

Generating Simple and Complex Clinical Graphs using Efficient SAS/GRAPH ® Procedures

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- Introduction
- Statistical Graphics (SG) procedures - Power to do more
- Graph Template Language (GTL) - Sanity for SAS Graphics
- Delights for the day – Programming some selective simple and complex Clinical Graphs
- Conclusion

- The process of statistical interpretation and analysis of the clinical trial data can be made more effectively through graphical display of data along with descriptive and inferential statistics.
- In particular, variety of Clinical Graphs with different dimension of data visualization can be efficiently achieved through GTL and SG procedures.

"One graph is more effective than another if its quantitative information can be decoded more quickly and more easily by most observers." - Naomi Robbins (2005)

- ODS Graphics and the SG procedures introduces an exciting new way of producing graphs using SAS.
- With just a few lines of code, you can create a wide variety of high-quality graphs.
- Of the three major SG procedures (SGPLOT, SGPANEL, SGSCATTER), SGPLOT is the one that people will use most often.

- Incorporates many automatic features such as label-collision avoidance algorithms.
- Use state-of-the-art rendering technology with a wide choice of output possibilities.
- GTL is more verbose but highly structured and flexible.
- Although many of tasks can be accomplished using the SG procedures, those procedures do not provide many of the advanced layout capabilities of GTL.

- ✓ Kaplan-Meier Plot - Time to event analysis
- ✓ Line plot - Baseline and Post baseline by patient
- ✓ Water-fall plot - Percent change from baseline reporting
- ✓ Longitudinal plot - Mean (+/-) SD by treatment and visit
- ✓ Drug Exposure plot - by Treatment and RECIST Overall response
- ✓ Forest plot - Most frequent AE with Relative Risk

Basic Pre-requisites for any Graph

1. Be an architect of the Graph.
2. Identify x, y and group variable from the dataset.
3. Identify what are the plot statement are required to draw the Graph.
4. Choose the attributes linestyle/pattern, markersymbol and color for meaningful pictorial representation.
5. Decide the position of the legend and what exactly to be presented in legend.

Kaplan-Meier Plot - Time to event analysis

Well structured input dataset to plot K-M survival estimates for two treatment groups with minimum statistics presented.

	sta1	sta2	texttab	tmerisk	left	tmont1	surv1	cen1	tmont2	surv2	cen2
1	1	2	Time (months)	0	0	0	0	0	.	.	.
2	1	2	Time (months)	2	2	0.0329	0	0	.	.	.
3	1	2	Time (months)	4	4	0.0329	0	0	.	.	.
4	1	2	Time (months)	6	6	0.0329	0	0	.	.	.
5	1	2	Time (months)	8	8	0.0329	0	0	.	.	.
6	1	2	Time (months)	10	10	0.0329	0	0	.	.	.
7	1	2	Time (months)	12	12	0.0329	0	0	.	.	.
8	1	2	Time (months)	14	14	0.0329	0	0	.	.	.
9	1	2	Time (months)	16	16	0.3614	0.540541	.	.	.	.
10	1	2	Time (months)	18	18	0.46	3.243243	.	.	.	.
11	1	2	Time (months)	20	20	0.4928	20	.	.	.	.
12	1	2	Time (months)	22	22	0.4928	20	20	.	.	.
13	1	2	Time (months)	24	24	0.4928	20	20	.	.	.
14	1	2	Time (months)	26	26	0.5257	23.28767	.	.	.	.
15	1	2	Time (months)	28	28	0.5914	24.93151	.	.	.	.
16	1	2	Time (months)	30	30	0.6242	26.0274	.	.	.	.
17	1	2	Time (months)	32	32	0.9199	26.57534	.	.	.	.
18	1	2	Time (months)	34	34	0.9199	26.57534	26.575	.	.	.
19	1	2	Time (months)	36	36	0.9528	35.40838	.	.	.	.
20	1	2	Drug A	0	192	0.9528	35.40838	35.408	.	.	.
21	1	2	Drug A	2	83	0.9528	35.40838	35.408	.	.	.
22	1	2	Drug A	4	63	0.9856	36.53172	.	.	.	.
23	1	2	Drug A	6	47	0.9856	36.53172	36.532	.	.	.
24	1	2	Drug A	8	36	1.0185	37.0984	.	.	.	.
25	1	2	Drug A	10	30	1.0513	37.0984	37.098	.	.	.
26	1	2	Drug A	12	22	1.0842	37.67023	.	.	.	.
27	1	2	Drug A	14	17	1.117	38.24206	.	.	.	.
28	1	2	Drug A	16	13	1.1499	39.38573	.	.	.	.
29	1	2	Drug A	18	12	1.1828	39.38573	39.386	.	.	.
30	1	2	Drug A	20	10	1.577	39.96301	.	.	.	.
31	1	2	Drug A	22	8	1.8398	41.69484	.	.	.	.
32	1	2	Drug A	24	5	1.8727	45.7358	.	.	.	.
33	1	2	Drug A	26	4	1.8727	45.7358	45.736	.	.	.
34	1	2	Drug A	28	1	1.8727	45.7358	45.736	.	.	.
35	1	2	Drug A	30	1	1.8727	45.7358	45.736	.	.	.
36	1	2	Drug A	32	0	1.9055	46.33211	.	.	.	.
37	1	2	Drug A	34	0	1.9055	46.33211	46.332	.	.	.
38	1	2	Drug A	36	0	1.9055	46.33211	46.332	.	.	.
39	1	2	.	.	.	1.9384	46.33211	46.332	.	.	.
40	1	2	.	.	.	1.9713	48.18272	.	.	.	.
41	1	2	.	.	.	1.9713	48.18272	48.183	.	.	.
42	1	2	.	.	.	2.0698	48.80703	.	.	.	.
43	1	2	.	.	.	2.1684	49.43133	.	.	.	.

