

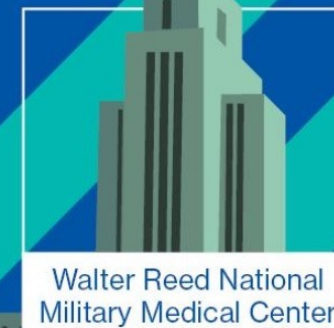


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& Conference Center



Paper SM04

**A standard data set format in regulatory submissions
for clinical trials: automatic creation of headers,
headers of headers, and footnotes.**

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Background

- Table and Listing (TL) programs are, by far, the most numerous statistical programs in clinical trial programming
- Top line tables and figures can be the “face” of a submission.
- Programmers and management aim for Accuracy, Efficiency, Reproducibility, and Traceability
- Emerging goals include automation and reusability

Busa B, Marshall R, and LeRoy B. 2023. **"All You Need to Know about the New CDISC Analysis Result Standards!"**

Proceedings of the PharmaSUG 2023 Conference, San Francisco, CA: PharmaSUG.

<https://www.pharmasug.org/proceedings/2023/MM/PharmaSUG-2023-MM-327.pdf>

Background (continued)

- Independent Validation - a 100% match on the data set
Viel, KR. “**A Standard Data Set Format for the Validation of Tables and Listings in Regulatory Submissions for Clinical Trials.**”
Conference Proceedings: PHUSE US Connect 2023. PP17.
https://phuse.s3.eu-central-1.amazonaws.com/Archive/2023/Connect/US/Florida/PAP_PP17.pdf
- Updates and correction occur (not infrequently)
 - Even a library of programs can be onerous to adapt to current specs (specifications)
- **FOLLOW** your SOP/WI

Background (continued)

A typical table shell

**Table 14.1.X Demographics
Safety Population**

Characteristic	Arm 1 (N=XXX)	Arm 2 (N=XXX)	Total (N=XXX)
Sex, n (%)			
Female	xx (xx.x)	xx (xx.x)	xx (xx.x)
Male	xx (xx.x)	xx (xx.x)	xx (xx.x)
Missing	xx (xx.x)	xx (xx.x)	xx (xx.x)
Age (years)			
n	xx	xx	xx
Mean (SD)	xx.x (xx.xx)	xx.x (xx.xx)	xx.x (xx.xx)
Median	xx.x	xx.x	xx.x
Min, Max	xx, xx	xx, xx	xx, xx
Missing (%)	xx (xx.x)	xx (xx.x)	xx (xx.x)
Age Group, n (%)			
< 65 years	xx (xx.x)	xx (xx.x)	xx (xx.x)
>= 65 years	xx (xx.x)	xx (xx.x)	xx (xx.x)
Missing	xx (xx.x)	xx (xx.x)	xx (xx.x)
Race, n (%)			
White	xx (xx.x)	xx (xx.x)	xx (xx.x)
Black or African American	xx (xx.x)	xx (xx.x)	xx (xx.x)
Asian	xx (xx.x)	xx (xx.x)	xx (xx.x)
American Indian or Alaska Native	xx (xx.x)	xx (xx.x)	xx (xx.x)
Native Hawaiian or Other Pacific Islander	xx (xx.x)	xx (xx.x)	xx (xx.x)
Other	xx (xx.x)	xx (xx.x)	xx (xx.x)
Missing	xx (xx.x)	xx (xx.x)	xx (xx.x)

Background (continued)

Modeling the shell as a VALDS

**Table 14.1.X Demographics
Safety Population (Page 1)**

Variable Name	Type	Codelist/Controlled Terms	Core	Notes
PAGE_y	Char		Perm	Higher level PAGE variables are nested in the lower level PAGE variables.
PAGE_ORDER_y	Num	Integer	Cond	Key variable(s) for the dataset.
SECTION_y	Char		Perm	Nested in the PAGE dimension. Higher level SECTION variables are nested in the lower level SECTION variables.
SECTION_ORDER_y	Num	Integer	Cond	Key variable(s) for the dataset.
ROW_y	Char		Req	Nested in the SECTION dimension. Higher level ROW variables are nested in the lower level ROW variables.
ROW_ORDER_y	Num	Integer	Req	Key variable(s) for the dataset.
COL_y	Char		Req	Nested in the ROW dimension.
TYPE	Char	B,H,F	Req	Indicator of whether the observation pertains to the Body, Header, or Footnote

Section_1	Section_Order_1	Row_1	Row_order_1	Col_1	Col_2	Col_3	Type
		Characteristic		Arm 1 (N=XXX)	Arm 2 (N=XXX)	Total (N=XXX)	H
Sex, n (%)	1	Sex, n (%)	1				B
Sex, n (%)	1	Female	2	xx (xx.x)	xx (xx.x)	xx (xx.x)	B
Sex, n (%)	1	Male	3	xx (xx.x)	xx (xx.x)	xx (xx.x)	B
Sex, n (%)	1	Missing	4	xx (xx.x)	xx (xx.x)	xx (xx.x)	B
							B
Age (years)	2	Age (years)	1				B
Age (years)	2	n	2	xx	xx	xx	B
Age (years)	2	Mean (SD)	3	xx.x (xx.xx)	xx.x (xx.xx)	xx.x (xx.xx)	B
Age (years)	2	Median	4	xx.x	xx.x	xx.x	B
Age (years)	2	Min, Max	5	xx, xx	xx, xx	xx, xx	B
Age (years)	2	Missing (%)	6	xx (xx.x)	xx (xx.x)	xx (xx.x)	B
							B
Age Group, n (%)	3	Age Group, n (%)	1				B
Age Group, n (%)	3	< 65 years	2	xx (xx.x)	xx (xx.x)	xx (xx.x)	B
Age Group, n (%)	3	>= 65 years	3	xx (xx.x)	xx (xx.x)	xx (xx.x)	B
Age Group, n (%)	3	Missing	4	xx (xx.x)	xx (xx.x)	xx (xx.x)	B
							B
Race, n (%)	4	Race, n (%)	1				B
Race, n (%)	4	White	2	xx (xx.x)	xx (xx.x)	xx (xx.x)	B
Race, n (%)	4	Black or African American	3	xx (xx.x)	xx (xx.x)	xx (xx.x)	B
Race, n (%)	4	Asian	4	xx (xx.x)	xx (xx.x)	xx (xx.x)	B
Race, n (%)	4	American Indian or Alaska Native	5	xx (xx.x)	xx (xx.x)	xx (xx.x)	B
Race, n (%)	4	Native Hawaiian or Other Pacific Islander	6	xx (xx.x)	xx (xx.x)	xx (xx.x)	B
Race, n (%)	4	Other	7	xx (xx.x)	xx (xx.x)	xx (xx.x)	B
Race, n (%)	4	Missing	8	xx (xx.x)	xx (xx.x)	xx (xx.x)	B

Viel, KR. Conference Proceedings: PHUSE US Connect 2023. PP17.

