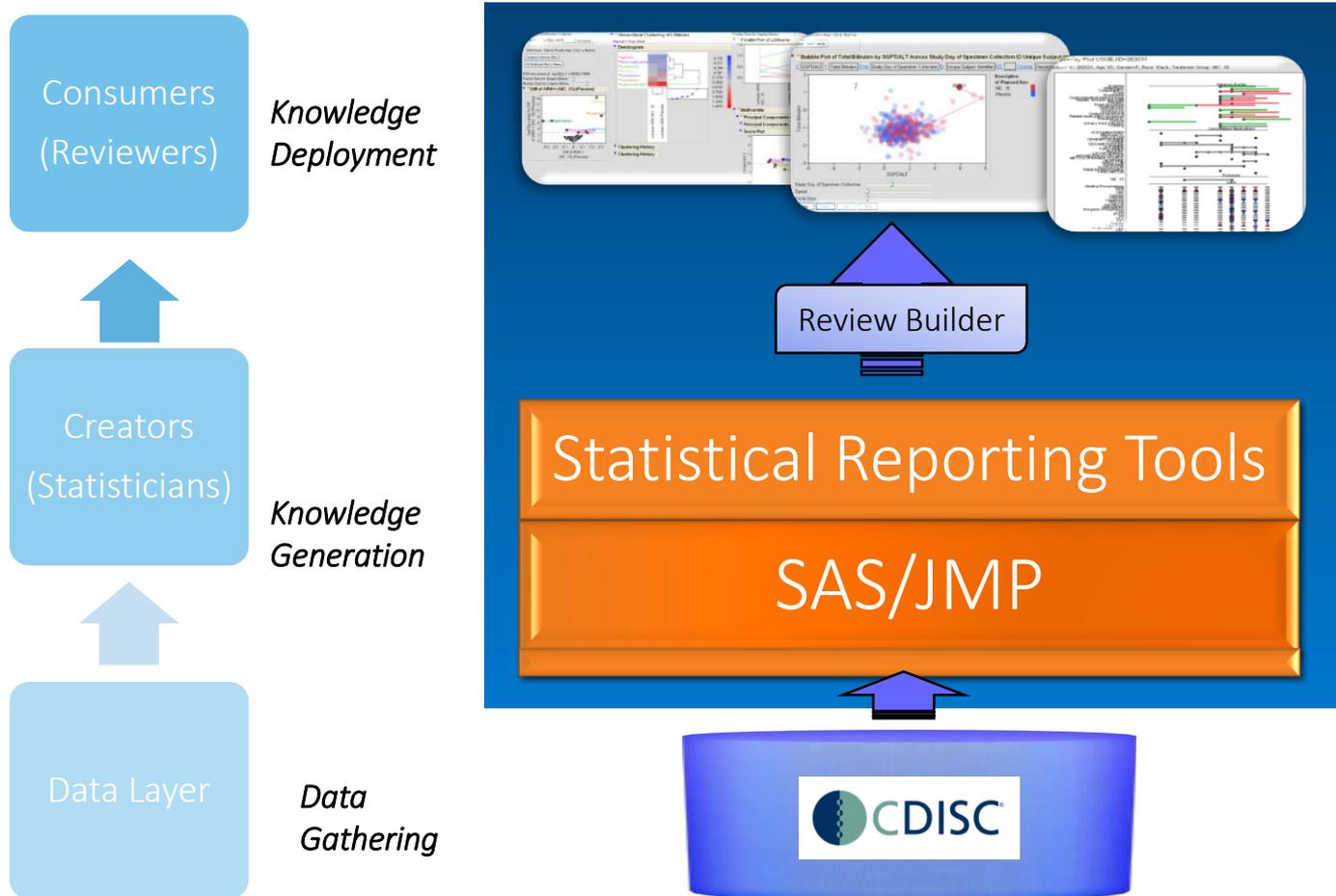
Counts Table
Tabulate
Total Count >= 19.23 & Total Count <= 560

Body System or Organ Class	Dictionary-Derived Term	Planned Treatment for Period 01								Total
		NIC_15		Placebo		NIC_15		Placebo		
		Count	%	Count	%	Count	%	Count	%	
VASCULAR DISORDERS	Vasoconstriction	203	45.4%	43	9.6%	226	49.7%	88	19.3%	560
	Hypertension	89	19.9%	2	0.4%	154	33.8%	9	2.0%	254
	Pyrexia	141	31.5%	14	3.1%	66	14.5%	14	3.1%	235
	Headache	96	21.5%	3	0.7%	23	5.1%	1	0.2%	122
	Infarction ischaemic cerebral	100	22.4%	26	5.8%	118	25.9%	31	6.8%	275
	Ischaemia	120	26.8%	10	2.3%	117	25.7%	12	2.6%	359
	Ischaemia peripheral	68	15.2%	12	2.7%	79	17.4%	21	4.6%	180
	Cerebral infarction	34	7.6%	11	2.5%	30	6.6%	19	4.2%	94
	Subarachnoid haemorrhage	6	1.3%	20	4.5%	11	2.4%	24	5.3%	61
	Cerebral haemorrhage	15	3.4%	2	0.4%	18	4.0%	10	2.2%	45
RESPIRATORY, THORACIC AND MEDIASTINAL DISORDERS	Sinus headache	20	4.5%	1	0.2%	24	5.3%	-	-	45
	Convulsion	17	3.8%	2	0.4%	17	3.7%	2	0.4%	38
	Coma	5	1.1%	9	2.0%	1	0.2%	6	1.3%	21
	Pulmonary oedema	120	26.8%	12	2.7%	98	21.5%	6	1.3%	236
	Alveolitis	90	20.1%	6	1.3%	97	21.3%	5	1.1%	198
	Atelectasis	90	20.1%	4	0.9%	71	15.6%	1	0.2%	166
	Respiratory disorder	12	2.7%	16	3.6%	12	2.6%	6	1.3%	46
	Pneumothorax	8	1.8%	2	0.4%	9	2.0%	3	0.7%	22
	Pyrexia	115	25.7%	2	0.4%	126	27.7%	4	0.9%	247
	Oedema peripheral	92	20.6%	2	0.4%	91	20.0%	-	-	185
GENERAL DISORDERS AND ADMINISTRATION SITE CONDITIONS	Enanthema	31	6.9%	1	0.2%	30	6.6%	1	0.2%	63
	Hyperglycaemia	111	24.8%	3	0.7%	93	20.4%	3	0.7%	210
	Hypokalaemia	73	16.3%	-	-	73	16.0%	-	-	146
	Hyponatraemia	24	5.4%	-	-	40	8.8%	-	-	64
METABOLISM AND NUTRITION DISORDERS	Hypernatraemia	30	6.7%	2	0.4%	18	4.0%	2	0.4%	52

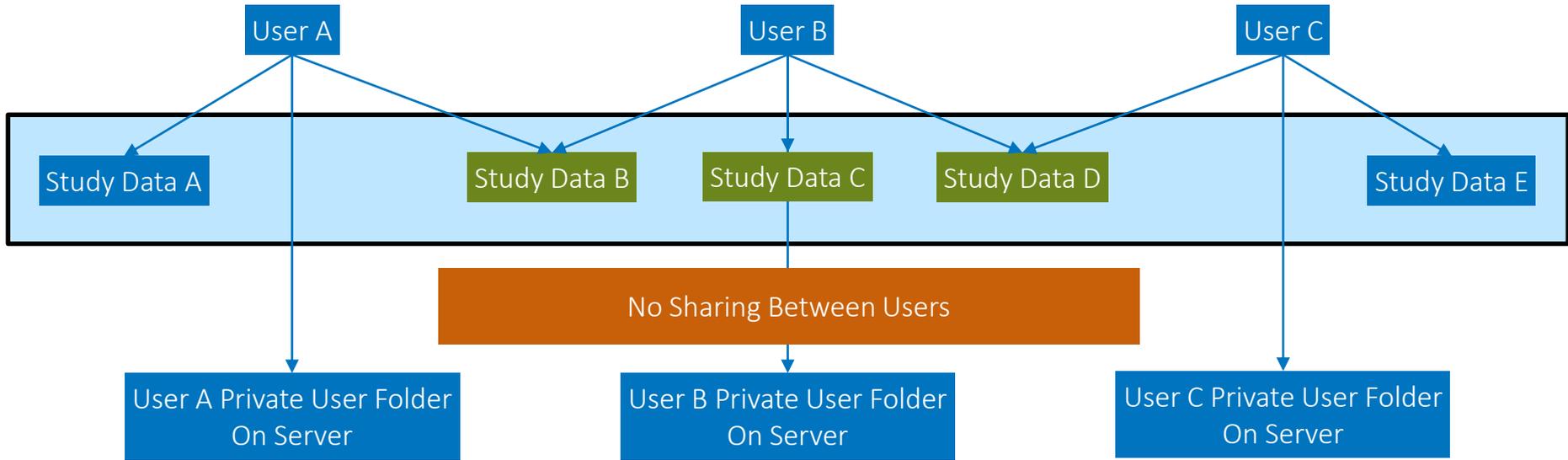
- Static Tables give all the information
- Time-consuming to absorb information and easy to miss signals

- Efficient data review with highly visual and interactive graphics linked to data tables
- Streamline clinical data review process

JMP Clinical Usage

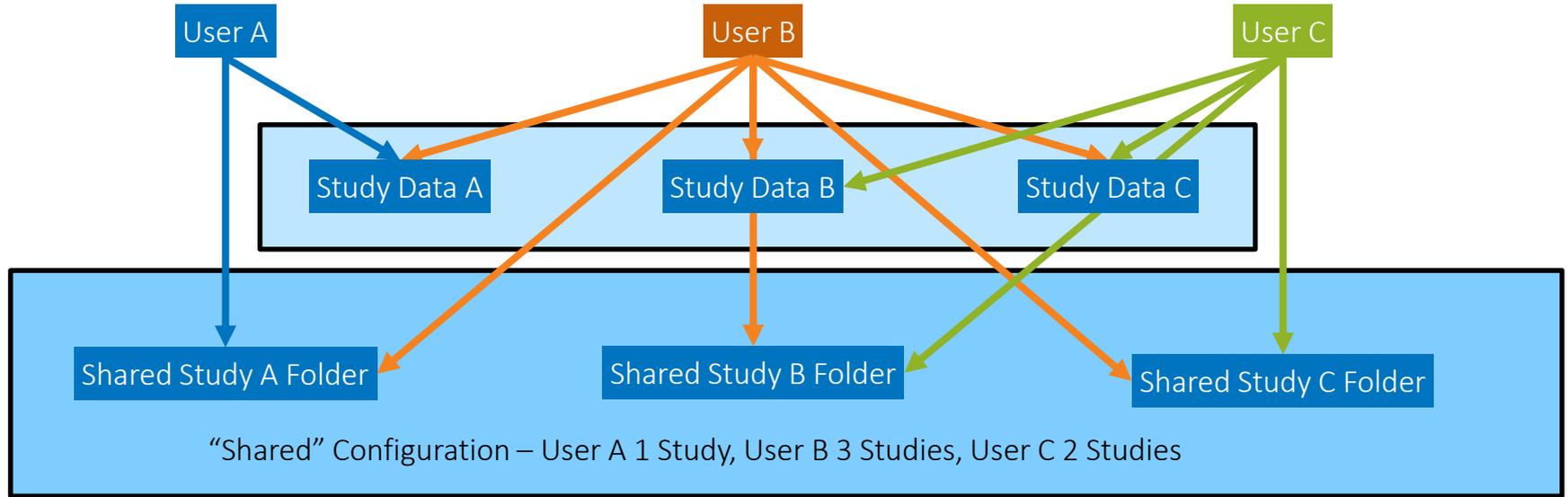


“Local” Configuration: Default Installation (Everyone is an ISLAND)