	sta1	sta2	texttab	tmerisk	left	tmont1	surv1	cen1	tmont2	surv2	cen2
119	1	2	Time (months)	0	0	0	0	0	.	.	.
120	1	2	Time (months)	2	2	.	0.0329	0	.	0	0
121	1	2	Time (months)	4	4	.	0.0329	0	.	0	0
122	1	2	Time (months)	6	6	.	0.0329	0	.	0	0
123	1	2	Time (months)	8	8	.	0.0329	0	.	0	0
124	1	2	Time (months)	10	10	.	0.0329	0	.	0	0
125	1	2	Time (months)	12	12	.	0.0329	0	.	0	0
126	1	2	Time (months)	14	14	.	0.0329	0	.	0	0
127	1	2	Time (months)	16	16	.	0.0329	0	.	0	0
128	1	2	Time (months)	18	18	.	0.46	0.541	.	.	.
129	1	2	Time (months)	20	20	.	0.4928	3.243	.	.	.
130	1	2	Time (months)	22	22	.	0.5257	3.784	.	.	.
131	1	2	Time (months)	24	24	.	0.5914	4.324	.	.	.
132	1	2	Time (months)	26	26	.	0.6242	5.405	.	.	.
133	1	2	Time (months)	28	28	.	0.8871	5.946	.	.	.
134	1	2	Time (months)	30	30	.	0.9199	7.027	.	.	.
135	1	2	Time (months)	32	32	.	0.9199	7.027	7.027	.	.
136	1	2	Time (months)	34	34	.	0.9528	9.746	.	.	.
137	1	2	Time (months)	36	36	.	0.9528	9.746	9.746	.	.
138	1	2	Placebo	0	193	.	0.9528	9.746	9.746	.	.
139	1	2	Placebo	2	143	.	0.9528	9.746	9.746	.	.
140	1	2	Placebo	4	107	.	0.9528	9.746	9.746	.	.
141	1	2	Placebo	6	81	.	0.9856	10.3	.	.	.
142	1	2	Placebo	8	73	.	0.9856	10.3	10.3	.	.
143	1	2	Placebo	10	58	.	0.9856	10.3	10.3	.	.
144	1	2	Placebo	12	44	.	1.2813	10.87	.	.	.
145	1	2	Placebo	14	38	.	1.6756	10.87	10.87	.	.
146	1	2	Placebo	16	32	.	1.8398	11.43	.	.	.
147	1	2	Placebo	18	29	.	1.8398	11.43	11.43	.	.
148	1	2	Placebo	20	25	.	1.8398	11.43	11.43	.	.
149	1	2	Placebo	22	21	.	1.8398	11.43	11.43	.	.
150	1	2	Placebo	24	17	.	1.8727	13.17	.	.	.
151	1	2	Placebo	26	12	.	1.8727	13.17	13.17	.	.
152	1	2	Placebo	28	6	.	1.8727	13.17	13.17	.	.
153	1	2	Placebo	30	3	.	1.9055	13.17	13.17	.	.
154	1	2	Placebo	32	2	.	1.9384	13.17	13.17	.	.
155	1	2	Placebo	34	2	.	1.9713	14.36	.	.	.
156	1	2	Placebo	36	0	.	1.9713	14.36	14.36	.	.
157	1	2	.	.	.	.	2.0698	14.96	.	.	.
158	1	2	.	.	.	.	2.1027	14.96	14.96	.	.
159	1	2	.	.	.	.	2.1684	14.96	14.96	.	.
160	1	2	.	.	.	.	2.5298	14.96	14.96	.	.
161	1	2	.	.	.	.	2.7269	14.96	14.96	.	.
162	1	2	.	.	.	.	2.7598	15.58	.	.	.
163	1	2	.	.	.	.	2.7598	15.58	15.58	.	.
164	1	2	.	.	.	.	2.7598	15.58	15.58	.	.
165	1	2	.	.	.	.	2.7926	18.08	.	.	.