Background (continued)

Schematic of the VALDS as a SAS data set

Page_1	Page_Order_1	Section_1	Section_Order_1	Row_1	Row_order_1	Col_1	Col_2	Col_3	Type
Safety Population	1			Characteristic		Arm 1 (N=XXX)	Arm 2 (N=XXX)	Total (N=XXX)	H
Safety Population	1	Sex, n (%)	1	Sex, n (%)	1				B
Safety Population	1	Sex, n (%)	1	Female	2	xx (xx.x)	xx (xx.x)	xx (xx.x)	B
Safety Population	1	Sex, n (%)	1	Male	3	xx (xx.x)	xx (xx.x)	xx (xx.x)	B
Safety Population	1	Sex, n (%)	1	Missing	4	xx (xx.x)	xx (xx.x)	xx (xx.x)	B
Safety Population	1	Age (years)	2	Age (years)	1				B
Safety Population	1	Age (years)	2	n	2	xx	xx	xx	B
Safety Population	1	Age (years)	2	Mean (SD)	3	xx.x (xx.xx)	xx.x (xx.xx)	xx.x (xx.xx)	B
Safety Population	1	Age (years)	2	Median	4	xx.x	xx.x	xx.x	B
Safety Population	1	Age (years)	2	Min, Max	5	xx, xx	xx, xx	xx, xx	B
Safety Population	1	Age (years)	2	Missing (%)	6	xx (xx.x)	xx (xx.x)	xx (xx.x)	B
Safety Population	1	Age Group, n (%)	3	Age Group, n (%)	1				B
Safety Population	1	Age Group, n (%)	3	< 65 years	2	xx (xx.x)	xx (xx.x)	xx (xx.x)	B
Safety Population	1	Age Group, n (%)	3	>= 65 years	3	xx (xx.x)	xx (xx.x)	xx (xx.x)	B
Safety Population	1	Age Group, n (%)	3	Missing	4	xx (xx.x)	xx (xx.x)	xx (xx.x)	B
Safety Population	1	Race, n (%)	4	Race, n (%)	1				B
Safety Population	1	Race, n (%)	4	White	2	xx (xx.x)	xx (xx.x)	xx (xx.x)	B
Safety Population	1	Race, n (%)	4	Black or African American	3	xx (xx.x)	xx (xx.x)	xx (xx.x)	B
Safety Population	1	Race, n (%)	4	Asian	4	xx (xx.x)	xx (xx.x)	xx (xx.x)	B
Safety Population	1	Race, n (%)	4	American Indian or Alaska Native	5	xx (xx.x)	xx (xx.x)	xx (xx.x)	B
Safety Population	1	Race, n (%)	4	Native Hawaiian or Other Pacific Islander	6	xx (xx.x)	xx (xx.x)	xx (xx.x)	B
Safety Population	1	Race, n (%)	4	Other	7	xx (xx.x)	xx (xx.x)	xx (xx.x)	B
Safety Population	1	Race, n (%)	4	Missing	8	xx (xx.x)	xx (xx.x)	xx (xx.x)	B

Goals

- 1) To discuss SAS Usage Note 24542.
- 2) To expand on the VALDS, emphasizing headers and footnotes and the ease with arranging them.
- 3) To introduce a SAS® System macro that automates their creation.
- 4) To demonstrate the ease of rearrangements or adapting a TL to a new task.

SAS Usage Note 24542

AE ordered by descending frequency

row_1	col_3	r_o_1
AE B	9 (90)	1
AE A	7 (70)	2
AE C	6 (60)	3
AE D	4 (40)	4

SAS Usage Note 24542 (continued)

Order in output (VALDS)

section_1	row_1	col_1	col_2	col_3	section_order_1	r_o_1	row_order_1
Visit 2	AE B	5 (50)	4 (40)	9 (90)	1	1	1
Visit 2	AE C	3 (30)	3 (30)	6 (60)	1	3	≠ 2
Visit 10	AE B	2 (20)	1 (10)	3 (30)	2	1	1
Visit 10	AE A	1 (10)	6 (60)	7 (70)	2	2	2
Visit 20	AE B	1 (10)	1 (10)	2 (20)	3	1	1
Visit 20	AE A	0	1 (10)	1 (10)	3	2	2
Visit 20	AE C	2 (20)	1 (10)	3 (30)	3	3	3
Visit 20	AE D	2 (20)	2 (20)	4 (40)	3	4	4

SAS Usage Note 24542 (continued)

REPORT code

```
proc report ;
  column section_order_1 section_1
  r_o_1
  /* row_order_1 */
  row_1 col_1 - col_3 ;
  define section_order_1 / noprint order order = data ;
  define section_1 / "Visit" order order = data ;
  define r_o_1 / noprint order order = data ;
  /* define row_order_1 / noprint order order = data ; */
  define row_1 / "PT" ;
  define col_1 / "Group 1" ;
  define col_2 / "Group 2" ;
  define col_3 / "Total" ;
  compute before section_order_1 / style = { height = 5pt } ;
    line " " ;
  endcomp ;
run ;
```

SAS Usage Note 24542 (continued)

R_O_1

Visit	PT	Group 1	Group 2	Total
Visit 2	AE B	5 (50)	4 (40)	9 (90)
	AE C	3 (30)	3 (30)	6 (60)
Visit 10	AE B	2 (20)	1 (10)	3 (30)
	AE A	1 (10)	6 (60)	7 (70)
Visit 20	AE B	1 (10)	1 (10)	2 (20)
	AE C	2 (20)	1 (10)	3 (30)
	AE A	0	1 (10)	1 (10)
	AE D	2 (20)	2 (20)	4 (40)

SAS Usage Note 24542 (continued)

ROW_ORDER_1

Visit	PT	Group 1	Group 2	Total
Visit 2	AE B	5 (50)	4 (40)	9 (90)
	AE C	3 (30)	3 (30)	6 (60)
Visit 10	AE B	2 (20)	1 (10)	3 (30)
	AE A	1 (10)	6 (60)	7 (70)
Visit 20	AE B	1 (10)	1 (10)	2 (20)
	AE A	0	1 (10)	1 (10)
	AE C	2 (20)	1 (10)	3 (30)
	AE D	2 (20)	2 (20)	4 (40)

SAS Usage Note 24542 (continued)

Order in output (VALDS)

section_1	row_1	col_1	col_2	col_3	section_order_1	r_o_1	row_order_1
Visit 2	AE B	5 (50)	4 (40)	9 (90)	1	1	1
Visit 2	AE C	3 (30)	3 (30)	6 (60)	1	3	≠ 2
Visit 10	AE B	2 (20)	1 (10)	3 (30)	2	1	1
Visit 10	AE A	1 (10)	6 (60)	7 (70)	2	2	2
Visit 20	AE B	1 (10)	1 (10)	2 (20)	3	1	1
Visit 20	AE A	0	1 (10)	1 (10)	3	2	2
Visit 20	AE C	2 (20)	1 (10)	3 (30)	3	3	3
Visit 20	AE D	2 (20)	2 (20)	4 (40)	3	4	4

SAS Usage Note 24542 (continued)

The Usage Note explained

- 1) The REPORT procedure establishes the *order pattern across all observations*
- 2) The established order pattern does not change for each group.
 - Even though $R_O_1 = 2$ is less than 3, 2 is not encountered until VISIT 10 (the second “group”), whereas 3 occurs in VISIT 2 (the first “group”).
 - Using ROW_ORDER_1, the value 2 corresponds to AE C in VISIT 2, but to AE A if VISIT 20, thus the “global” order that REPORT preserves across all “groups”.