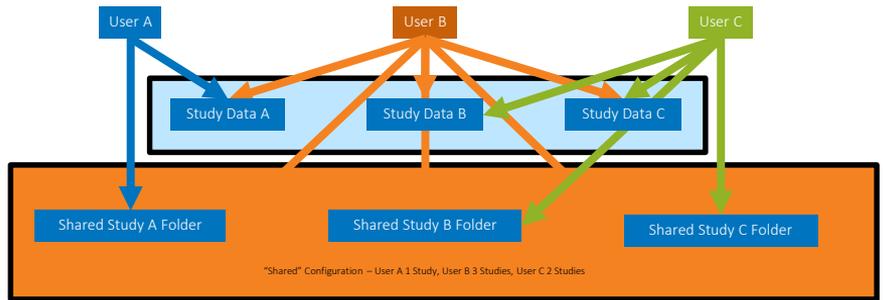
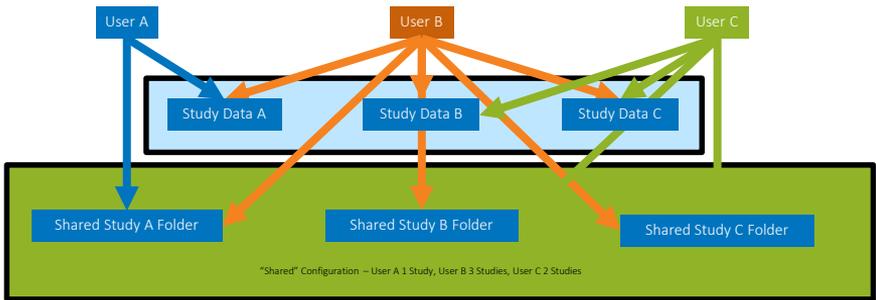
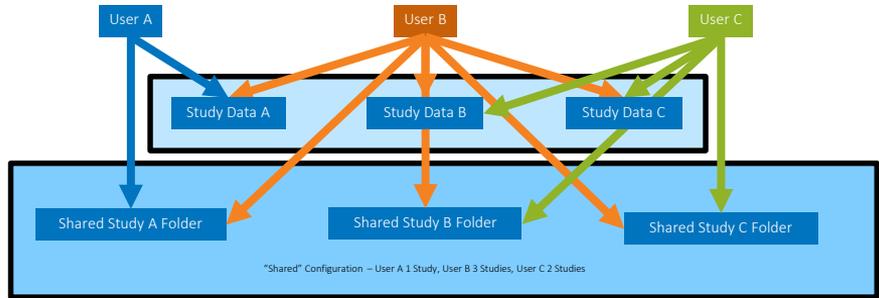
- All Access (Read/Write) Permissions Controlled By Active Directory (Study Data and User Folders)
- User B is allowed to see some Study Data (B, C, and D) that is also allowed to be seen by User A and C
 - User B cannot see Study Data A or E
- Any given user can only see the output they have generated within JMP Clinical
 - User B cannot see User A output generated within JMP Clinical automatically saved to a default location
- If users want to share output, there will have to be a folder setup so that the appropriate users have access
- Narrative Templates (Velocity and SAS Macro) are stored, by default, in Program Files (readable by all)

“Shared” Configuration: People have Shared JMP Clinical Folders



- In addition to the default “Local” configuration, one or more “Shared” configurations can be created
 - User can switch between configurations, but only one configuration can be active at any given time
- All Access (Read/Write) Permissions Controlled By Active Directory (Study Data and Shared Folders)
- When users save output, they are directed to save it to the default study specific shared folder
 - However, a user can optionally save the output wherever they have access
- Users can only see a study registered within JMP Clinical if they have access rights to the study data AND shared configuration folder
- When notes are created, they are automatically saved to the active study specific folder (no exceptions)

Multiple “Shared” Configurations: One for each Therapeutic Area



JMP Clinical Usage Scenario



User personas

Report Creators

Clinical or Statistical
Programmers



Cleanse and prepare data for
other groups

Statisticians
Biostatisticians
Biometrician



Reporting safety and efficacy
(effectiveness)

Data Monitors/
Data Managers



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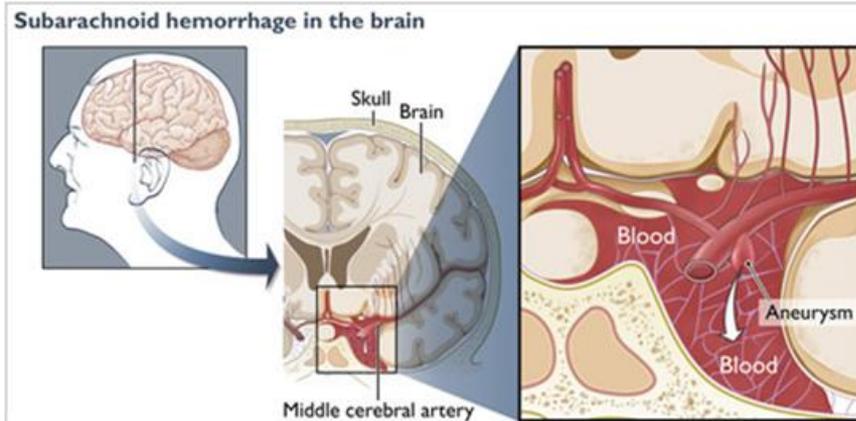
Concerned with bad side effects
(adverse events)

Report Consumers

Case Study

Nicardipine Study: Treatment of Subarachnoid Hemorrhage

- A subarachnoid hemorrhage (SAH) is bleeding into the subarachnoid space, the area between the arachnoid membrane and the pia mater surrounding the brain. This may occur spontaneously, usually from a ruptured cerebral aneurysm, or may result from head injury.



Nicardipine is a medication used to treat high blood pressure and angina. Therefore it reduces the risk for additional subarachnoid hemorrhage.

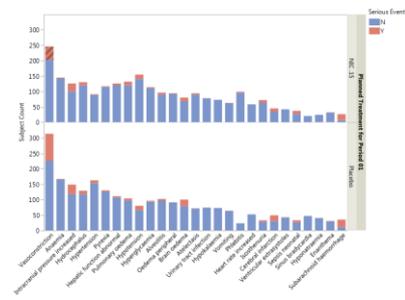
Live Presentation

Next slides are screenshots from the live presentation

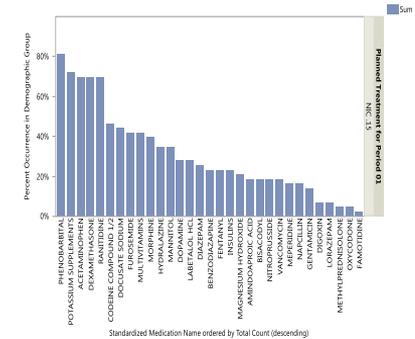




What count/percent of subjects on drug had a serious adverse event?



What medications were those subjects taking?



For selected subjects, what is the complete patient profile or narrative?

Profile

Subject: 101004
 Randomized Arm: NIC.15
 Investigator Name: 101A
 Drugs and Doses on Day of Event: On Treatment

Serious Adverse Event (coded term [reported term]): COMA [COMA]

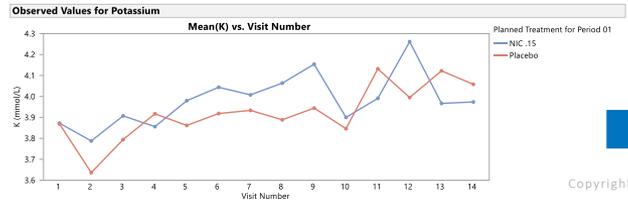
Subject 101004 was a 48-year-old white female. Her medical history included focal deficit associated with sah (1988), headache associated with sah (1988), loss of consciousness associated with sah (1988), vomiting associated with sah (1988), other medical condition (1977), and allergies (start date unknown). The subject discontinued the trial on 31JAN1988 (Day 4) due to death.

On 28JAN1988 (Day 1) the subject experienced a coma (severe) which was considered a serious adverse event (SAE). Though the event was considered serious, no reasons were provided on the case report form. The subject was on treatment when the event occurred. It is not known from the case report form if therapeutic measures were administered to treat the event.

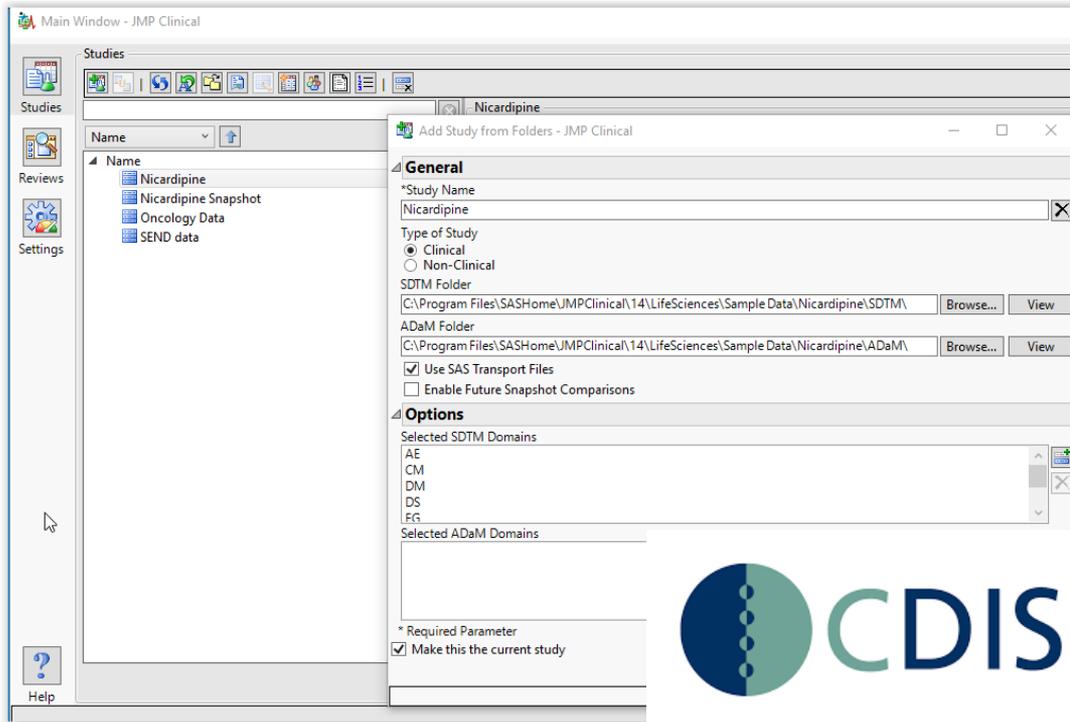
Adverse events that occurred within a +/- 3-day window of the onset of the SAE included brain oedema (mild), hydrocephalus (severe), hyperglycaemia (mild), hypotension (severe), intracranial pressure increased (severe), subarachnoid haemorrhage (severe), and vasoconstriction (severe). Concomitant medications taken at the onset of the SAE included: docusate sodium, phenobarbital, potassium supplements, and ranitidine.

The investigator considered the AE to be related to study medication. The event ended on 31JAN1988 (Day 4) with a final outcome of recovered/resolved.

Did those subjects have abnormal lab results?



Adding a Study

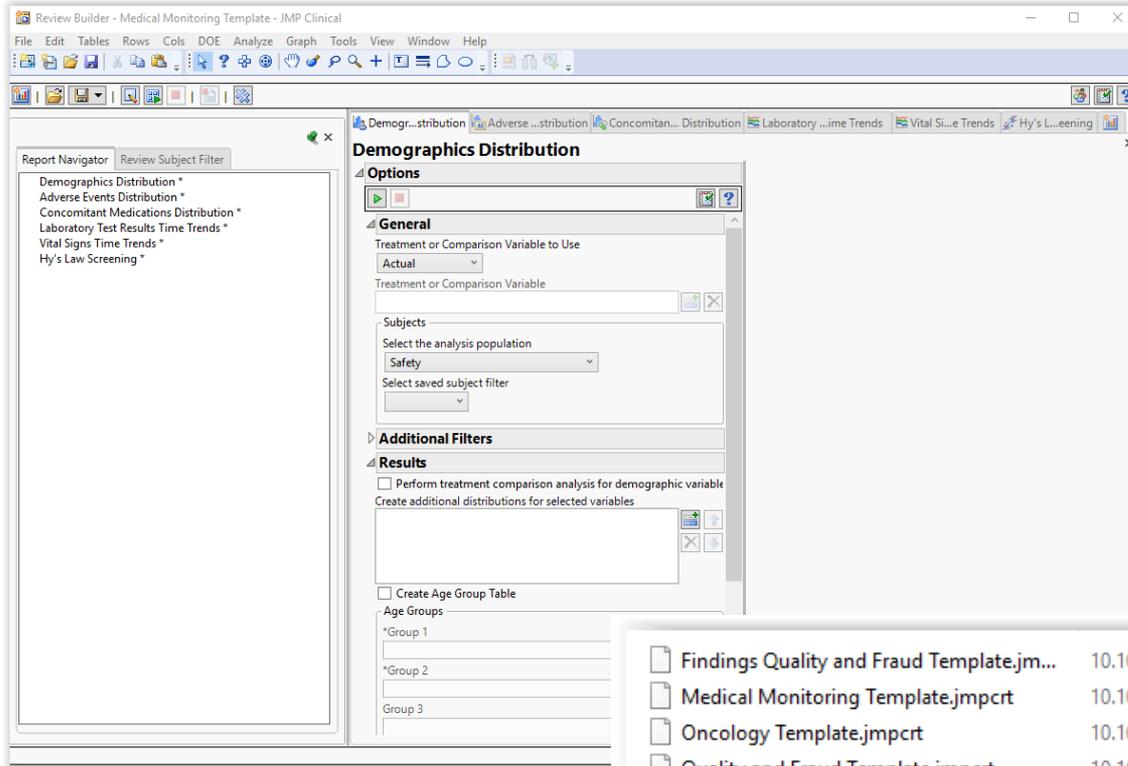


A study is a collection of input data folders, settings, and an output folder.