K-M plot – SAS Code to create Template

```
proc template;
define statgraph kmplot;
  BeginGraph / border=false pad=0 designwidth=26.0cm designheight=17.5cm ;

  /*--- To plot titles and footnotes ---*/
  entrytitle halign=left "XYZ123 CSR";
  entrytitle HALIGN = left " ";
  entrytitle HALIGN = center "Figure 14.3-2.2 (Page 1 of 1)";
  entrytitle HALIGN = center "Time to first occurrence of new or worsening Hyperglycemic events, by treatment";
  entrytitle HALIGN = center "Safety Set";
  entrytitle HALIGN = center " ";
  entryfootnote HALIGN = left " ";
  entryfootnote HALIGN = left "- n represents the number of patients in the population with an uncensored event.";
  entryfootnote HALIGN = left "- Only patients with available baseline are included.";
  entryfootnote HALIGN = left " ";
  entryfootnote HALIGN = left "XYZ123/report/pgm_saf/&pgmname..sas" halign=right "Version 1.0";

  /*--- To plot censored symbols and text as legend ---*/
  legenditem type=marker name="a_marker"/markerattrs=(color=green symbol=squarefilled) lineattrs=(color=green pattern = 1);
  legenditem type=marker name="p_marker"/markerattrs=(color=blue symbol=triangledownfilled)lineattrs=(color=blue pattern = 34);
  legenditem type=text name="indic" / text="Censoring Times" ;

  layout lattice/rows=2 columns=1 columndatarange=unionall rowweights=(.86 .14);
  layout overlay / xaxisopts=(label= "Time (months)" offsetmin=0 linearopts= (tickvaluepriority=true
  tickvaluelist=(0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36)))
  yaxisopts=(label="Probability (%) of event" linearopts=(viewmin=0 viewmax=100));
  stepplot y=Surv1 x=tmont1/group=sta1 lineattrs = graphdatal(pattern = 1 color=green thickness=2) name="Survival1" ;
  scatterplot y=CEN1 x=tmont1/group=sta1 markerattrs=(symbol=squarefilled color=Green) legendlabel="q1" name="SCATTER1";
  stepplot y=Surv2 x=tmont2/group=sta2 lineattrs = graphdata2(pattern = 34 color=blue thickness=1) name="Survival2" ;
  scatterplot y=CEN2 x=tmont2/group=sta2 markerattrs=(symbol=triangledownfilled color=Blue) legendlabel="q1" name="SCATTER2";
  discretelegend "a_marker" "p_marker" "indic"/across=3 halign=right valign=0.3 autoitemsiz=True location=inside border=false;
  discretelegend "Survival1" "SCATTER1" / merge=true halign=right valign=0.25 autoitemsiz=True location=inside border= false;
  discretelegend "Survival2" "SCATTER2" / merge=true halign=right valign=0.2 autoitemsiz=True location=inside border= false;
  layout gridded/columns=1 border=false autoalign=(BottomRight);
  entry halign=left " ";
  entry halign=left "Kaplan-Meier medians";
  entry halign=left " Drug A: &medin1. months";
  entry halign=left "Placebo: &medin2. months";
  endlayout;
endlayout;

/*--- Table below the graph ---*/
cell;
layout overlay / border=false walldisplay=none xaxisopts=(display=none linearopts=(viewmax=36
  tickvaluesequence=(start=0 end=36 increment=2))) yaxisopts=(display=(tickvalues) type=discrete reverse=true);
  scatterplot x=timerisk y=texttab / markercharacter=left markercharacterattrs=GraphDataText;
endlayout;
cellheader;
  entry halign=left "No. of patients still at risk";
endcellheader;
endcell;
endlayout;

EndGraph;
end;
quit;
run;

options orientation=landscape papersize='ISO A4' nodate nonumber nobylines;
ods pdf file="XYZ123/report/safety/KM2_TTOHYPE.pdf" style=graph dpi=300;
ods listing close; /* Avoid .PNG creation in home drive*/
proc sgrender data=kml_ids template=kmplot;
run;
ods listing;
ods pdf close;
```