Expanded use of VALDS

Derived Footnotes

	page_1	page_order_1	section_1	section_order_1	row_1	row_order_1	col1	col2	col3	col4	col5	col6	header_order	type	type_order	footer_order
1	ALT		1 Header		0 Header	0	Group 1'n(N = 10)		Group 2'n(N = 8)		All'n(N = 18)		1	H		1
2	ALT		1 Header		0 Header	0	Observed Value	Change from'nBaseline	Observed Value	Change from'nBaseline	Observed Value	Change from'nBaseline	0	H		1
3	ALT		1 Baseline		1 Baseline	0								B		2
4	ALT		1 Baseline		1 n	1	10		8		18			B		2
5	ALT		1 Baseline		1 Mean (SD)	2	6.4 (2.17)		4.3 (1.83)		5.4 (2.25)			B		2
6	ALT		1 Baseline		1 Median	3	7.0		3.5		5.5			B		2
7	ALT		1 Baseline		1 Q1, Q3	4	5.0, 8.0		3.0, 5.0		3.0, 7.0			B		2
8	ALT		1 Baseline		1 Min, Max	5	3, 9		3, 8		3, 9			B		2
9	ALT		1 Month 1		2 Month 1	0								B		2
10	ALT		1 Month 1		2 n	1	9'super A }	9'super B }	8	8	17'super C }	17'super D }		B		2
11	ALT		1 Month 1		2 Mean (SD)	2	5.7 (2.83)	-0.4 (3.36)	4.9 (1.81)	0.6 (2.92)	5.3 (2.37)	0.1 (3.11)		B		2
12	ALT		1 Month 1		2 Median	3	6.0	-1.0	4.0	1.0	5.0	1.0		B		2
13	ALT		1 Month 1		2 Q1, Q3	4	5.0, 8.0	-2.0, 1.0	4.0, 5.0	-1.0, 1.5	4.0, 6.0	-2.0, 1.0		B		2
14	ALT		1 Month 1		2 Min, Max	5	1, 9	-5, 6	4, 9	-4, 6	1, 9	-5, 6		B		2
15	ALT		1 Month 2		3 Month 2	0								B		2
16	ALT		1 Month 2		3 n	1	10	10	8	8	18	18		B		2
17	ALT		1 Month 2		3 Mean (SD)	2	6.0 (2.40)	-0.4 (2.88)	5.9 (3.36)	1.6 (3.58)	5.9 (2.78)	0.5 (3.28)		B		2
18	ALT		1 Month 2		3 Median	3	6.0	0.5	6.0	2.0	6.0	1.0		B		2
19	ALT		1 Month 2		3 Q1, Q3	4	5.0, 8.0	-2.0, 2.0	4.0, 9.0	-1.0, 5.0	4.0, 8.0	-2.0, 3.0		B		2
20	ALT		1 Month 2		3 Min, Max	5	1, 9	-6, 3	0, 9	-4, 5	0, 9	-6, 5		B		2
21	ALT		1 Footer		0 Footer	0	'super A } The following subject(s) have missing values: 001-01-0001'n'super B } The following subject(s) have missing values: 001-01-0001'n'super C } The following subject(s) have missing values:	001-01-0001'n'super D } The following subject(s) have missing values: 001-01-0001						F		3
22	AST		2 Header		0 Header	0	Group 1'n(N = 10)		Group 2'n(N = 8)		All'n(N = 18)		1	H		1
23	AST		2 Header		0 Header	0	Observed Value	Change from'nBaseline	Observed Value	Change from'nBaseline	Observed Value	Change from'nBaseline	0	H		1
24	AST		2 Baseline		1 Baseline	0								B		2
25	AST		2 Baseline		1 n	1	10	10	8	8	18	18		B		2
26	AST		2 Baseline		1 Mean (SD)	2	5.1 (4.01)	-0.4 (2.88)	5.4 (3.25)	1.6 (3.58)	5.2 (3.59)	0.5 (3.28)		B		2
27	AST		2 Baseline		1 Median	3	5.0	0.5	5.0	2.0	5.0	1.0		B		2
28	AST		2 Baseline		1 Q1, Q3	4	1.0, 9.0	-2.0, 2.0	3.5, 8.0	-1.0, 5.0	1.0, 9.0	-2.0, 3.0		B		2
29	AST		2 Baseline		1 Min, Max	5	1, 10	-6, 3	0, 10	-4, 5	0, 10	-6, 5		B		2
30	AST		2 Month 1		2 Month 1	0								B		2
31	AST		2 Month 1		2 n	1	10	10	8	8	18	18		B		2
32	AST		2 Month 1		2 Mean (SD)	2	5.4 (2.41)	0.3 (5.17)	5.4 (2.77)	0.0 (4.31)	5.4 (2.50)	0.2 (4.67)		B		2
33	AST		2 Month 1		2 Median	3	5.0	-1.0	5.5	1.0	5.5	0.5		B		2
34	AST		2 Month 1		2 Q1, Q3	4	4.0, 7.0	-3.0, 3.0	4.0, 8.0	-1.5, 2.5	4.0, 8.0	-3.0, 3.0		B		2
35	AST		2 Month 1		2 Min, Max	5	2, 9	-8, 8	0, 8	-9, 5	0, 9	-9, 8		B		2
36	AST		2 Month 2		3 Month 2	0								B		2
37	AST		2 Month 2		3 n	1	10	10	8	8	18	18		B		2
38	AST		2 Month 2		3 Mean (SD)	2	5.5 (2.42)	0.4 (4.38)	5.1 (3.40)	-0.3 (4.40)	5.3 (2.81)	0.1 (4.27)		B		2
39	AST		2 Month 2		3 Median	3	5.5	0.0	5.0	-0.5	5.0	0.0		B		2
40	AST		2 Month 2		3 Q1, Q3	4	4.0, 7.0	-4.0, 5.0	2.5, 8.0	-2.5, 1.5	3.0, 8.0	-3.0, 4.0		B		2
41	AST		2 Month 2		3 Min, Max	5	1, 9	-6, 6	0, 10	-7, 8	0, 10	-7, 8		B		2

Like the column total (N = xx), a footnote may be derived, and thus should be Validated. Further, a footnote may be applicable to just one physical page.