JMP Clinical reads directly CDISC data, a combination of SDTM and ADaM. It reads also SEND.



Building Review from Template

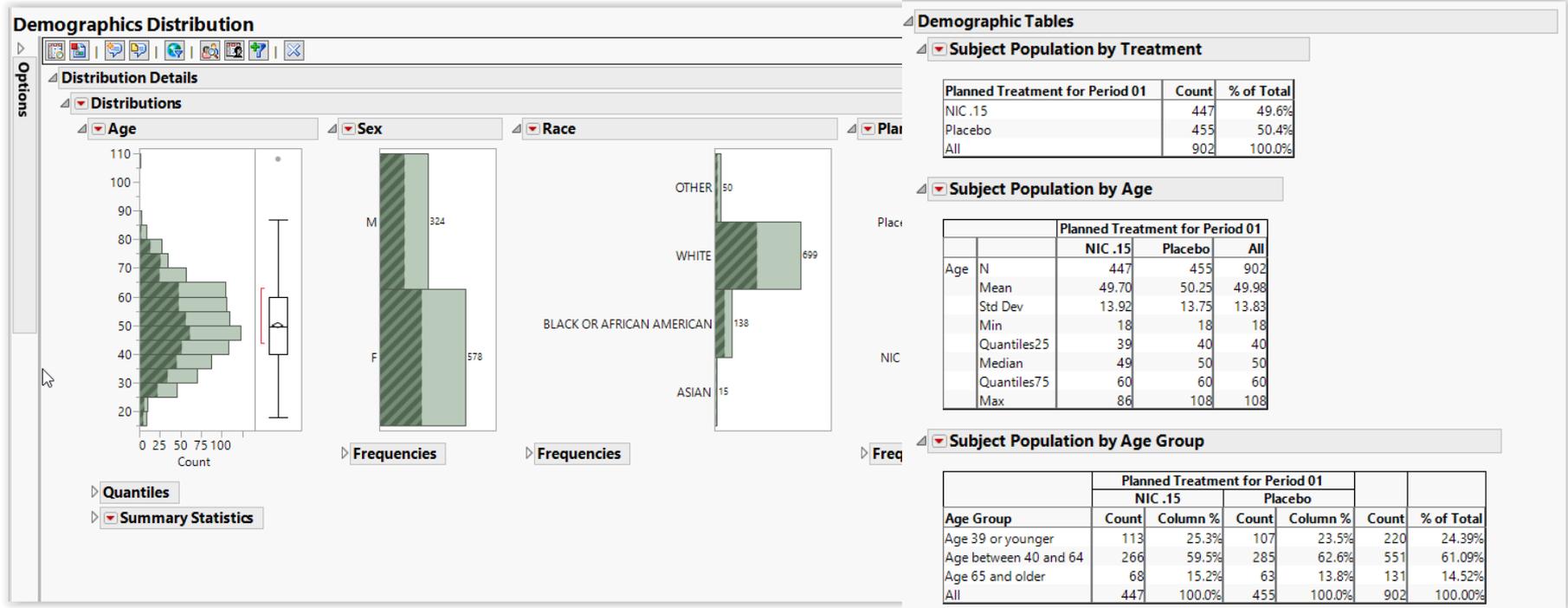


The Reviews tab enables to create a new review of the selected study, open an existing review, or use a template generated previously for another study to generate a review for the current study. Default templates for different user personas are in place.

 Findings Quality and Fraud Template.jm...	10.10.2018 14:01	JMPCRT File	9 KB
 Medical Monitoring Template.jmpcrt	10.10.2018 14:01	JMPCRT File	13 KB
 Oncology Template.jmpcrt	10.10.2018 14:01	JMPCRT File	12 KB
 Quality and Fraud Template.jmpcrt	10.10.2018 14:01	JMPCRT File	11 KB
 Signal Detection Template.jmpcrt	10.10.2018 14:01	JMPCRT File	9 KB

Report Screenshot

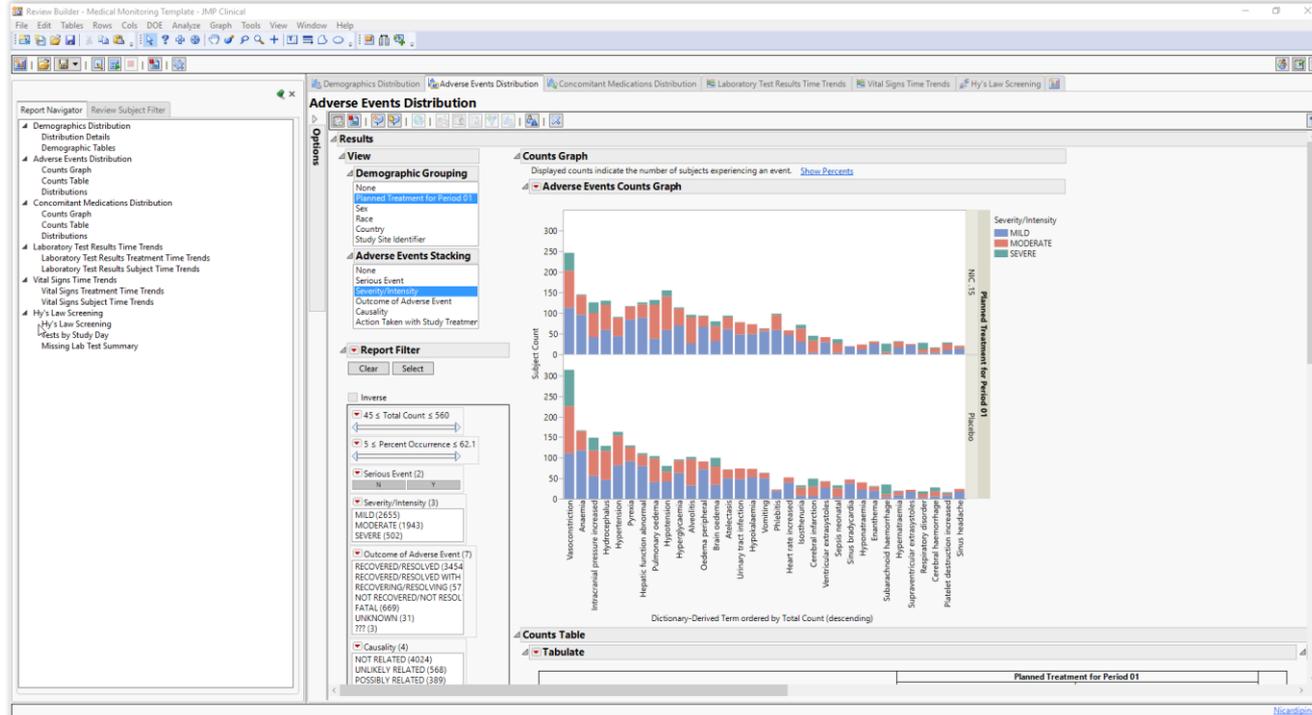
Demographic Distribution



Visualize relationships between demographic characteristics and treatment groups. One would need to check for consistency in the demographics distributions to evaluate any significant deviation among age, sex, race groups and sites within the different treatment groups

Report Screenshot

Adverse Event Distribution

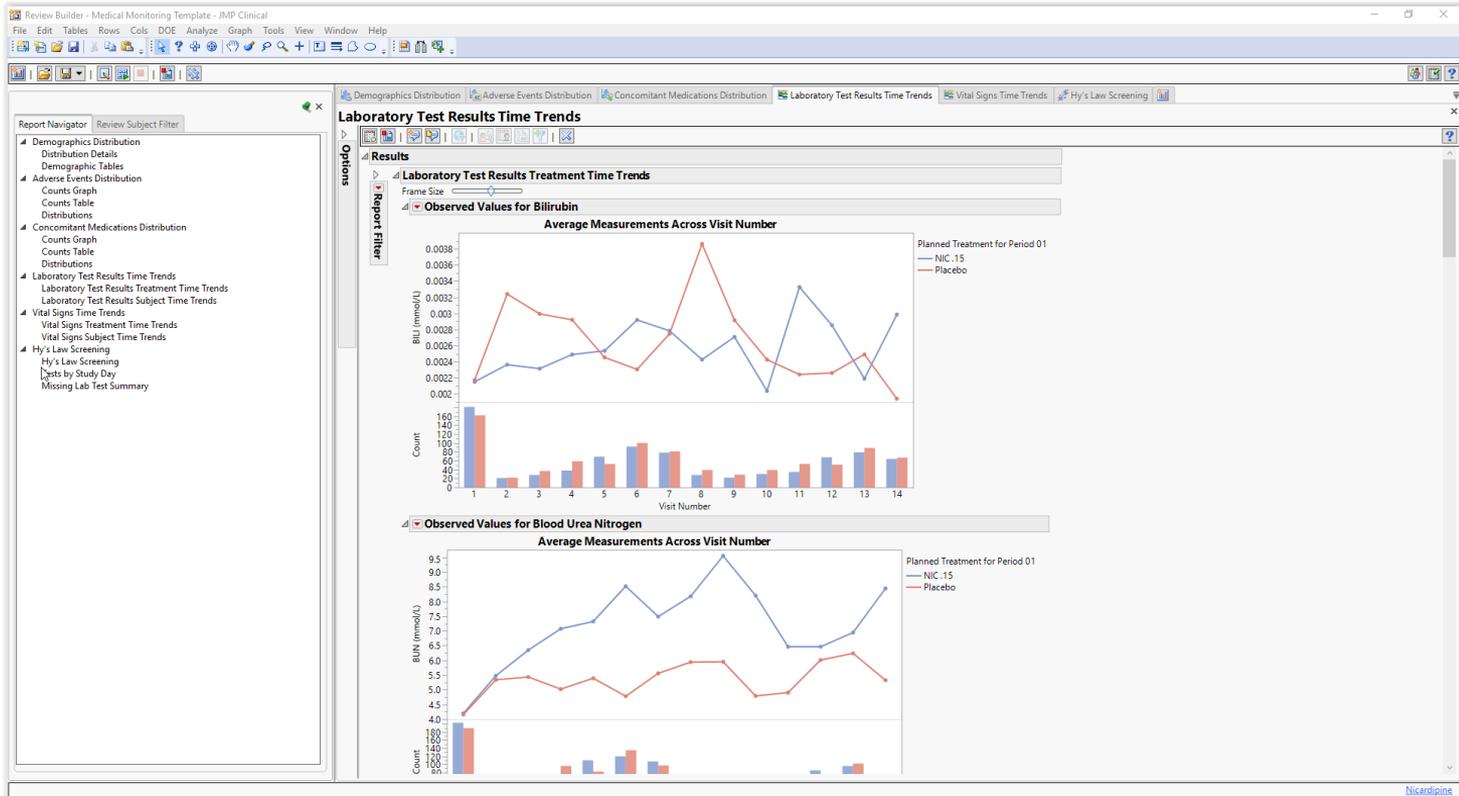


Visualize relationships between adverse events frequencies and treatment groups:

One would to need find particular adverse events more frequent in particular treatment groups than other.

Report Screenshot

Laboratory Time Trends



Visualize laboratory test results enables to visualize findings accross the time of the study.