K-M plot

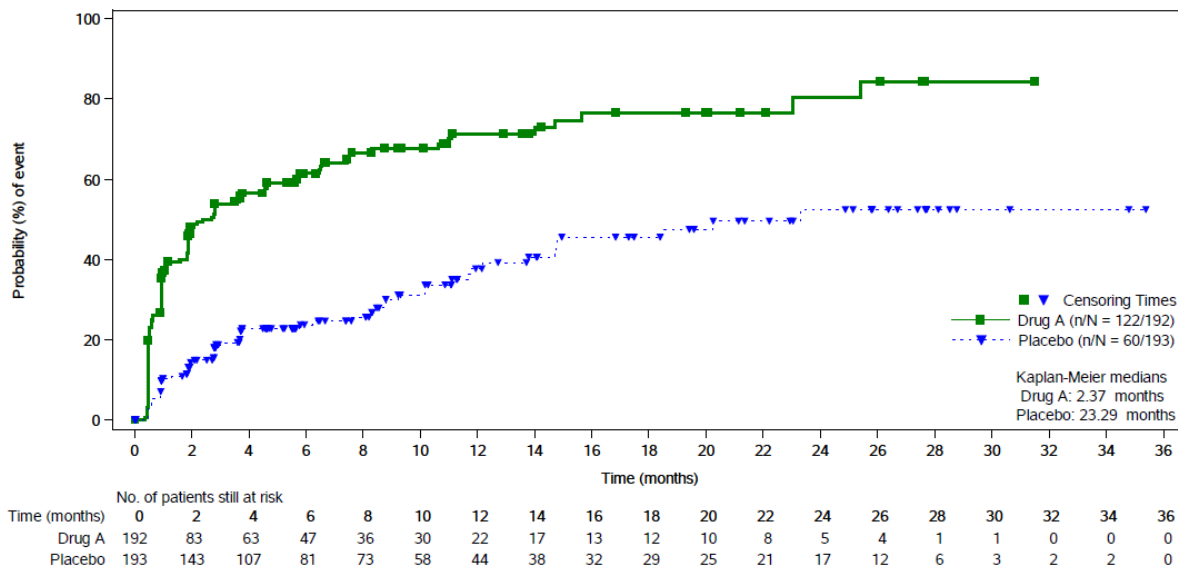
```

proc templat_ /*--- Table below the graph ---*/
cell;
layout lattilayout overlay / border=false walldisplay=none xaxisopts=(display=none linearopts=(viewmax=36
layout overl tickvaluesequence=(start=0 end=36 increment=2)) yaxisopts=(display=(tickvalues) type=discrete reverse=true);
tickvalue scatterplot x=timerrisk y=textttab / markercharacter=left markercharacterattrs=GraphDataText;
endlayout; 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36));
yaxisocellheader; l="Probability (%) of event" linearopts=(viewmin=0 viewmax=100));
steppl entry haligh=left "No. of patients still at risk"; graphdata1(pattern = 1 color=green thickness=2) name="Survival1" ;
scatteendcellheader; x=tmont1/group=sta1 markerattrs=(symbol=squarefilled color=Green) legendlabel="q1" name="SCATTER1";
stepplendcell; n=2 x=tmont2/group=sta2 lineattrs = graphdata2(pattern = 34 color=blue thickness=1) name="Survival2" ;
endlayout; scatterplot y=CEN2 x=tmont2/group=sta2 markerattrs=(symbol=triangledownfilled color=Blue) legendlabel="q1" name="SCATTER2";
discreteleEndGraph; marker "p_marker" "indic"/across=3 haligh=right valign=0.3 autoitemsz=True location=inside border=false;
discreteleend; "Survival1" "SCATTER1" / merge=true haligh=right valign=0.25 autoitemsz=True location=inside border= false;
discretelequit; "Survival2" "SCATTER2" / merge=true haligh=right valign=0.2 autoitemsz=True location=inside border= false;
layout gridded/columns=1 border=false autoalign=(BottomRight);
entry options orientation=landscape papersize='ISO A4' nocode nonumber nobylne;
entry ods pdf file="CXYZ123/report/safety/KM2_TTOHYPE.pdf" style=graph dpi=300;=right "Version 1.0";
entry ods listing close; /* Avoid .PNG creation in home drive*/
entry proc sgrender data=kml_ids template=kmplot;S";-*/
entry run;ign=left "Placebo: &medin2. months"; (color=green symbol=squarefilled) lineattrs=(color=green pattern = 1);
endlayout; ods listing;ker name="p_marker"/markerattrs=(color=blue symbol=triangledownfilled)lineattrs=(color=blue pattern = 34);
endlayout; ItCm type=cont; name="indic" / text="Censoring Times" ;

```

CXYZ123 CSR

Figure 14.3-2.2 (Page 1 of 1)
Time to first occurrence of new or worsening Hyperglycemic events, by treatment
Safety Set



- n represents the number of patients in the population with an uncensored event.
- Only patients with available baseline are included.