Expanded use of VALDS

Substitution versus global FOOTNOTE statement

Table 14.2.1
Laboratory Results
Safety Population

Parameter = ALT

	Group 1 (N = 10)		Group 2 (N = 8)		All (N = 18)	
	Observed Value	Change from Baseline	Observed Value	Change from Baseline	Observed Value	Change from Baseline
Baseline						
n	10		8		18	
Mean (SD)	6.4 (2.17)		4.3 (1.83)		5.4 (2.25)	
Median	7.0		3.5		5.5	
Q1, Q3	5.0, 8.0		3.0, 5.0		3.0, 7.0	
Min, Max	3, 9		3, 8		3, 9	
Month 1						
n	9 ^a	9 ^a	8	8	17 ^c	17 ^c
Mean (SD)	5.7 (2.83)	-0.4 (3.36)	4.9 (1.81)	0.6 (2.92)	5.3 (2.37)	0.1 (3.11)
Median	6.0	-1.0	4.0	1.0	5.0	1.0
Q1, Q3	5.0, 8.0	-2.0, 1.0	4.0, 5.0	-1.0, 1.5	4.0, 6.0	-2.0, 1.0

Very important text

^a The following subject(s) have missing values: 001-01-0001
^b The following subject(s) have missing values: 001-01-0001
^c The following subject(s) have missing values: 001-01-0001
^d The following subject(s) have missing values: 001-01-0001

1 of 4

Table 14.2.1
Laboratory Results
Safety Population

Parameter = AST

	Group 1 (N = 10)		Group 2 (N = 8)		All (N = 18)	
	Observed Value	Change from Baseline	Observed Value	Change from Baseline	Observed Value	Change from Baseline
Baseline						
n	10		8		18	
Mean (SD)	5.1 (4.03)	-0.4 (2.88)	5.4 (3.25)	1.6 (3.88)	5.2 (3.39)	0.5 (3.28)
Median	5.0		5.0		5.0	
Q1, Q3	1.0, 9.0	-2.0, 2.0	3.5, 8.0	-1.0, 5.0	1.0, 9.0	-2.0, 3.0
Min, Max	1, 10	-6, 3	0, 10	-4, 5	0, 10	-6, 5
Month 1						
n	10	10	8	8	18	18
Mean (SD)	5.4 (2.41)	0.3 (5.17)	5.4 (2.77)	0.0 (4.31)	5.4 (2.30)	0.2 (4.67)
Median	5.0	-1.0	5.5	1.0	5.5	0.5
Q1, Q3	4.0, 7.0	-3.0, 3.0	4.0, 8.0	-1.5, 2.5	4.0, 8.0	-3.0, 3.0
Min, Max	2, 9	-8, 8	0, 8	-9, 5	0, 9	-9, 8
Month 2						

Very important text

3 of 4

Table 14.2.1
Laboratory Results
Safety Population

Parameter = ALT

	Group 1 (N = 10)		Group 2 (N = 8)		All (N = 18)	
	Observed Value	Change from Baseline	Observed Value	Change from Baseline	Observed Value	Change from Baseline
Min, Max	1, 9	-3, 8	4, 9	-4, 6	1, 9	-5, 6
Month 2						
n	10	10	8	8	18	18
Mean (SD)	6.0 (2.40)	-0.4 (2.88)	5.9 (3.36)	1.6 (3.38)	5.9 (2.78)	0.5 (3.28)
Median	6.0	0.5	6.0	2.0	6.0	1.0
Q1, Q3	5.0, 8.0	-2.0, 2.0	4.0, 9.0	-1.0, 5.0	4.0, 8.0	-2.0, 3.0
Min, Max	1, 9	-6, 3	0, 9	-4, 5	0, 9	-6, 5

Very important text

^a The following subject(s) have missing values: 001-01-0001
^b The following subject(s) have missing values: 001-01-0001
^c The following subject(s) have missing values: 001-01-0001
^d The following subject(s) have missing values: 001-01-0001

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Table 14.2.1
Laboratory Results
Safety Population

Parameter = AST

	Group 1 (N = 10)		Group 2 (N = 8)		All (N = 18)	
	Observed Value	Change from Baseline	Observed Value	Change from Baseline	Observed Value	Change from Baseline
n	10	10	8	8	18	18
Mean (SD)	5.5 (2.42)	0.4 (4.30)	5.1 (3.40)	-0.3 (4.40)	5.3 (2.81)	0.1 (4.27)
Median	5.0		5.0		5.0	
Q1, Q3	4.0, 7.0	-4.0, 5.0	2.5, 8.0	-2.5, 1.5	3.0, 8.0	-3.0, 4.0
Min, Max	1, 9	-6, 6	0, 10	-7, 6	0, 10	-7, 8

Very important text

4 of 4

footnote3 "#byval(footer_3)" ;

versus a global footnote statement:

footnote3 "` {super A} The following subject(s) have missing values: 001-01-0001` n` {super B} The following subject(s) have missing values: 001-01-0001` n` {super C} The following subject(s) have missing values: 001-01-0001` n` {super D} The following subject(s) have missing values: 001-01-0001";

Note the lack of these footnotes in the lower two panels.

MAC_R_REPORT macro

- **Part 1:** reports the column widths and their running totals.
- **Part 2:** processes the situation of no qualifying observations resulting in zero observations.
- **Part 3:** processes the data and instructions, including providing instructions to the macro for logic (decisions), and reporting, generating the REPORT procedure code.

MAC_R_REPORT macro

```
%mac_r_report
( help = Y ) ;
```

Purpose of program:	This report macro creates the headers, COLUMN statements, and DEFINE statements, for the REPORT procedure.
Macro Parameter	Description
in_ds	= The input data set.
page_by_vars	= The variables, if any, that distinguish the tables, i.e., the columns, column headers, and footnotes, which may be distinct for each table in the data set. Each distinct combination of these variables results in a separate call of the REPORT procedure. Default: page_1 page_2
num_of_cols	= The number of columns (COLN variables) for the table with the maximum number of columns.
style_prefix	= The inline style to the headers that span multiple headers or columns. Default: 'S={ borderbottomcolor = black borderbottomwidth = 1pt borderleftstyle = none borderrightstyle = none }
add_null_cols	= Whether to add columns, derived in the REPORT procedure, for formatting purposes, for instance, to add a break between header tables. These have no headers or values, they simply add spacing. Default: Y
null_cellwidth	= The width of the added null columns. Default: 0.25%
report_define_options_ds	= The data set that defines the options to the DEFINE statements in the REPORT procedure. The required variables and suggested lengths are: variable \$ 32 order \$ define_options \$ 2000 cellwidth \$ 10 define_options \$ 2000 cellwidth \$ 10 The PAGE_BY_VARS, if any, would also be required, for instance: page_1 \$ 200 Default: report_define_options
report_column_widths	= Whether to report the column widths and their running totals and exit the macro. Default: N
split	= The value of the SPLIT= option to the REPORT statement. Default: #
report_options	= Any additional code to add to the REPORT statement. Default: style(report) = { width = 100% } missing spanrows
column_non_col_vars	= The variables in their respective order to substitute instead of allowing the macro to write the variables. These are the variables except the COLN variables. Default:
code_after_define	= Any code to follow the DEFINE statements. Default: compute row_1 ; if row_order_1 > 0 then call define (_col_ "style" "style = { leftmargin = 1% }"); endcomp ;
report_by	= The BY variables of the BY statement of the REPORT procedure. Default:
The following pertain to the situation when the input data set contains zero observations:	
This creates a temporary data set, __ZERO_OBS, that is deleted.	
zero_observation_text	= Text to write to the output table or listing. Default: No qualifying observations.
zero_observation_header	= The column heading for the ZERO_OBSERVATION_TEXT. Default:
zero_observation_report_style	= The options to the REPORT statement. Any option can be listed, but the default is a style overrides for the ODS output Default: style(report) = { width = 100% }
zero_observation_define_style	= The options to the DEFINE statement. As above, any option can be listed, but the default is a style overrides for the ODS output Default: style(column) = { just = c }
zero_observation_retain_by	= Variable and values for the RETAIN statement in the data step that creates __ZERO_OBS. Default: " (when REPORT_BY is populated)
make_zero_obs_ds	= To overwrite the zero observation input data set with a one observation, one variable version with COLO equal to the ZERO_OBSERVATION_TEXT, if populated, or "No qualifying observations". Default: Y
End of help	