Manage Profile Data

Patient Profile Precompute and Display Template

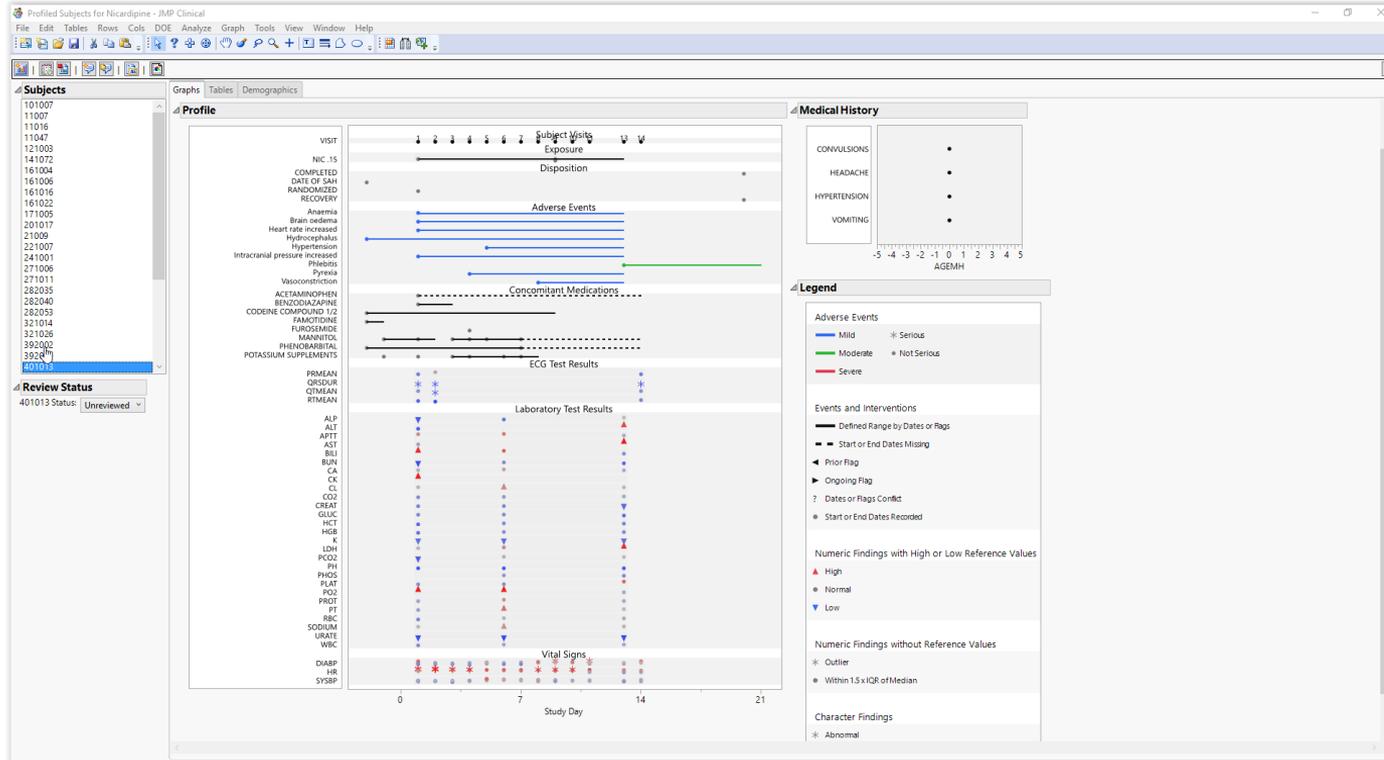
An action on the Studies window enables now to precompute profile data for faster processing and to create, save and apply multiple data templates per study.

The 'Manage Profile Data' dialog box is shown. It features a search bar at the top right with a question mark icon. Below the search bar, it states 'Current Profile Data Template: None'. The main section is titled 'Manage All Profile Data Templates' and includes a 'Profile Data Template' dropdown menu set to 'None', with 'Apply', 'Save', and 'Delete...' buttons. Under 'Selection Behavior', there are two radio buttons: 'Include Only the Selected Domains' (unselected) and 'Exclude the Selected Domains' (selected). The 'Available Domains' list includes AE, CM, DS, EG, EX, LB, MH, SV, and VS. The 'Selected Domains' list is currently empty, with a 'Remove' button. On the right side, there is a section titled 'Manage Precomputed Profile Data for Nicardipine' with a button 'Precompute profile data using current template'. Below this, it says 'Precomputed Profiles Exist for the Following Templates' with 'None' listed and a 'Delete' button.

The patient profile data display for subject 21025 is shown. The 'Subjects' list at the top left shows subject 21025 selected. The 'Review Status' is 'Unreviewed'. The 'Demographics' section shows: Subject 21025, Age 108, Sex F, Race WHITE, Site 02, Arm Placebo, Start Date 1989-03-16T12:00:00, End Date 1989-03-19T21:00:00, Study NCSAH1. The 'Profile' section displays a timeline from -5 to 5 AGEH. Key events include: VISIT (1, 2, 3, 4), Placebo exposure, DATE OF SAH (0), DEATH (0), RANDOMIZED (0), Adverse Events (Anemia, Apnoea, Hydrocephalus, Intracranial pressure increased, Isosthenuria, Pulmonary oedema, Sinus bradycardia, Subarachnoid haemorrhage), Concomitant Medications (FUROSEMIDE, MEPERIDINE, MULTIVITAMINS, POTASSIUM SUPPLEMENTS), and ECG Test Results (PRIMEAN, QRS DUR, QTMEAN). The 'Medical History' section lists ALLERGIES, ANGINA, HEADACHE, HYPERTENSION, LOSS OF CONSCIOUSNESS, and OTHER MEDICAL CONDITION. A legend at the bottom right defines Adverse Events: Mild (blue line), Moderate (green line), Serious (asterisk), and Not Serious (circle).

Report Screenshot

Patient Profiles



- Individual Patient profiles summarized each event happening across study days

Report Screenshot

Adverse Event Narratives with Tables

Subject: 101004
Randomized Arm: NIC .15
Investigator Name: 101A

Subject 101004 was a 48-year-old white female. Medical history is included in Table 1.

The subject had the following vital signs at baseline: DIABP (89, 86, 90, 93, 72, 94, 88, 89, 85 and 81 mmHg at 16:00, 16:15, 16:30, 16:45, 17:00, 18:00, 19:00, 20:00, 21:00 and 22:00, respectively), HR (66, 84, 118, 119, 145, 96, 99, 95, 94 and 91 BEATS/MIN at 16:00, 16:15, 16:30, 16:45, 17:00, 18:00, 19:00, 20:00, 21:00 and 22:00, respectively), and SYSBP (172, 168, 166, 168, 149, 177, 169, 183, 166 and 148 mmHg at 16:00, 16:15, 16:30, 16:45, 17:00, 18:00, 19:00, 20:00, 21:00 and 22:00, respectively).

Table 1: Medical History

Term	Year
<i>focal deficit associated with sah</i>	1988
<i>headache associated with sah</i>	1988
<i>loss of consciousness associated with sah</i>	1988
<i>vomiting associated with sah</i>	1988
<i>other medical condition</i>	1977
<i>allergies</i>	start date unknown

The subject's concomitant medications are listed in Table 2.

Table 2: Concomitant Meds

Reported Name	Standardized Name	Indication	Dose per Administration	Start Date	End Date	Start Study Day	End Study Day
DOCUSATE SODIUM	DOCUSATE SODIUM	STOOL SOFTNER	200	1988-01-27T 14:35:00	1988-01-31T 12:30:00	-1	4
PHENOBARBITAL	PHENOBARBITAL	SEDATIVE	120	1988-01-27T 14:35:00	1988-01-31T 12:30:00	-1	4
POTASSIUM SUPPLEMENT	POTASSIUM SUPPLEMENT	FLUIDS	50	1988-01-27T 14:35:00	1988-01-31T 12:30:00	-1	4
RANITIDINE	RANITIDINE	DECREASE ACIDITY	150	1988-01-27T 14:35:00	1988-01-31T 12:30:00	-1	4
DOPAMINE	DOPAMINE	ELEVATED BP	381	1988-01-30T 01:30:00	1988-01-31T 00:00:00	3	4
DOPAMINE	DOPAMINE	ELEVATED BP	250	1988-01-31T 01:00:00	1988-01-31T 12:30:00	4	4

Patient narrative is a brief summary of specific events experienced by patients, during the course of a clinical trial.

User personas

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Reporting safety and efficacy
(effectiveness)

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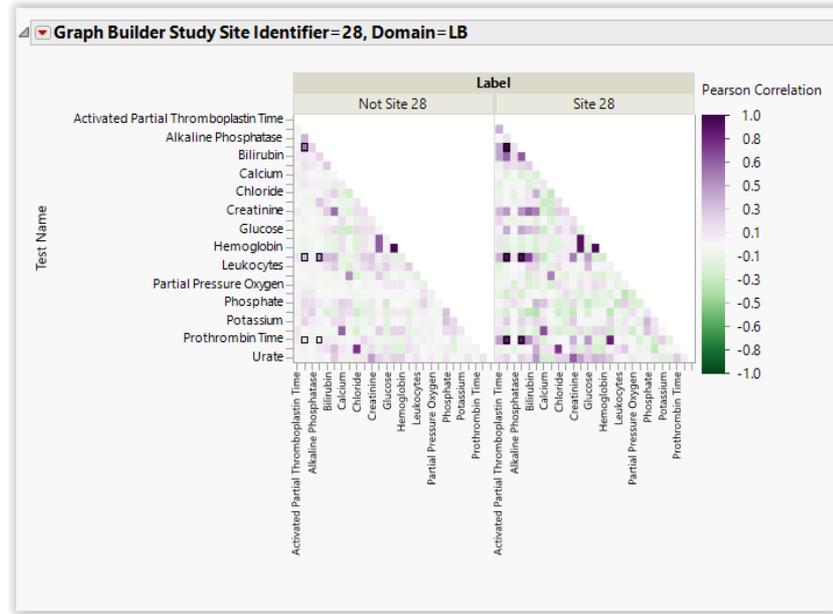
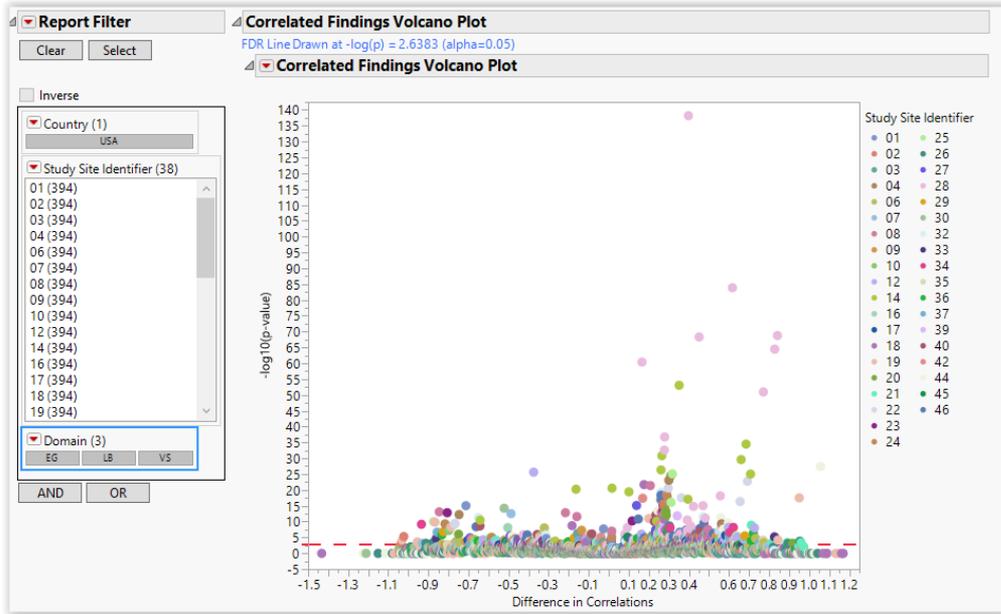


Concerned with bad side effects
(adverse events)