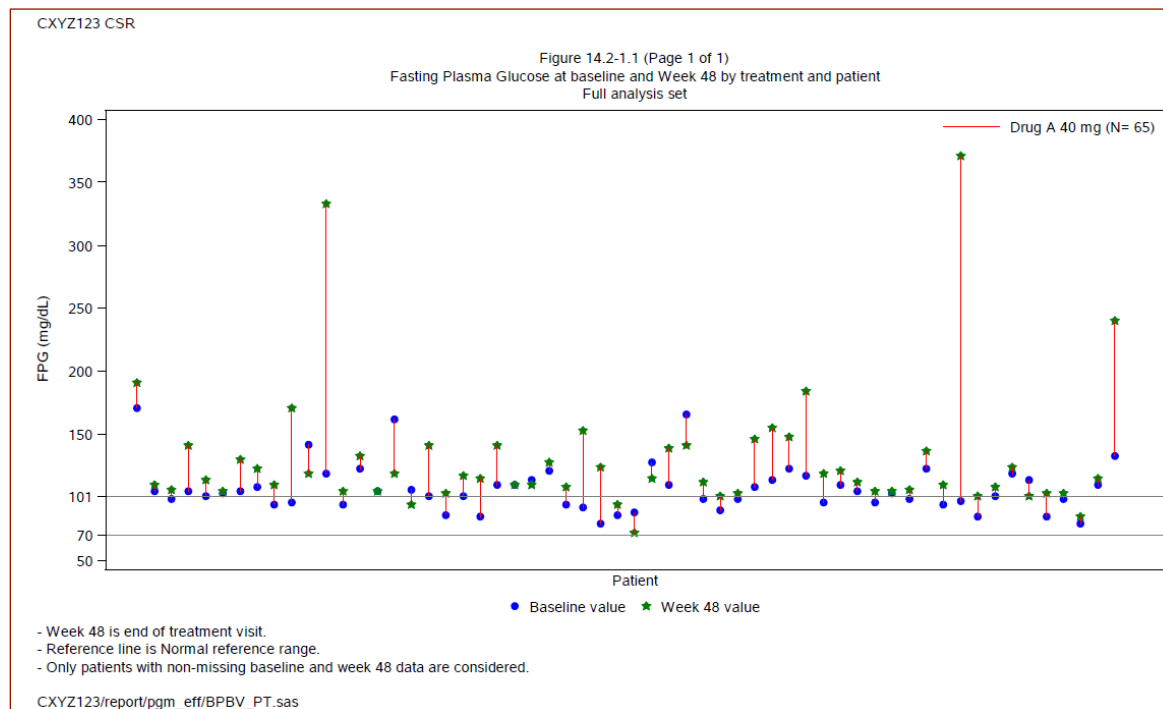
CXYZ123/report/pgm_saf/KM2_TTOHYPE.sas

Version 1.0

Line plot - Baseline and Post baseline by patient

```
/*--- To plot titles and footnotes ---*/
title1 j=1 "CXYZ123 CSR" f="arial" h=9pt;
title2 " ";
title3 "Figure 14.2-1.1 (Page 1 of 1)" j=c f="arial" h=9pt;
title4 "Fasting Plasma Glucose at baseline and Week 48 by treatment and patient" j=c f="arial" h=9pt;
title5 "Full analysis set" j=c f="arial" h=9pt;
footnote1 j=1 "- Week 48 is end of treatment visit." f="arial" h=9pt;
footnote2 j=1 "- Reference line is Normal reference range." f="arial" h=9pt;
footnote3 j=1 "- Only patients with non-missing baseline and week 48 data are considered." f="arial" h=9pt;
footnote4 j=1 " " f="arial" h=9pt;
footnote5 j=1 "CXYZ123/report/pgm_eff/&pgmname..sas" f="arial" h=9pt;

ods graphics on / noborder width=28.0cm height=17.5cm ANTIALLIASEMAX=2000 maxlegendarea=10;
options device=sasemf ;
options orientation=landscape papersize='ISO A4' nodate nonumber nobylines ;
ods pdf file CXYZ123/report/efficacy/BPBV_PT.pdf" style=graph dpi=300 ;
ods listing close; /*To avoid .png creation at home drive */
proc sgplot data=final ;
  yaxis type=linear min = 50 max = 400 values=(50 70 101 150 200 250 300 350 400) label = "FPG (mg/dL)" ;
  xaxis display = (novalues noticks) ;
  scatter x=pat y=bas/legendlabel = "Baseline value" name="abas" markerattrs = (color=BLUE symbol=circlefilled) ;
  scatter x=pat y=wk48/legendlabel = "Week 48 value" name="bbas" markerattrs = (color=GREEN symbol=starfilled);
  highlow x = pat high = bas low = wk48 / group = trtn lineattrs=( pattern=1) name="tbas" fillattrs = (color=Red);
  keylegend "abas" "bbas" / across = 2 noborder location=outside ;
  keylegend "tbas" / across = 1 noborder location=inside position=topright;
  refline 70 101/ axis = Y ; /* To draw reference line for normal reference range */
run;
ods listing;
ods pdf close;
ods graphics off;
```