MAC_R_REPORT macro

Part 1: REPORT_DEFINE_OPTIONS

	page_1	variable	define_options	cellwidth	order
1	ALT	page_order_1	order order = data noprint		1
2	ALT	page_1	order order = data noprint		2
3	ALT	section_order_1	order order = data noprint		3
4	ALT	row_order_1	order order = data noprint		4
5	ALT	row_1	" " order style (column) = { cellwidth = 15% just = l vjust = top } style (header) = { just = l }		5
6	ALT	col1		10%	6
7	ALT	col2		10%	7
8	ALT	col3		10%	8
9	ALT	col4		10%	9
10	ALT	col5		10%	10
11	ALT	col6		10%	11
12	AST	page_order_1	order order = data noprint		1
13	AST	page_1	order order = data noprint		2
14	AST	section_order_1	order order = data noprint		3
15	AST	row_order_1	order order = data noprint		4
16	AST	row_1	" " order style (column) = { cellwidth = 15% just = l vjust = top } style (header) = { just = l }		5
17	AST	col1		10%	6
18	AST	col2		10%	7
19	AST	col3		10%	8
20	AST	col4		10%	9
21	AST	col5		10%	10
22	AST	col6		10%	11

MAC_R_REPORT macro

Part 1: REPORT_COLUMN_WIDTHS

```
%mac_r_report
  ( page_by_vars           = page_1
    , report_column_widths = Y
  ) ;
```

page_1=ALT

type	__var1	__var2	__var3	__var4	__var5	__var6	__var7
variable	row_1	col1	col2	col3	col4	col5	col6
cellwidth	15	10	10	10	10	10	10
running total	15	25	35	45	55	65	75

MAC_R_REPORT macro

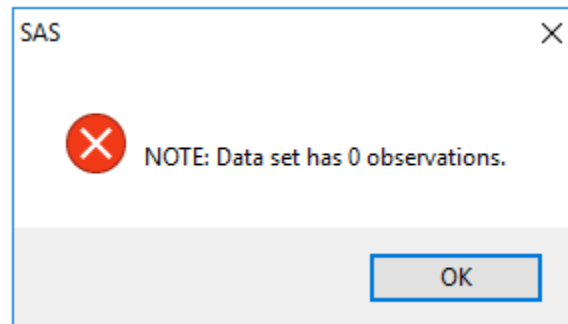
Part 1: REPORT_COLUMN_WIDTHS

- The values include code, specifically, the options to the DEFINE statements, that must appear somewhere in a program.
- Being collected in a data set may allow automation and reconciliation across deliveries or projects without finding and opening (or programmatically reading) programs.
- Fine-tuning column widths is easier and does not require a programmatic read of the program(s).
 - If the programs called a macro, then it might require (repeatedly) running the program, and possibly generating and collecting the SAS code the macro generates.
 - MAC_DEBUG_MFILE
- The cellwidths do not account for COMPUTED columns, i.e. NULL for spacing.

MAC_R_REPORT macro

Part 2: No Qualifying Observations

- On occasion, a shell exist but no qualifying observations exist
 - EXAMPLE: No Treatment-emergent, serious adverse events



MAC_R_REPORT macro

Part 2: Possible REPORT output

Page 1 of 1 0 words

Page 1 of 1 0 words

Name	Date modified	Type	Size ^
 L16.1.1_deaths_1.rtf	1/7/2024 4:24 PM	Rich Text Format	1 KB
 L16.1.1_deaths.rtf	1/7/2024 4:24 PM	Rich Text Format	2 KB

MAC_R_REPORT macro

Part 2: Possible REPORT output

Listing 16.1.1
Deaths

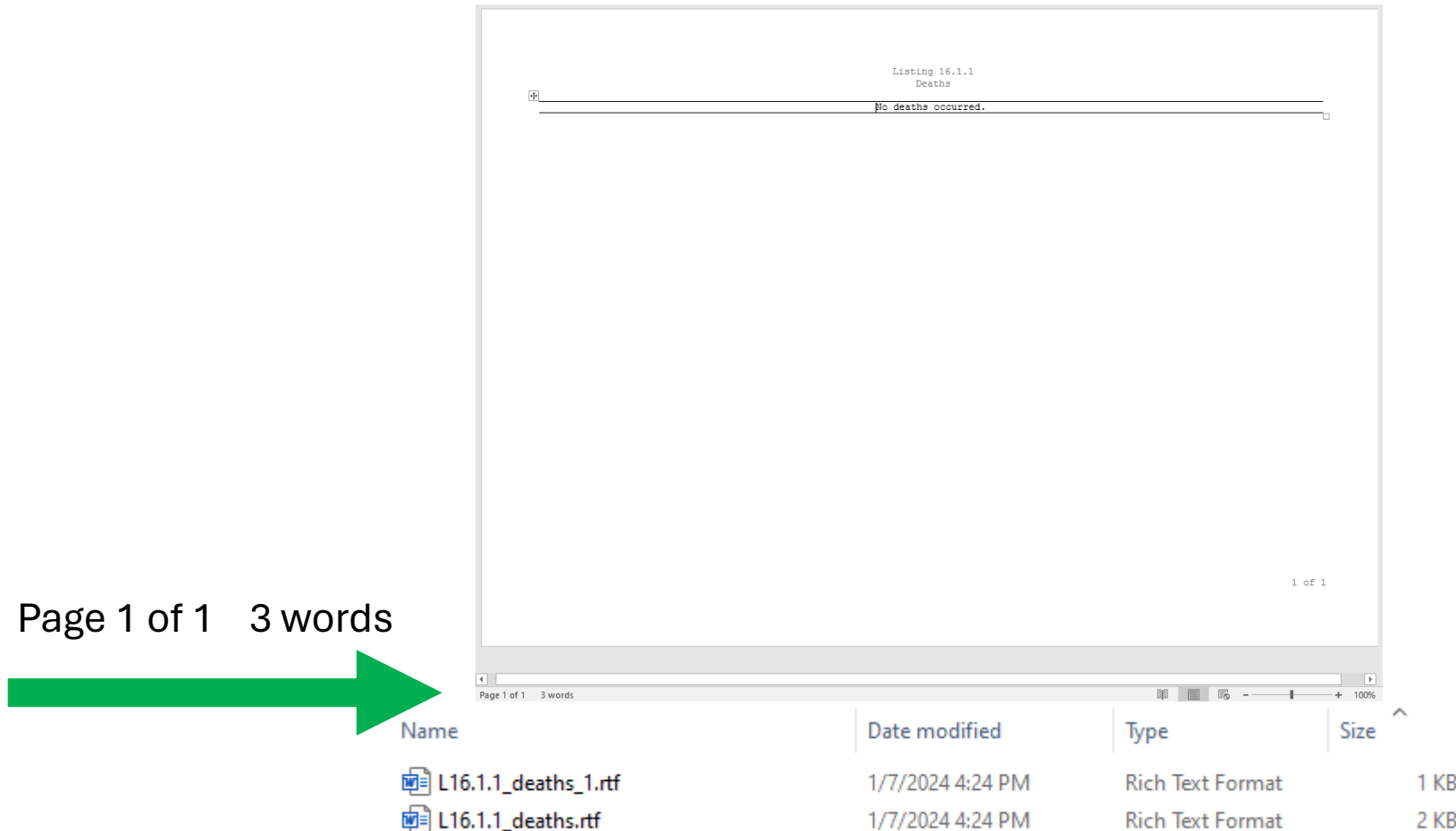
No deaths occurred.