Report Consumers

Report Screenshot

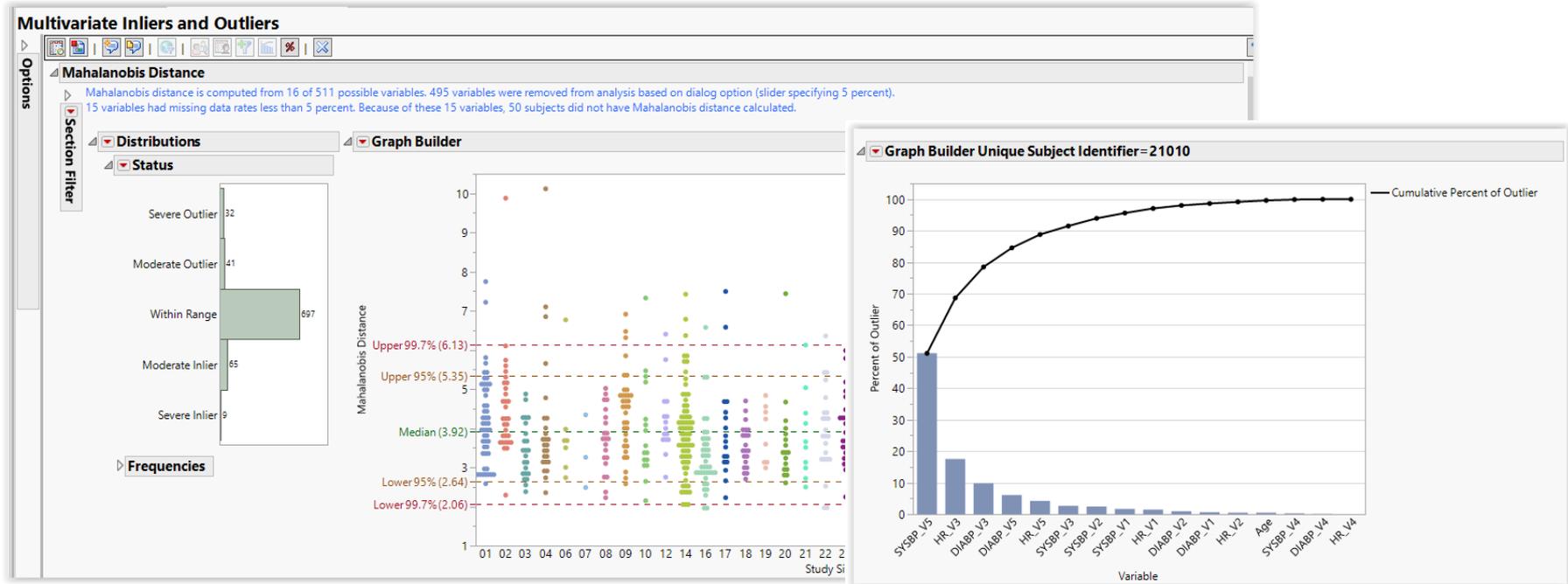
Correlated Findings



This report calculates pairwise correlations between tests within each findings domain and identifies unusual results at specific study sites

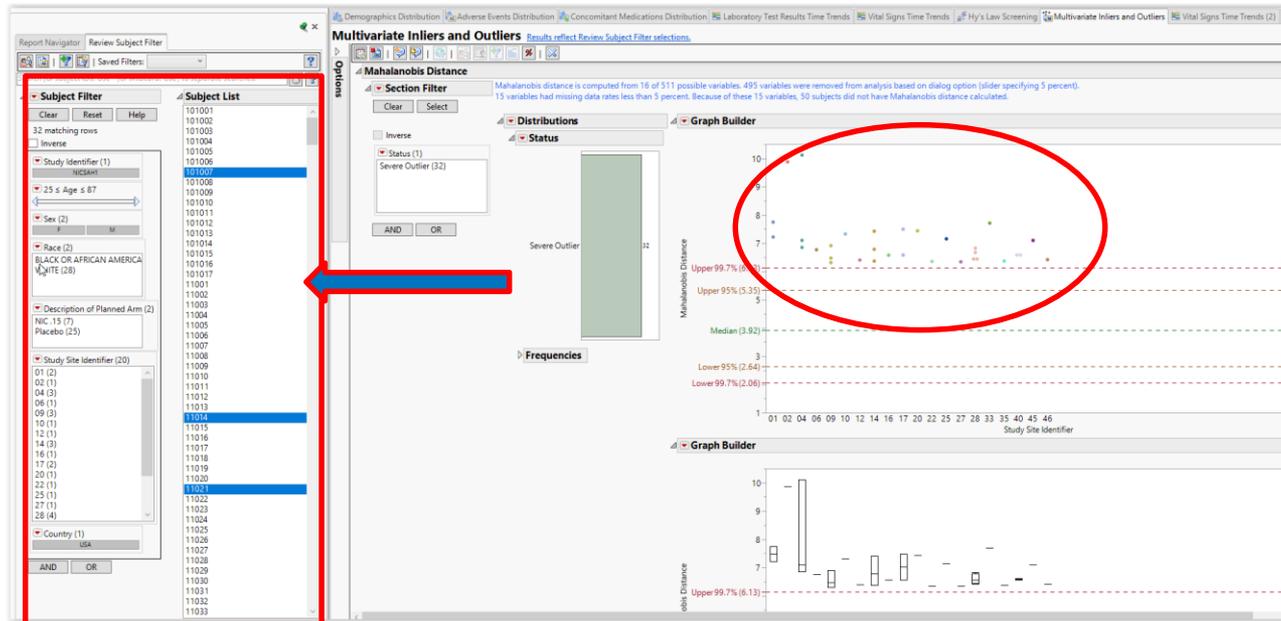
Report Screenshot

Multivariate Inliers and Outliers



This report calculates Mahalanobis distance based on available data to identify subject inliers and outliers in multivariate space from the multivariate mean. It generates results by site to see which sites are extreme in this multivariate space.

Review Subject Filter



- System-wide **Review Subject Filter** can be used to filter all subject-level reports comprehensively by using row state synchronization across virtually joined tables.
- The review subject filter is based on demographic characteristics.
- One can filter on a particular report and the filter gets propagated to each reports

Review Subject Filter

The screenshot displays the SAS interface for reviewing subject filters. On the left, the 'Review Subject Filter' panel is highlighted with a red border. It includes a search bar, a 'Subject List' with 32 matching rows, and various filter criteria such as 'Study Identifier (1)', 'Age (1)', 'Sex (2)', 'Race (2)', 'Description of Planned Arm (2)', 'Study Site Identifier (20)', and 'Country (1)'. A red arrow points from the 'Subject List' to the right-hand reports.

The right-hand side shows 'Vital Signs Time Trends (2)' reports. The top report is 'Observed Values for Systolic Blood Pressure', which includes a line graph titled 'Average Measurements Across Visit Number' and a bar chart. The line graph shows SYSBP (mmHg) on the y-axis (130-174) and Visit Number on the x-axis (1-14). It compares 'NIC_15' (blue line) and 'Placebo' (red line). The bar chart shows 'Co' on the y-axis (0-10) and Visit Number on the x-axis (1-14). The bottom report is 'Vital Signs Subject Time Trends', which includes a line graph titled 'Subject Trends Across Visit Number' showing SYSBP (mmHg) on the y-axis (50-260) and Visit Number on the x-axis (1-14) for multiple subjects.

- With the subject filter all reports gets updated on subject level.
- Powerful way to directly find relationships

Part 2

Oncology, JMP Infrastructure and Clinical Review Customization

Oncology Clinical Trials

Analysis Challenges

- Creating deterministic/consistent endpoints for tumor response
- Data capture and evaluation of solid tumor lesions
- **Appropriate Analysis and Visualization of early efficacy**
 - Complex trial designs and small sample sizes

Response Evaluation Criteria in Solid Tumors (RECIST)

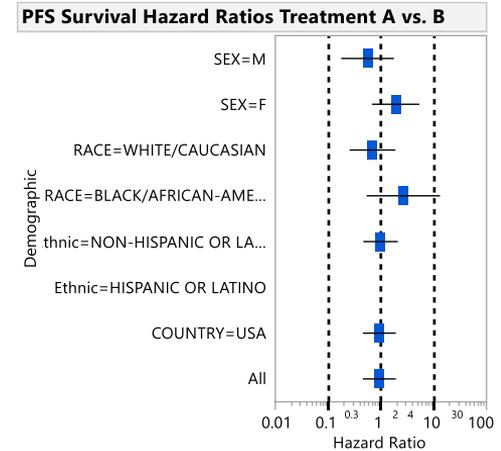
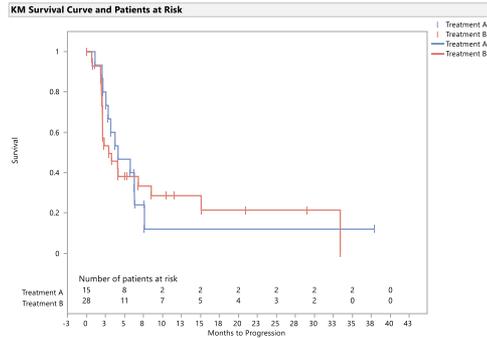
International guidelines originally developed by World Health Organization (WHO)

- RECIST Overview
 - Identify Target Lesion Response
 - Max 5 lesions (generally >10mm in size), Max 2 lesions per organ
 - Sum of the longest diameters (uni-dimensional)
 - short axis consideration for nodal tumors.
 - Disease Response Identification
 - Complete Response (CR): All target lesions disappear/shrink.
 - Partial Response (PR): At least **30% decrease** in the sum of target lesions WRT baseline.
 - Progressive Disease (PD): At least **20% increase** in tumor burden response WRT minimum lesion sum on study (nadir).
 - Stable Disease (SD): Change in tumor burden response fails to qualify for either PR or PD.
- RECIST Endpoints common for regulatory approval by both FDA and EMA
 - Objective Response Rate (CR + PR) for early efficacy

Efficacy Signals

FDA Industry Guidance for Clinical Trial Endpoints

- Survival Analysis (OS)
 - Time to Death
- Progression Free Survival Curves (PFS)
 - Time to “disease progression” OR Death
- Objective Response Rate (ORR)
 - Trend and summaries in “Best” Response



Best Response Summary: Overall Response Test Results

	Description of Planned Arm				Total Subjects	
	Treatment A		Treatment B		Total Subjects	
	(N = 17)		(N = 33)		(N = 50)	
Objective Response Rate (ORR)	Count	%	Count	%	Total Count	Total %
CR + PR	4	23.5%	6	18.2%	10	20.0%
Best Response						
CR	.	.	3	9.1%	3	6.0%
PR	4	23.5%	3	9.1%	7	14.0%
SD	6	35.3%	8	24.2%	14	28.0%
PD	5	29.4%	14	42.4%	19	38.0%

Detecting Early Efficacy Signals

Waterfall Plots

- Ordered Quantitative Best Response

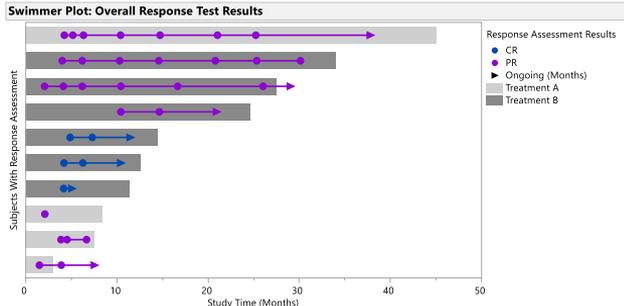
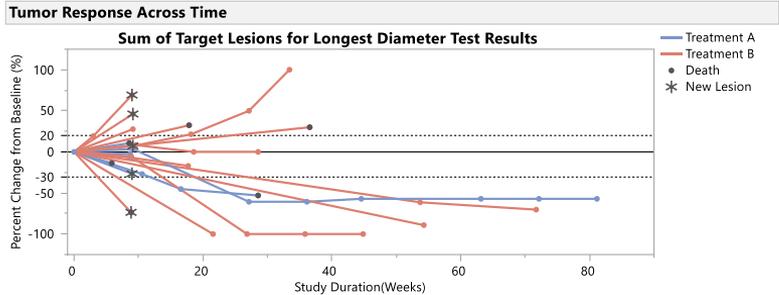
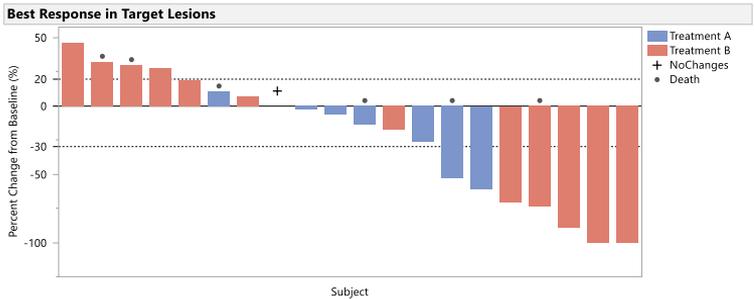
Time Trend Plots