	PAT	TRTN	BAS	WK48
1	1	1	171	191
2	2	1	105	110
3	3	1	99	106
4	4	1	105	141
5	5	1	101	114
6	6	1	103	105
7	7	1	105	130
8	8	1	108	123
9	9	1	94	110
10	10	1	96	171
11	11	1	142	119
12	12	1	119	333
13	13	1	94	105
14	14	1	123	133
15	15	1	105	105
16	16	1	162	119
17	17	1	106	94
18	18	1	101	141
19	19	1	86	103
20	20	1	101	117
21	21	1	85	115
22	22	1	110	141
23	23	1	110	110
24	24	1	114	110
25	25	1	121	128
26	26	1	94	108
27	27	1	92	153
28	28	1	79	124
29	29	1	86	94
30	30	1	88	72
31	31	1	128	115
32	32	1	110	139
33	33	1	166	141
34	34	1	99	112
35	35	1	90	101
36	36	1	99	103
37	37	1	108	146
38	38	1	114	155
39	39	1	123	148
40	40	1	117	184

Water-fall plot - Percent change from baseline reporting

Well structured input dataset to generate Water-fall plot by treatment groups and responders with minimum statistics presented.

	ORD	VAL1	VAL1R	RESP1	VAL2	VAL2R	RESP2	VAL3	VAL3R	RESP3
1	1	19.440746	21.44075	0	14.48276	16.4828	0	29.507	31.507	0
2	2	14.285714	16.28571	0	11.55015	13.5502	1	14.107	16.107	0
3	3	11.764706	13.76471	1	11.34752	13.3475	0	12.063	14.063	0
4	4	10.727612	12.72761	0	8.683473	10.6835	0	11.412	13.412	0
5	5	6.6666667	8.666667	0	8.333333	10.3333	0	11.236	13.236	0
6	6	5.0847458	7.084746	0	6.153846	8.15385	0	8.2143	10.214	0
7	7	4.5883941	6.588394	0	5.660377	7.66038	0	7.2243	9.2243	0
8	8	1.1851016	3.185102	0	5.479452	7.47945	0	7.1429	9.1429	0
9	9	-0.571429	-2.57143	0	5.343511	7.34351	0	6.8966	8.8966	0
10	10	-1.520913	-3.52091	0	3.448276	5.44828	0	6	8	0
11	11	-3.025065	-5.02506	0	2.287582	4.28758	0	3.6765	5.6765	0
12	12	-3.26087	-5.26087	0	0	2	1	3.6649	5.6649	0
13	13	-3.405018	-5.40502	0	0	2	0	2.9851	4.9851	0
14	14	-3.846154	-5.84615	1	-1.24224	-3.2422	0	2.4242	4.4242	0
15	15	-4.230769	-6.23077	0	-1.82371	-3.8237	0	2.2222	4.2222	0
16	16	-5.717762	-7.71776	0	-1.97368	-3.9737	0	2	4	0
17	17	-6.17284	-8.17284	0	-4.69613	-6.6961	1	1.7857	3.7857	0
18	18	-6.923077	-8.92308	0	-4.81928	-6.8193	0	0.3003	2.3003	0
19	19	-8.059701	-10.0597	0	-6.25	-8.25	1	0	2	0
20	20	-8.108108	-10.1081	0	-6.28272	-8.2827	0	0	2	0
21	21	-10.34483	-12.3448	0	-7.5383	-9.5383	0	-1.63	-3.63	0
22	22	-10.44487	-12.4449	0	-8.59978	-10.6	0	-3.061	-5.061	0
23	23	-11.11111	-13.1111	0	-10.8434	-12.843	0	-4.255	-6.255	0
24	24	-12.5	-14.5	1	-11.2676	-13.268	0	-5.128	-7.128	0
25	25	-20	-22	0	-13.3333	-15.333	0	-5.607	-7.607	0
26	26	-21.46893	-23.4689	0	-15.0376	-17.038	1	-6.392	-8.392	0
27	27	-23.25581	-25.2558	0	-15.8416	-17.842	0	-6.452	-8.452	0
28	28	-23.50487	-25.5049	0	-18.75	-20.75	1	-7	-9	0
29	29	-23.52941	-25.5294	1	-20.4783	-22.478	0	-7.778	-9.778	0
30	30	-24.92432	-26.9243	0	-25	-27	0	-9.091	-11.09	0
31	31	-25.60647	-27.6065	1	-26.0116	-28.012	0	-12.5	-14.5	0
32	32	-25.60976	-27.6098	0	-28.9474	-30.947	0	-13.35	-15.35	0
33	33	-28.28729	-30.2873	0	-29.8507	-31.851	0	-13.89	-15.89	0
34	34	-29.36508	-31.3651	0	-30.4239	-32.424	0	-20.3	-22.3	0
35	35	-30.76923	-32.7692	1	-35.6164	-37.616	1	-23.88	-25.88	0
36	36	-31.05882	-33.0588	0	-41.0853	-43.085	0	-65.87	-67.87	0
37	37	-34.24658	-36.2466	0	-66.6667	-68.667	0	.	.	.
38	38	-35.3914	-37.3914	0	.	.	.	.	.	.
39	39	-37.9562	-39.9562	0	.	.	.	.	.	.
40	40	-44.14414	-46.1441	0	.	.	.	.	.	.
41	41	-45.00537	-47.0054	0	.	.	.	.	.	.
42	42	-74.54545	-76.5455	0	.	.	.	.	.	.