Page 1 of 1 3 words

1 of 1

Page 1 of 1 3 words

Name	Date modified	Type	Size
L16.1.1_deaths_1.rtf	1/7/2024 4:24 PM	Rich Text Format	1 KB
L16.1.1_deaths.rtf	1/7/2024 4:24 PM	Rich Text Format	2 KB



MAC_R_REPORT macro

Part 2: Possible REPORT VALDS

Obs

col0

1

No deaths occurred.

- Removes potential confusion
- Follow the SOP/WI

MAC_R_REPORT macro

Part 3: VALDS

	page_1	page_order_1	section_1	section_order_1	row_1	row_order_1	col1	col2	col3	col4	col5	col6	header_order	type	type_order	footer_order
1	ALT	1	Header	0	Header	0	Group 1'n(N = 10)		Group 2'n(N = 8)		All'n(N = 18)		1	H	1	.
2	ALT	1	Header	0	Header	0	Observed Value	Change from'nBaseline	Observed Value	Change from'nBaseline	Observed Value	Change from'nBaseline	0	H	1	.
3	ALT	1	Baseline	1	Baseline	0							.	B	2	.
4	ALT	1	Baseline	1	n	1	10		8		18		.	B	2	.
5	ALT	1	Baseline	1	Mean (SD)	2	6.4 (2.17)		4.3 (1.83)		5.4 (2.25)		.	B	2	.
6	ALT	1	Baseline	1	Median	3	7.0		3.5		5.5		.	B	2	.
7	ALT	1	Baseline	1	Q1, Q3	4	5.0, 8.0		3.0, 5.0		3.0, 7.0		.	B	2	.
8	ALT	1	Baseline	1	Min, Max	5	3, 9		3, 8		3, 9		.	B	2	.
9	ALT	1	Month 1	2	Month 1	0							.	B	2	.
10	ALT	1	Month 1	2	n	1	9'super A }	9'super B }	8	8	17'super C }	17'super D }	.	B	2	.
11	ALT	1	Month 1	2	Mean (SD)	2	5.7 (2.83)	-0.4 (3.36)	4.9 (1.81)	0.6 (2.92)	5.3 (2.37)	0.1 (3.11)	.	B	2	.
12	ALT	1	Month 1	2	Median	3	6.0	-1.0	4.0	1.0	5.0	1.0	.	B	2	.
13	ALT	1	Month 1	2	Q1, Q3	4	5.0, 8.0	-2.0, 1.0	4.0, 5.0	-1.0, 1.5	4.0, 6.0	-2.0, 1.0	.	B	2	.
14	ALT	1	Month 1	2	Min, Max	5	1, 9	-5, 6	4, 9	-4, 6	1, 9	-5, 6	.	B	2	.
15	ALT	1	Month 2	3	Month 2	0							.	B	2	.
16	ALT	1	Month 2	3	n	1	10	10	8	8	18	18	.	B	2	.
17	ALT	1	Month 2	3	Mean (SD)	2	6.0 (2.40)	-0.4 (2.88)	5.9 (3.36)	1.6 (3.58)	5.9 (2.78)	0.5 (3.28)	.	B	2	.
18	ALT	1	Month 2	3	Median	3	6.0	0.5	6.0	2.0	6.0	1.0	.	B	2	.
19	ALT	1	Month 2	3	Q1, Q3	4	5.0, 8.0	-2.0, 2.0	4.0, 9.0	-1.0, 5.0	4.0, 8.0	-2.0, 3.0	.	B	2	.
20	ALT	1	Month 2	3	Min, Max	5	1, 9	-6, 3	0, 9	-4, 5	0, 9	-6, 5	.	B	2	.
21	ALT	1	Footer	0	Footer		'super A } The following subject(s) have missing values: 0 001-01-0001'n'super B } The following subject(s) have missing values: 001-01-0001'n'super C } The following subject(s) have missing values:	001-01-0001'n'super D } The following subject(s) have missing values: 001-01-0001					.	F	3	3
22	AST	2	Header	0	Header	0	Group 1'n(N = 10)		Group 2'n(N = 8)		All'n(N = 18)		1	H	1	.
23	AST	2	Header	0	Header	0	Observed Value	Change from'nBaseline	Observed Value	Change from'nBaseline	Observed Value	Change from'nBaseline	0	H	1	.
24	AST	2	Baseline	1	Baseline	0							.	B	2	.
25	AST	2	Baseline	1	n	1	10	10	8	8	18	18	.	B	2	.
26	AST	2	Baseline	1	Mean (SD)	2	5.1 (4.01)	-0.4 (2.88)	5.4 (3.25)	1.6 (3.58)	5.2 (3.59)	0.5 (3.28)	.	B	2	.
27	AST	2	Baseline	1	Median	3	5.0	0.5	5.0	2.0	5.0	1.0	.	B	2	.
28	AST	2	Baseline	1	Q1, Q3	4	1.0, 9.0	-2.0, 2.0	3.5, 8.0	-1.0, 5.0	1.0, 9.0	-2.0, 3.0	.	B	2	.
29	AST	2	Baseline	1	Min, Max	5	1, 10	-6, 3	0, 10	-4, 5	0, 10	-6, 5	.	B	2	.
30	AST	2	Month 1	2	Month 1	0							.	B	2	.
31	AST	2	Month 1	2	n	1	10	10	8	8	18	18	.	B	2	.
32	AST	2	Month 1	2	Mean (SD)	2	5.4 (2.41)	0.3 (5.17)	5.4 (2.77)	0.0 (4.31)	5.4 (2.50)	0.2 (4.67)	.	B	2	.
33	AST	2	Month 1	2	Median	3	5.0	-1.0	5.5	1.0	5.5	0.5	.	B	2	.
34	AST	2	Month 1	2	Q1, Q3	4	4.0, 7.0	-3.0, 3.0	4.0, 8.0	-1.5, 2.5	4.0, 8.0	-3.0, 3.0	.	B	2	.
35	AST	2	Month 1	2	Min, Max	5	2, 9	-8, 8	0, 8	-9, 5	0, 9	-9, 8	.	B	2	.
36	AST	2	Month 2	3	Month 2	0							.	B	2	.
37	AST	2	Month 2	3	n	1	10	10	8	8	18	18	.	B	2	.
38	AST	2	Month 2	3	Mean (SD)	2	5.5 (2.42)	0.4 (4.38)	5.1 (3.40)	-0.3 (4.40)	5.3 (2.81)	0.1 (4.27)	.	B	2	.
39	AST	2	Month 2	3	Median	3	5.5	0.0	5.0	-0.5	5.0	0.0	.	B	2	.
40	AST	2	Month 2	3	Q1, Q3	4	4.0, 7.0	-4.0, 5.0	2.5, 8.0	-2.5, 1.5	3.0, 8.0	-3.0, 4.0	.	B	2	.
41	AST	2	Month 2	3	Min, Max	5	1, 9	-6, 6	0, 10	-7, 8	0, 10	-7, 8	.	B	2	.