- Tumor Burden response across time
- Nicknames: Line, Spider, Spaghetti Plots

Swimmer Plots

- Qualitative response and duration

Effective Tumor Response Visualization



Oncology Visualization in JMP/JMP Clinical

Demo

JMP Clinical Solution Screenshot

Solid tumor oncology clinical review

Review Builder - Oncology Template - JMP Clinical

Demographics | Disposition | Tumor Response | **Disease Response** | irRC Disease Response | Progression Free Survival

Report Navigator | Review Subject Filter

Search for subject IDs. Use * for wildcard. Use , to separate

Subject Filter

Clear Reset Help

Inverse

Study Identifier (1)
JMPCOnc

25 ≤ Age ≤ 84

Sex (2)
F M

Race (2)
BLACK/AFRICAN-AMERICAN | WHITE/CAUCASIAN (54)

Study Site Identifier (8)
001 (16)
002 (6)
003 (18)
004 (9)
005 (11)
006 (7)
008 (2)
009 (8)

AND OR

Subject List

JMPCO11-001
JMPCO11-002
JMPCO11-003
JMPCO11-004
JMPCO11-005
JMPCO11-006
JMPCO11-007
JMPCO11-008
JMPCO11-009
JMPCO11-010
JMPCO11-011
JMPCO11-012
JMPCO11-013
JMPCO11-014
JMPCO11-015
JMPCO11-016
JMPCO12-001
JMPCO12-002
JMPCO12-003
JMPCO12-004
JMPCO12-005
JMPCO12-006
JMPCO13-001
JMPCO13-002
JMPCO13-003
JMPCO13-004
JMPCO13-005
JMPCO13-006
JMPCO13-007
JMPCO13-008
JMPCO13-009
JMPCO13-010
JMPCO13-011

Disease Response

Disease Response Assessment (RECIST 1.1)
Displaying results for 10 (out of 50) subjects who had at least one Overall Response test assessment recorded as one of the following values: CR, PR.

Swimmer Plot: Overall Response Test Results

Subjects With Response Assessment

Treatment B

Treatment A

Study Time (Months)

Response Assessment Results

- CR
- PR
- ▶ Ongoing (Months)
- Treatment A
- Treatment B

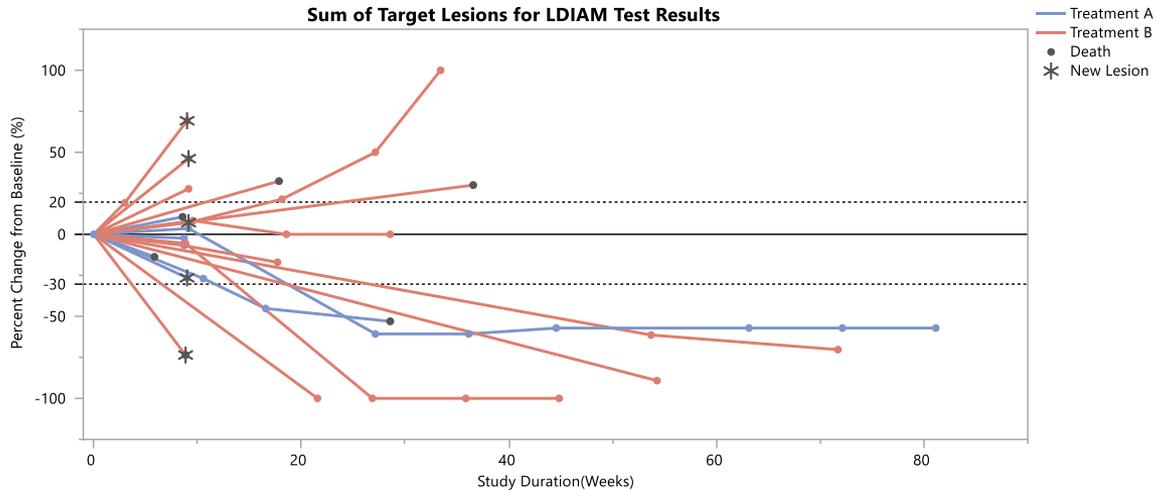
Best Response Summary: Overall Response Test Results

	Description of Planned Arm				Total Subjects	
	Treatment A (N = 17)	Treatment B (N = 33)	Count	%	Total Count	Total %
Objective Response Rate (ORR)						
CR + PR	4	6	23.5%	18.2%	10	20.0%

Oncology Example

Tumor Burden Spider Plot

Tumor Response Across Time



Variables{

```
X( :Name( "Study Duration(Weeks)" ),
X( :Death, Position( 1 ) ),
X( :New Lesion, Position( 1 ) ),
Y( :Name( "Percent Change from Baseline (%)" ),
Overlay( :Unique Subject Identifier ),
Color( "Description of Planned Arm" )
```

},

Elements{

```
Line( X( 1 ), Y, Legend( 1 ), Summary Statistic( "Min" ) ),
Points( X( 1 ), Y, Overlay( 0 ), Legend( 2 ) ),
Points( X( 2 ), X( 3 ), Y, Overlay( 0 ), Color( 0 ), Legend( 3 ) )
```

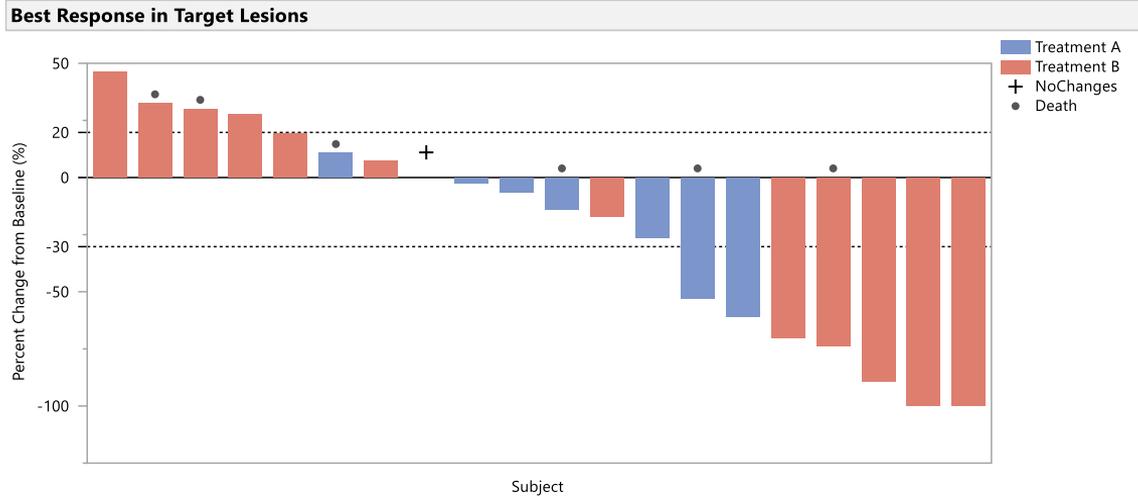
},

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JMP Implementation

- 3 Elements
 - Line, Points, Points
- 6 Variables
 - 3 in X Role (point annotation)
 - 1 Y Role for all elements
 - Overlay
 - Color
- Element/Variable Control
 - Overlay for Subject Lines (new in 14)
 - Color
 - X Variables
- Legend Control
 - Item ID() to control Legend Items
 - Set Marker Size and Marker
 - Legend Index to Hide Elements

Best Response Waterfall Plot



Variables

```
X( :Unique Subject Identifier, Order By( :Name( "Percent Change from Baseline (%)" ), Descending, Order Statistic( "Min" ) ),
Y( :Name( "Percent Change from Baseline (%)" ),
Y( :NoChanges, Position( 1 ) ),
Y( :_DSDECOD_, Position( 1 ) ),
Color( :Description of Planned Arm )
```

),

Elements

```
Bar( X, Y( 1 ), Legend( 7 ), Bar Style( "Stacked" ), Summary Statistic( "Min" ) ),
Points( X, Y( 2 ), Y( 3 ), Color( 0 ), Legend( 6 ) )
```

),

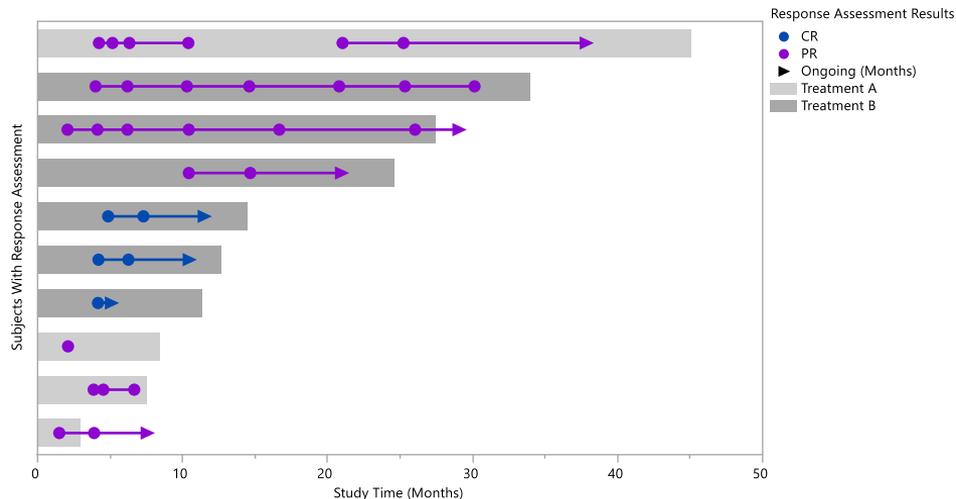
Where(:Best == 1),

JMP Implementation

- 2 Elements
 - Bar, Points
- 5 Variables
 - 3 Y Roles (Bar Height & Point annotation)
 - 1 X ordered by Y
 - Color (Bar)
- Element/Variable Control
 - Color
 - Y Variables (Bar vs. Point)
- Legend Control
 - Item ID() for Marker Control
- Where Statement
 - JSL to LINK Spider Plot to Waterfall Plot
 - BEST column value in data

Swimmer Plot: Duration of Positive Tumor Response

Swimmer Plot: Overall Response Test Results



Variables(

```
X( :RFWK ),
X( :RSWK, Position( 1 ) ),
X( :Response Assessment, Position( 1 ) ),
X( :Name( "Ongoing (Months)" ), Position( 1 ) ),
Y( :Unique Subject Identifier, Order By( :RFWK, Ascending, Order Statistic( "Mean" ) ) ),
Overlay( :Unique Subject Identifier ),
Color( :Name( "Character Result/Finding in Std Format" ) ),
Color( :Description of Planned Arm )
```

),

Elements(

```
Bar( X( 1 ), Y, Overlay( 0 ), Color( 2 ), Legend( 2 ), Summary Statistic( "Max" ) ),
Line( X( 2 ), Y, Color( 1 ), Legend( 5 ), Row order( 1 ), Missing Values( "No Connection" ) ),
Points( X( 3 ), X( 4 ), Y, Overlay( 0 ), Color( 1 ), Legend( 4 ), Jitter( "None" ) )
```

),

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JMP Implementation

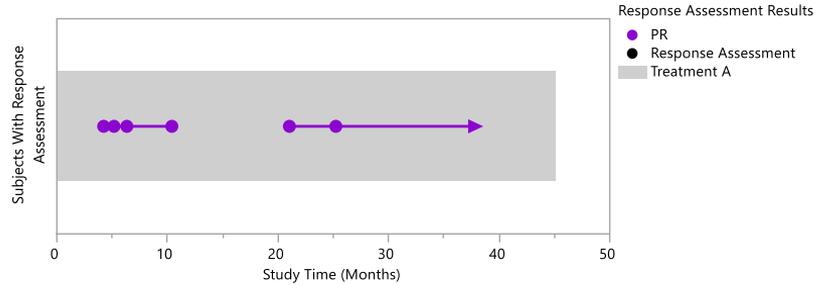
- 3 Elements
 - Bar, Line, Points
- 8 Variables
 - 4 X Roles
 - 2 Color Roles
- Element/Variable Control
 - Overlay for Lines on Subject Lanes*
- Legend Control
 - Item ID() for Color/Marker Control
 - Legend ID to Hide Elements
- Data Formatting
 - Record duplication
 - Support Line/Point Response Color Changes
 - Support "Breaks" in Response