Water-fall plot – SAS Code to create Template

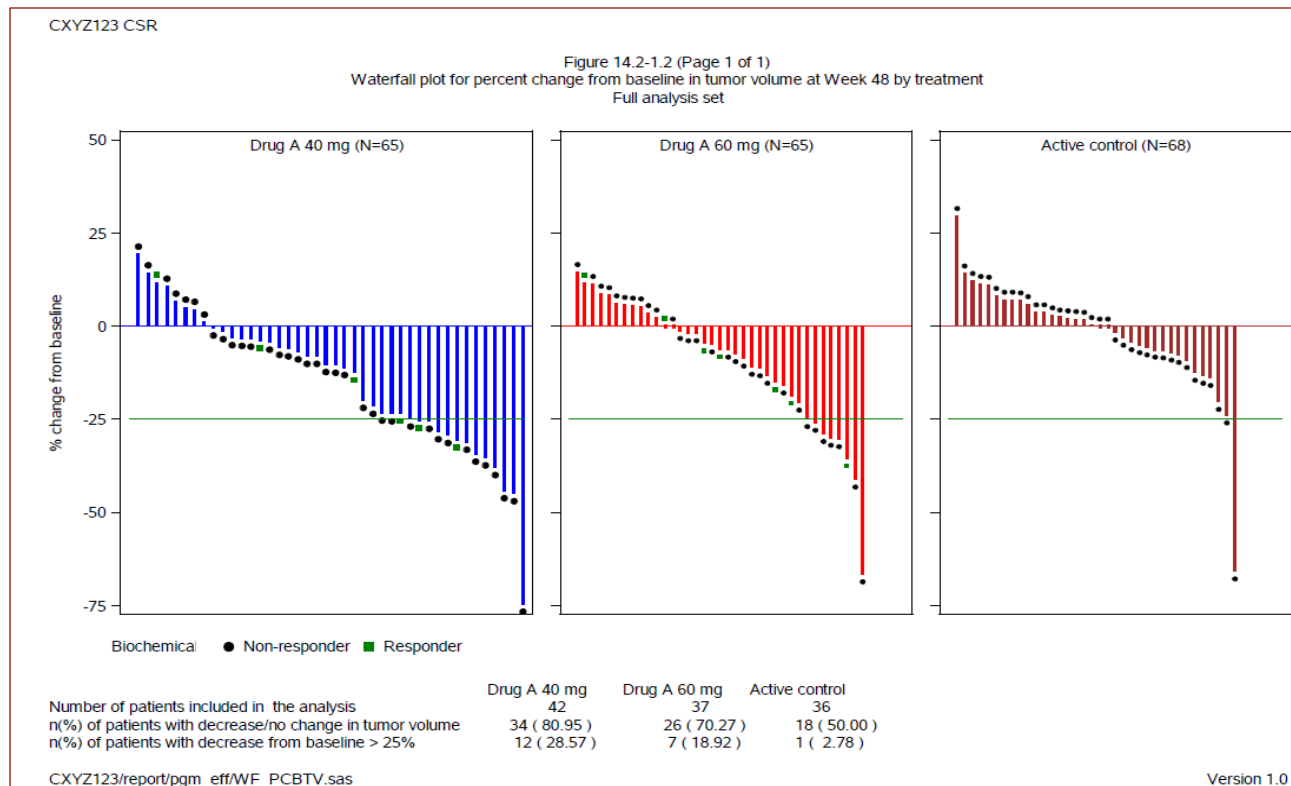
```
*%macro create_wfplot;
proc template;
  define style graph; /*--- Attributes for grouping variable ---*/
    parent=styles.rtf;
    style GraphData1 from GraphData1/MarkerSymbol = "CircleFilled" contrastcolor = Black;
    style GraphData2 from GraphData2/MarkerSymbol = "SquareFilled" contrastcolor = Green;
  end;
  define statgraph wfplot;
    begingraph / border=false pad=0 designwidth=26.0cm designheight=17.5cm;
    entrytitle halign=left "CXYZ123 CSR"; /*--- Getting titles and footnotes ---*/
    entrytitle HALIGN = left " ";
    entrytitle HALIGN = center "Figure 14.2-1.2 (Page 1 of 1)";
    entrytitle HALIGN = center "Waterfall plot for percent change from baseline in tumor volume at Week 48 by treatment";
    entrytitle HALIGN = center "Full analysis set";
    entrytitle HALIGN = center " ";
    entryfootnote "&label_trt1. &label_trt2. &label_trt3.";
    entryfootnote HALIGN = left "Number of patients included in the analysis &trtot1. &trtot2. &trtot3.";
    entryfootnote HALIGN = left "n(%) of patients with decrease/no change in tumor volume &trtdecr1. &trtdecr2. &trtdecr3.";
    entryfootnote HALIGN = left "n(%) of patients with decrease from baseline > 25% &trtincl1. &trtincl2. &trtincl3.";
    entryfootnote HALIGN = left " ";
    entryfootnote HALIGN = left "CXYZ123/report/pgm_eff/&pgmname..sas" halign=right "Version 1.0" ;
    /*--- Plotting percentage change for each treatment group with differing attributes/colors ---*/
    layout lattice / rows=2 columns=3 columnweights=(0.40 0.30 0.30) columnngutter=10 border=false rowweights=(0.9 0.1);
    %do i=1 %to &nbtrt.;
      layout overlay / yaxisopts=(label= "&label_axis." type=linear linearopts=(viewmin=-75 viewmax=50)
        display=(line ticks %if &i. eq 1 %then tickvalues label;)) xaxisopts=(display=(line)) border=false;
      %if &i. eq 1 %then %do;
        needleplot X=ord Y=val1 / baselineintercept=0 lineattrs=(color=blue thickness=2);
        scatterplot x=ord y= val1r / primary=true group=resp1 name="S1";
        LINEPARM X = 0 Y = -25 SLOPE = 0 / LINEATTRS = (PATTERN = solid color=green thickness=1);
      %end;
      %if &i. eq 2 %then %do;
        needleplot X=ord Y=val2 / baselineintercept=0 lineattrs=(color=red thickness=2);
        scatterplot x=ord y= val2r / primary=true group=resp2 name="S2";
        LINEPARM X = 0 Y = -25 SLOPE = 0 / LINEATTRS = (PATTERN = solid color=green thickness=1);
      %end;
      %if &i. eq 3 %then %do;
        needleplot X=ord Y=val3 / baselineintercept=0 lineattrs=(color=brown thickness=2);
        scatterplot x=ord y= val3r / primary=true group=resp3 name="S3";
        LINEPARM X = 0 Y = -25 SLOPE = 0 / LINEATTRS = (PATTERN = solid color=green thickness=1);
      %end;
      entry "&&label_graph&i.." / valign=top textattrs=GraphLabelText;
    endlayout;
    %end;
    DiscreteLegend "S1" "S2" "S3"/ merge=true title="Biochemical" location=outside border=false autoitemsiz= True across=3;
  endlayout;
endgraph;
end;
run;
```