MAC_R_REPORT macro

Part 3: Example macro call

```
%mac_r_report
( in_ds           = tfl.tfl_outsas
, page_by_vars   = page_1
, num_of_cols    = &num_of_cols.
, report_options = style( report ) = { width           = 100%
                                       frame            = hsidess
                                       rules            = groups
                                       cellpadding       = 1pt
                                       cellspacing      = 0pt
                                       borderwidth      = 1
                                       fontfamily       = "Courier New"
                                       fontsize         = 9pt
                                       backgroundcolor  = white
                                       }
, style( header ) = { backgroundcolor = white
                     fontweight      = medium
                     }
, style( column ) = { just           = c
                     vjust          = m
                     backgroundcolor = white
                     }
missing
```

MAC_R_REPORT macro

Part 3: Example macro call (continued)

```
, code_after_define      = compute before section_order_1
                          / style = { height = 18pt }
                          ;
                          line " " ;
                          endcomp ;

                          compute row_1 ;

                          if row_order_1 > 0 then
                            call define( _col_
                                          %str(,) "style"
                                          %str(,) "style = { leftmargin = 1% }"
                                          ) ;

                          endcomp ;

, report_by              = page_1
) ;
```

MAC_R_REPORT macro

Part 3: Example macro call (continued)

```
title1 j = c "Table 14.2.1" ;
title2 j = c "Laboratory Results" ;
title3 j = c "Safety Population" ;
title5 j = 1 "Parameter = #byval( page_1 )" ;
footnote1 "Very important text" ;
footnote3 "#byval( footer_3 )" ;

footnote5 j = r "`{pageof}" ;
```

MAC_R_REPORT macro

Table 14.2.1
Laboratory Results
Safety Population

Parameter = ALT

	Group 1 (N = 10)		Group 2 (N = 5)		All (N = 15)	
	Observed Value	Change from Baseline	Observed Value	Change from Baseline	Observed Value	Change from Baseline
Baseline						
n	10		8		18	
Mean (SD)	6.4 (2.17)		4.3 (1.83)		5.4 (2.25)	
Median	7.0		3.5		5.5	
Q1, Q3	5.0, 8.0		3.0, 5.0		3.0, 7.0	
Min, Max	3, 9		3, 8		3, 9	
Month 1						
n	9 ^a	9 ^b	8	8	17 ^c	17 ^d
Mean (SD)	5.7 (2.83)	-0.4 (3.36)	4.9 (1.81)	0.6 (2.92)	5.3 (2.37)	0.1 (3.11)
Median	6.0	-1.0	4.0	1.0	5.0	1.0
Q1, Q3	5.0, 8.0	-2.0, 1.0	4.0, 5.0	-1.0, 1.5	4.0, 6.0	-2.0, 1.0

Very important text

- ^a The following subject(s) have missing values: 001-01-0001
^b The following subject(s) have missing values: 001-01-0001
^c The following subject(s) have missing values: 001-01-0001
^d The following subject(s) have missing values: 001-01-0001

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Table 14.2.1
Laboratory Results
Safety Population

Parameter = AST

	Group 1 (N = 10)		Group 2 (N = 5)		All (N = 15)	
	Observed Value	Change from Baseline	Observed Value	Change from Baseline	Observed Value	Change from Baseline
Baseline						
n	10	10	8	8	18	18
Mean (SD)	5.1 (4.01)	-0.4 (2.88)	5.4 (3.25)	1.6 (3.58)	5.2 (3.59)	0.5 (3.28)
Median	5.0	0.5	5.0	2.0	5.0	1.0
Q1, Q3	1.0, 9.0	-2.0, 2.0	3.5, 8.0	-1.0, 5.0	1.0, 9.0	-2.0, 3.0
Min, Max	1, 10	-6, 3	0, 10	-4, 5	0, 10	-6, 5
Month 1						
n	10	10	8	8	18	18
Mean (SD)	5.4 (2.41)	0.3 (5.17)	5.4 (2.77)	0.0 (4.31)	5.4 (2.50)	0.2 (4.67)
Median	5.0	-1.0	5.5	1.0	5.5	0.5
Q1, Q3	4.0, 7.0	-3.0, 3.0	4.0, 8.0	-1.5, 2.5	4.0, 8.0	-3.0, 3.0
Min, Max	2, 9	-8, 8	0, 8	-9, 5	0, 9	-9, 8

Very important text

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Table 14.2.1
Laboratory Results
Safety Population

Parameter = ALT

	Group 1 (N = 10)		Group 2 (N = 5)		All (N = 15)	
	Observed Value	Change from Baseline	Observed Value	Change from Baseline	Observed Value	Change from Baseline
Min, Max	1, 9	-5, 6	4, 9	-4, 6	1, 9	-5, 6
Month 2						
n	10	10	8	8	18	18
Mean (SD)	6.0 (2.40)	-0.4 (2.88)	5.9 (3.36)	1.6 (3.58)	5.9 (2.78)	0.5 (3.28)
Median	6.0	0.5	6.0	2.0	6.0	1.0
Q1, Q3	5.0, 8.0	-2.0, 2.0	4.0, 9.0	-1.0, 5.0	4.0, 8.0	-2.0, 3.0
Min, Max	1, 9	-6, 3	0, 9	-4, 5	0, 9	-6, 3

Very important text

- ^a The following subject(s) have missing values: 001-01-0001
^b The following subject(s) have missing values: 001-01-0001
^c The following subject(s) have missing values: 001-01-0001
^d The following subject(s) have missing values: 001-01-0001

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Table 14.2.1
Laboratory Results
Safety Population

Parameter = AST

	Group 1 (N = 10)		Group 2 (N = 5)		All (N = 15)	
	Observed Value	Change from Baseline	Observed Value	Change from Baseline	Observed Value	Change from Baseline
n	10	10	8	8	18	18
Mean (SD)	5.5 (2.42)	0.4 (4.38)	5.1 (3.40)	-0.3 (4.40)	5.3 (2.81)	0.1 (4.27)
Median	5.5	0.0	5.0	-0.5	5.0	0.0
Q1, Q3	4.0, 7.0	-4.0, 5.0	2.5, 8.0	-2.5, 1.5	3.0, 8.0	-3.0, 4.0
Min, Max	1, 9	-6, 6	0, 10	-7, 8	0, 10	-7, 8

Very important text

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MAC_R_REPORT macro

Part 3: Example macro call (continued)

A very concise version, given default values of macro parameters consistent with the conventions of a company might be:

```
%mac_r_report  
  ( in_ds                      = tfl.tfl_outsas  
    , page_by_vars             = page_1  
    , num_of_cols              = &num_of_cols.  
    , report_by                = page_1  
  ) ;
```

MAC_R_REPORT macro

Part 3: Capturing the SAS code generated

```
%mac_debug_mfile  
  ( mcall = mac_r_report  
    ( in_ds                                = tfl.tfl_outsas  
      , page_by_vars                        = page_1  
      , num_of_cols                        = &num_of_cols.  
      , report_by                          = page_1  
    )  
  ) ;
```

Viel, K. 2016. "Capturing Macro Code when Debugging in the Windows Environment: The Power of MFILE and the Simplicity of Pasting." Proceedings of the PharmaSUG 2016 Conference, Denver, CO: PharmaSUG.