Swimmer Plot Data Formatting

- Supporting Line Breaks

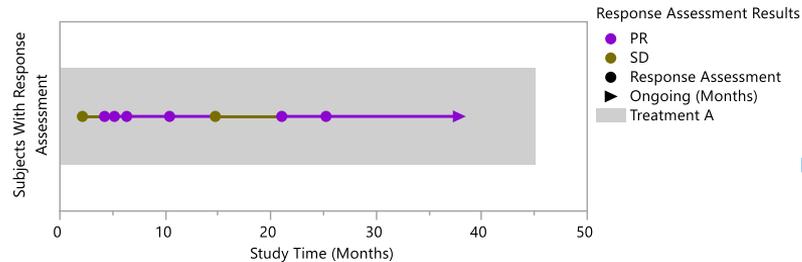
Swimmer Plot: Overall Response Test Results



	Unique Subject Identifier	Character Result/...	Visit Number	Visit Name	RSWK
•	1 JMPCO13-007	PR	7	CYCLE 7	4.233333333
	2 JMPCO13-007	PR	•		5.166666667
•	3 JMPCO13-007	PR	7.1	UNSCHEDULED	5.166666667
	4 JMPCO13-007	PR	•		6.333333333
•	5 JMPCO13-007	PR	10	CYCLE 10	6.333333333
	6 JMPCO13-007	PR	•		10.4
•	7 JMPCO13-007	PR	16	CYCLE 16	•
	8 JMPCO13-007	PR	•		•
•	9 JMPCO13-007	PR	31	CYCLE 31	21.033333333
	10 JMPCO13-007	PR	•		25.233333333
•	11 JMPCO13-007	PR	37	CYCLE 37	25.233333333
	12 JMPCO13-007	PR	•		37.833333333
•	13 JMPCO13-007	PR	55	CYCLE 55	•

- Supporting Color Changes

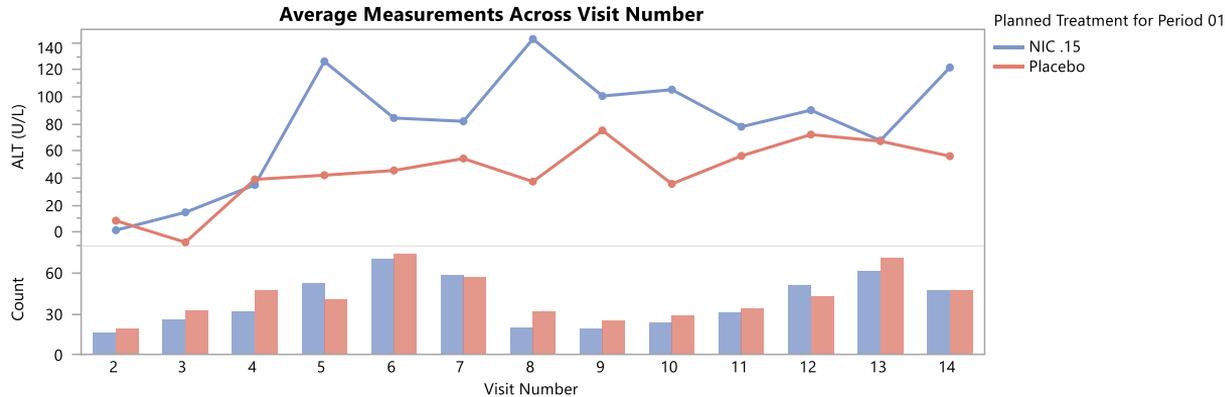
Swimmer Plot: Overall Response Test Results



	Unique Subject Identifier	Character Result/...	Visit Number	Visit Name	RSWK
•	1 JMPCO13-007	SD	4	CYCLE 4	2.133333333
	2 JMPCO13-007	SD	•		4.233333333
•	3 JMPCO13-007	PR	7	CYCLE 7	4.233333333
	4 JMPCO13-007	PR	•		5.166666667
•	5 JMPCO13-007	PR	7.1	UNSCHEDULED	5.166666667
	6 JMPCO13-007	PR	•		6.333333333
•	7 JMPCO13-007	PR	10	CYCLE 10	6.333333333
	8 JMPCO13-007	PR	•		10.4
•	9 JMPCO13-007	PR	16	CYCLE 16	10.4
	10 JMPCO13-007	PR	•		14.733333333
•	11 JMPCO13-007	SD	22	CYCLE 22	14.733333333
	12 JMPCO13-007	SD	•		21.033333333
•	13 JMPCO13-007	PR	31	CYCLE 31	21.033333333
	14 JMPCO13-007	PR	•		25.233333333
•	15 JMPCO13-007	PR	37	CYCLE 37	25.233333333
	16 JMPCO13-007	PR	•		37.833333333
•	17 JMPCO13-007	PR	55	CYCLE 55	•

Summary Time Trends With Count Plots

Change from Baseline for Alanine Aminotransferase



- Incorporate subject counts into visualization of treatment summaries

```

Variables(
  X(:Visit Number), Y(:ALT), Y(:ALT), Overlay(:Planned Treatment for Period 01)
),
Relative Sizes("Y", [2 1]),
Elements( Position( 1, 1 ),
  Line( X, Y, Legend( 1 ) ),
  Points( X, Y, Legend( 2 ), Summary Statistic( "Mean" ) )
),
Elements( Position( 1, 2 ),
  Bar( X, Y, Legend( 19 ), Summary Statistic( "N" ) )
),
Where( !Is Missing( :ALT ) )

```

JMP Implementation

- Multiple Frames Elements
 - Use of Relative Sizes Option
- Elements for Each Frame
 - Line & Points
 - Bar
- Summary Statistic Control
 - Y Value
 - Show average in line trend
 - Count of records for bar chart

JMP Clinical with JMP 14 Features

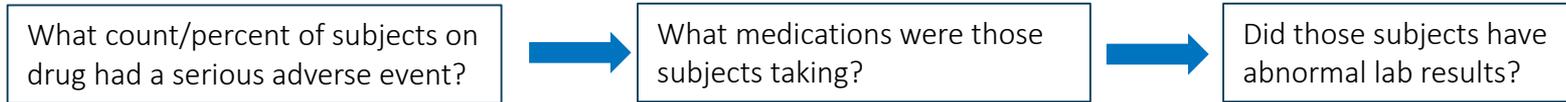
Leveraging JMP and JSL to Create our Vertical Solution



JMP Clinical Review Subject Filter

Linking Domains to Demography with Virtual Joins

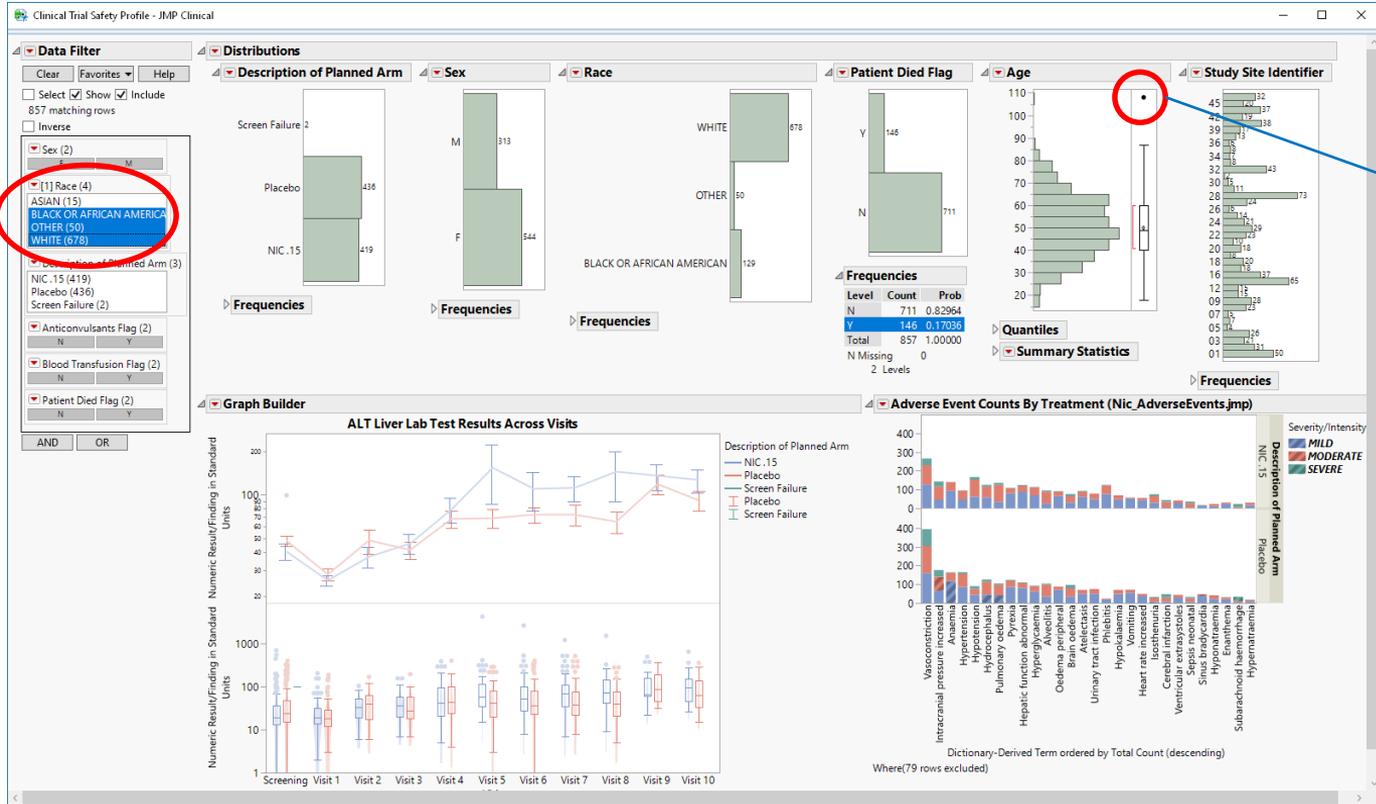
- Clinical Review “Line of Question” Analysis



- Virtual Joins within JMP Clinical architecture enable this analysis to be
 - Immediate
 - Interactive
 - **Accomplished with Row States only and NO DATA STRUCTURE MANIPULATION**

JMP Virtual Joins & Row State Synchronization

- See JMP Discovery US Tutorial “Talking Tables”
- <https://community.jmp.com/t5/Discovery-Summit-2018/Let-s-Talk-Tables-US-2018-412/ta-p/80248>



Excluding 15 Asian Patients

Single Selected Subject

Demography

Notes The Unique Subject Identifier cont Reference These data were derived from

- Age By Study Site Scatter Plot
- Data Filter
- Distribution**
- Comprehensive Safety Profile

Columns (17/0)

- Study Identifier
- Domain Abbreviation
- Unique Subject Identifier ?
- Subject Reference Start Date/Time
- Subject Reference End Date/Time
- Study Site Identifier
- Date/Time of Birth
- Age
- Sex
- Race
- Description of Planned Arm
- Country
- Anticonvulsants Flag
- Blood Transfusion Flag
- Induced Hypertension Flag
- Patient Died Flag
- Patient had Vasoconstriction Flag

Rows

All rows	872
Selected	1
Excluded	15
Hidden	15
Labelled	0



AdverseEvents

Notes The Unique Subject Identifier is virt Reference These data were derived from t

- Dictionary-Derived Term
- Adverse Event Occurrence

Columns (31/0)

- Study Identifier
- Domain Abbreviation
- Unique Subject Identifier
- Dictionary-Derived Term
- Body System or Organ Class
- Severity/Intensity
- Serious Event
- Action Taken with Study Treatment
- Causality
- Outcome of Adverse Event
- Start Date/Time of Adverse Event
- End Date/Time of Adverse Event
- Study Day of Start of Adverse Event
- Study Day of End of Adverse Event
- Total Count
- referenced by Uni...Demography (16/0)

Rows

All rows	5,134
Selected	7
Excluded	79
Hidden	79
Labelled	0

Labs

Notes The Unique Subject Identifier is virtually joined t Reference These data were derived from the Nicardipi

- Lab Counts By Visit
- Liver Lab Results By Visit

Columns (31/0)

- Study Identifier
- Domain Abbreviation
- Unique Subject Identifier
- Lab Test or Examination Short Name
- Lab Test or Examination Name
- Numeric Result/Finding in Standard Units
- Standard Units
- Reference Range Lower Limit-Std Units
- Reference Range Upper Limit-Std Units
- Reference Range Indicator
- Baseline Flag
- Date/Time of Specimen Collection
- Study Day of Specimen Collection
- Visit Number
- Visit
- referenced by Unique Su...ier to Demography (16/0)

Rows

All rows	6,803
Selected	3
Excluded	106
Hidden	106
Labelled	0

Unique Subject Identifier - JMP Clinical

'Unique Subject Identifier' in table 'AdverseEvents'

Column Name: Unique Subject Identifier

Lock

Data Type: Character

Modeling Type: Nominal

Column Properties

SAS Name

SAS Label

Link Reference (optional item)

Link Reference

Reference Table: Select Table

Demography.jmp

Use Linked Column Name

Remove

Row States Synchronization with Referenced Table

None

Accept

Dispatch

Row States

Select Exclude Hide

Label Color Marker

OK Cancel Apply Help

- 1 Subject Selected in Demography:
 - 7 associated AE records
 - 3 associated Laboratory records
- 15 Excluded Subjects:
 - 79 Excluded AE Records
 - 106 Excluded Lab Records

JMP Virtual Joins

You can't go both ways....