MAC_R_REPORT macro

Part 3: SAS code generated

```
proc sql noprint ;  
select count( * ) into : num_obs from tfl.tfl_outsas ;  
quit ;  
proc sql noprint ;  
select distinct page_1 , page_order_1 into : __d1_1 - , :  
null11 - from tfl.tfl_outsas order by page_order_1 ;  
quit ;
```

<SNIPPED>

```
proc report data = __mrr split = "#" style( report ) = {  
width = 100% frame = hside
```

<SNIPPED>

Changes to the shell

```
data reorder ;  
  set tfl.tfl_outsas ;  
  page_order_1 = mod( page_order_1 , 2 ) ;  
  
  array __c ( * )  
    col1 - col&num_of_cols.  
    ;  
  
  if page_1 = "AST"  
  then call missing ( col5  
                     , col6  
                     ) ;  
  
run ;
```

Changes to REPORT_DEFINE_OPTIONS

```
data report_define_options ;  
  set report_define_options  
    ( where = (      page_1 ne "AST"  
                  or  variable ~ in  
                      ( "col5"  
                        , "col6"  
                      )  
                  )  
    )  
  ;  
run ;
```

Changes to output

Table 14.2.1
Laboratory Results
Safety Population

Parameter = AST

	Group 1 (N = 10)		Group 2 (N = 8)	
	Observed Value	Change from Baseline	Observed Value	Change from Baseline
Baseline				
n	10	10	8	8
Mean (SD)	5.1 (4.01)	-0.4 (2.88)	5.4 (3.25)	1.6 (3.58)
Median	5.0	0.5	5.0	2.0
Q1, Q3	1.0, 9.0	-2.0, 2.0	3.5, 8.0	-1.0, 5.0
Min, Max	1, 10	-6, 3	0, 10	-4, 5
Month 1				
n	10	10	8	8
Mean (SD)	5.4 (2.41)	0.3 (5.17)	5.4 (2.77)	0.0 (4.31)
Median	5.0	-1.0	5.5	1.0
Q1, Q3	4.0, 7.0	-3.0, 3.0	4.0, 8.0	-1.5, 2.5
Min, Max	2, 9	-8, 8	0, 8	-9, 5
Month 2				

Very important text

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Table 14.2.1
Laboratory Results
Safety Population

Parameter = ALT

	Group 1 (N = 10)		Group 2 (N = 8)		All (N = 18)	
	Observed Value	Change from Baseline	Observed Value	Change from Baseline	Observed Value	Change from Baseline
Baseline						
n	10		8		18	
Mean (SD)	6.4 (2.17)		4.3 (1.83)		5.4 (2.25)	
Median	7.0		3.5		5.5	
Q1, Q3	5.0, 8.0		3.0, 5.0		3.0, 7.0	
Min, Max	3, 9		3, 8		3, 9	
Month 1						
n	9 ^A	9 ^A	8	8	17 ^C	17 ^B
Mean (SD)	5.7 (2.83)	-0.4 (3.36)	4.9 (1.81)	0.6 (2.92)	5.3 (2.37)	0.1 (3.11)
Median	6.0	-1.0	4.0	1.0	5.0	1.0
Q1, Q3	5.0, 8.0	-2.0, 1.0	4.0, 5.0	-1.0, 1.5	4.0, 6.0	-2.0, 1.0

Very important text

- ^A The following subject(s) have missing values: 001-01-0001
^B The following subject(s) have missing values: 001-01-0001
^C The following subject(s) have missing values: 001-01-0001
^D The following subject(s) have missing values: 001-01-0001

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Table 14.2.1
Laboratory Results
Safety Population

Parameter = AST

	Group 1 (N = 10)		Group 2 (N = 8)	
	Observed Value	Change from Baseline	Observed Value	Change from Baseline
n	10	10	8	8
Mean (SD)	5.5 (2.42)	0.4 (4.38)	5.1 (3.40)	-0.3 (4.40)
Median	5.5	0.0	5.0	-0.5
Q1, Q3	4.0, 7.0	-4.0, 5.0	2.5, 8.0	-2.5, 1.5
Min, Max	1, 9	-6, 6	0, 10	-7, 8

Very important text

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Table 14.2.1
Laboratory Results
Safety Population

Parameter = ALT

	Group 1 (N = 10)		Group 2 (N = 8)		All (N = 18)	
	Observed Value	Change from Baseline	Observed Value	Change from Baseline	Observed Value	Change from Baseline
Min, Max	1, 9	-5, 6	4, 9	-4, 6	1, 9	-5, 6
Month 2						
n	10	10	8	8	18	18
Mean (SD)	6.0 (2.40)	-0.4 (2.88)	5.9 (3.36)	1.6 (3.58)	5.9 (2.78)	0.5 (3.28)
Median	6.0	0.5	6.0	2.0	6.0	1.0
Q1, Q3	5.0, 8.0	-2.0, 2.0	4.0, 9.0	-1.0, 5.0	4.0, 8.0	-2.0, 3.0
Min, Max	1, 9	-6, 3	0, 9	-4, 5	0, 9	-6, 5

Very important text

- ^A The following subject(s) have missing values: 001-01-0001
^B The following subject(s) have missing values: 001-01-0001
^C The following subject(s) have missing values: 001-01-0001
^D The following subject(s) have missing values: 001-01-0001

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Contributions

- Automates creation of TLs while increasing **accuracy** and **traceability** in a manner that aids in **reusability** with **minimal changes** to the generating program code.
- Using the VALDS facilitates manual (spot) checking of the output, a penultimate task in approving and promoting a program.
- Addresses parsimony in directory audits/reconciliations when TL might have no qualifying observations.
- MAC R REPORT functions as a stand-alone product or a *program generating programs*.
- Enables programmers to create more standardized TL programs, resulting in fewer overall changes between updates (deliveries) or projects.

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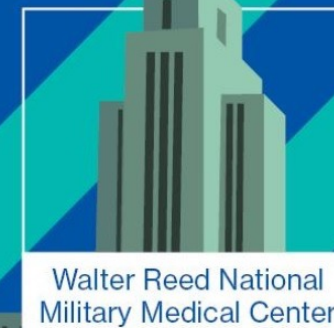


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