- A Referencing Table may only dispatch or accept row states from source.
 - Loops, inconsistent rows states may easily ensue
- JMP Clinical Application
 - Domain Tables are all “listening” to demography updates
 - We can drive all clinical report domain analyses from demography data filter
 - Globally filter from any domain signals enabled with action buttons that rely on JSL scripted data table and local data filter Listeners

Make Filter Change Handler

```
rs = df << Make Filter Change Handler(function(a) );
```

Creates a data filter handler to handle notification that the filter has changed. The number of rows filtered is returned in the argument to the function.

Example  See Also ▾ Topic Help

```
Names Default To Here( 1 );
dt = Open( "$SAMPLE_DATA/Cities.jmp" );
dist = Distribution( Automatic Recalc( 1 ), Continuous Distribution( Column( :POP ) );
filter = dist << Local Data Filter( Add Filter( columns( :Region ) ) );
f = Function( {a}, Print( a ) );
rs = filter << Make Filter Change Handler( f );
```

Demo

JMP implementation of table and filter listeners Screenshot

JMP Table Linking Example - JMP Clinical

Subject Filter

Clear Favorites Help

Inverse

Study Identifier (1)
NCSAH1

18 ≤ Age ≤ 108

Sex (2)
F M

Race (4)
ASIAN (15)
BLACK OR AFRICAN AMERICA
OTHER (51)
WHITE (701)

Description of Planned Arm (3)
NIC .15 (447)
Placebo (455)
Screen Failure (4)

Study Site Identifier (40)
01 (51)
02 (32)
03 (23)
04 (26)
05 (5)
06 (7)
07 (5)
08 (23)
09 (40)
10 (17)
12 (16)
14 (75)
16 (39)
17 (18)

Subject List

101001
101002
101003
101004
101005
101006
101007
101008
101009
101010
101011
101012
101013
101014
101015
101016
101017
11001
11002
11003
11004
11005
11006
11007
11008
11009
11010
11011
11012
11013
11014
11015
11016
11017
11018
11019
11020
11021
11022
11023

Demography Distribution AE Distribution Findings Distribution

Distributions

Age

Sex

M 324
F 578

Race

WHITE 699
OTHER 50
BLACK OR AFRICAN AMERICAN 138
ASIAN 15

Planned T

Placebo
NIC .15

Quantiles

Summary Statistics

Subject Population by Treatment

Planned Treatment for Period 01	Count_Text	% of Total
NIC .15	447	49.6%

JMP Clinical Review Subject Filter Screenshot

Enable efficient “global” filtering of subjects in a Review

The screenshot displays the JMP Clinical Review Builder interface for an Oncology Template. The main window is titled "Review Builder - Oncology Template - JMP Clinical".

Report Navigator: Shows the "Review Subject Filter" report. The "Subject Filter" section includes filters for Study Identifier (1), Age (47 ≤ Age ≤ 75), Sex (2), Race (2), Description of Planned Arm (2), Study Site Identifier (2), and Country (1). The "Subject List" shows 18 subjects, with 6 matching rows highlighted in blue. A red arrow points from the "Review Subject Filter" report icon in the top toolbar to the "Subject Filter" section.

Tumor Response Report: The "Tumor Response" report is selected. The "Report Filter" section shows 14 matching rows with filters for Best Disease Response (3), New Lesion Detected (2), and Disposition Event (1). The "Tumor Response" section summarizes tumor burden for measured lesions by study visit, with Best Disease Response values detected in RSTESTCD = OVRLRESP.

Best Response in Target Lesions: A bar chart showing the Percent Change from Baseline (%) for Treatment A (blue) and Treatment B (red) across subjects. The y-axis ranges from -80 to 40. The x-axis is labeled "Subject".

Tumor Response Across Time: A line chart showing the Sum of Target Lesions for LDIAM Test Results. The y-axis is Percent Change from Baseline (%) and the x-axis is Study Duration (Weeks). The chart shows data for Treatment A (blue) and Treatment B (red), with markers for Death (black dot), New Lesion (black asterisk), and NoChanges (black plus sign).

Customizing a Clinical Review

Including JMP exploration in standard review process

The Trouble with Vertical Applications

“I Like it! BUT.....”

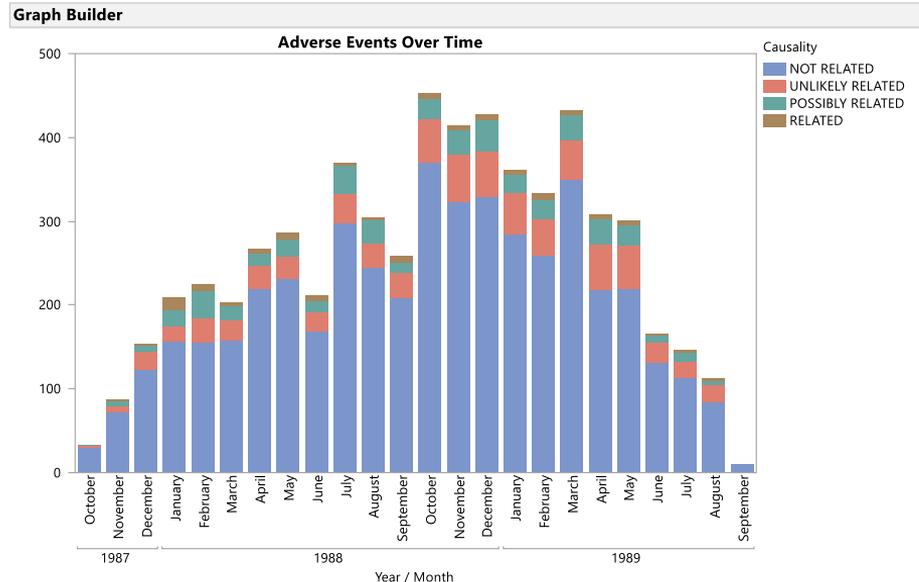
- Even with a rich set of report options, no “out-of-the-box” report will do 100% of everything everyone wants.
- ***JMP Clinical comes with JMP***
- JMP Clinical 7 enables saving Filter Settings, Data Table changes, and JMP custom scripts into a JMP Clinical Review Package

JMP Clinical Customization

JMP Exploration on Report Output

- JMP Clinical Reviews
 - Retain Data Table updates (e.g. creation of a new column)
 - Includes any data table scripts and automatically runs them on review open.

Live Example:
Create an include a custom
adverse events graph in a JMP
Clinical AE Distribution Review

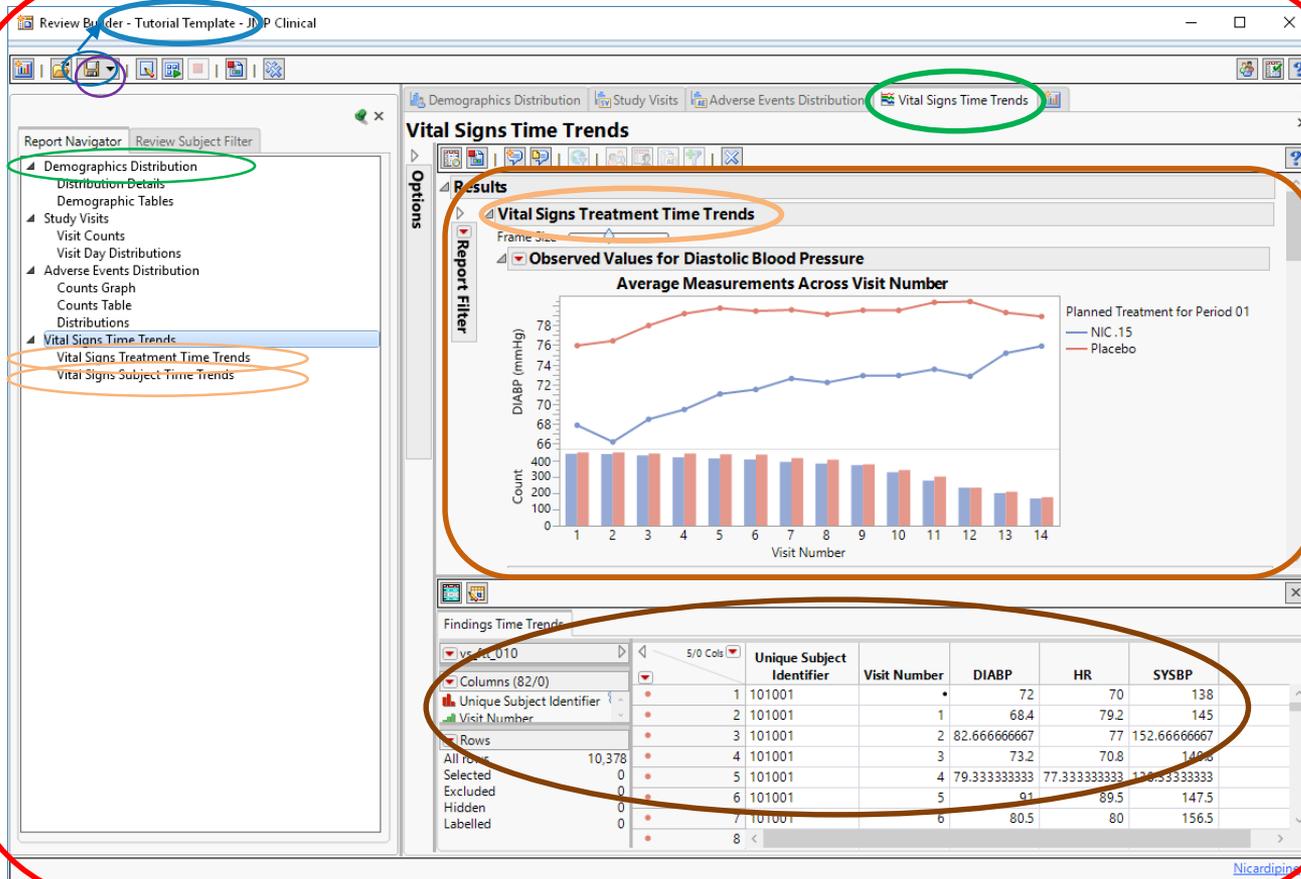


JMP Clinical API

Control Execution and Content of JMP Clinical Reviews

Standard Terminology

- Review Builder
- Review Template
- Report (Title)
- Report Results
 - Section(s)
 - Data Table
- Review
 - Saved Review Builder



Save -> Review Template

Open -> Review Template*

*Opens in Review Builder

Save -> Review

Open -> Review**

**Opens in Review Viewer

JMP Clinical API

Examples

- Insert a new section into a Review

```
If( Is Empty( JMPClinicalReviewID ),
    JMPClinicalReviewID = (JMPClinicalReviewAPI:getReviewBuilder()) << getName
);
Show( JMPClinicalReviewID );
reportTitle = "Vital Signs Time Trends";

JMPClinicalReviewAPI:insertSectionIntoReportByTitleAndSectionName(
    JMPClinicalReviewID,
    reportTitle,
    "Blood Pressure Plot",
    V List Box(
        /* Put Display Object Code here */
    ),
    1
);
```

- Automate opening and running Review Templates to Create Reviews

Thank you!
Q/A

jmp.com