Water-fall plot

```

* /--- Plotting percentage change for each treatment group with differing attributes/colors ---*/
p layout lattice / rows=2 columns=3 columnweights=(0.40 0.30 0.30) columngutter=10 border=false rowweights=(0.9 0.1);
%do_i=1 %to &nbrtrt.;--- Attributes for grouping variable ---*/
  layout overlay / yaxisopts=(label= "&label_axis." type=linear linearopts=(viewmin=-75 viewmax=50)
    display=(line ticks %if &i. eq 1 %then tickvalues label;)) xaxisopts=(display=(line)) border=false;
  %if &i. eq 1 %then %do;
    needleplot X=ord Y=vall / baselineintercept=0 lineattrs=(color=blue thickness=2);
    options orientation=landscape papersize='ISO A4' nodate nonumber nobyline;
    ods pdf file="XYZ123/report/efficacy/WF_PCBTV.pdf" style=graph dpi=300;
  %end;
  ods listing close; * Avoid .PNG creation in home drive;
  proc sgrender data=wf_ids template=wfplot; r=red thickness=2;
  terplot x=ord y= valz / primary=true group=respz name="S2";
  run; NEPARM X = 0 Y = -25 SLOPE = 0 / LINEATTRS = (PATTERN = solid color=green thickness=1); Week 48 by treatment";
  ods listing; ter "Full analysis set";
  %ods pdf close;; " ";
  %mend create wfplot; r / primary=true group=resp3 name="S3"; is &trtot1. &trtot2. &trtot3.";
  LINEPARM X = 0 Y = -25 SLOPE = 0 / LINEATTRS = (PATTERN = solid color=green thickness=1); 1. &trtdecr2. &trtdecr3.";
  %er;
  %*create wfplot; n(%) of patients with decrease from baseline > 25% &trtincr1. &trtincr2. &trtincr3.";
  er;
  endlayout;
  %end;
  DiscreteLegend "S1" "S2" "S3" / merge=true title="Biochemical" location=outside border=false autoitemsiz= True across=3;
endlayout;
endgraph;
end;
run;

```



Longitudinal plot – SAS code to create Template

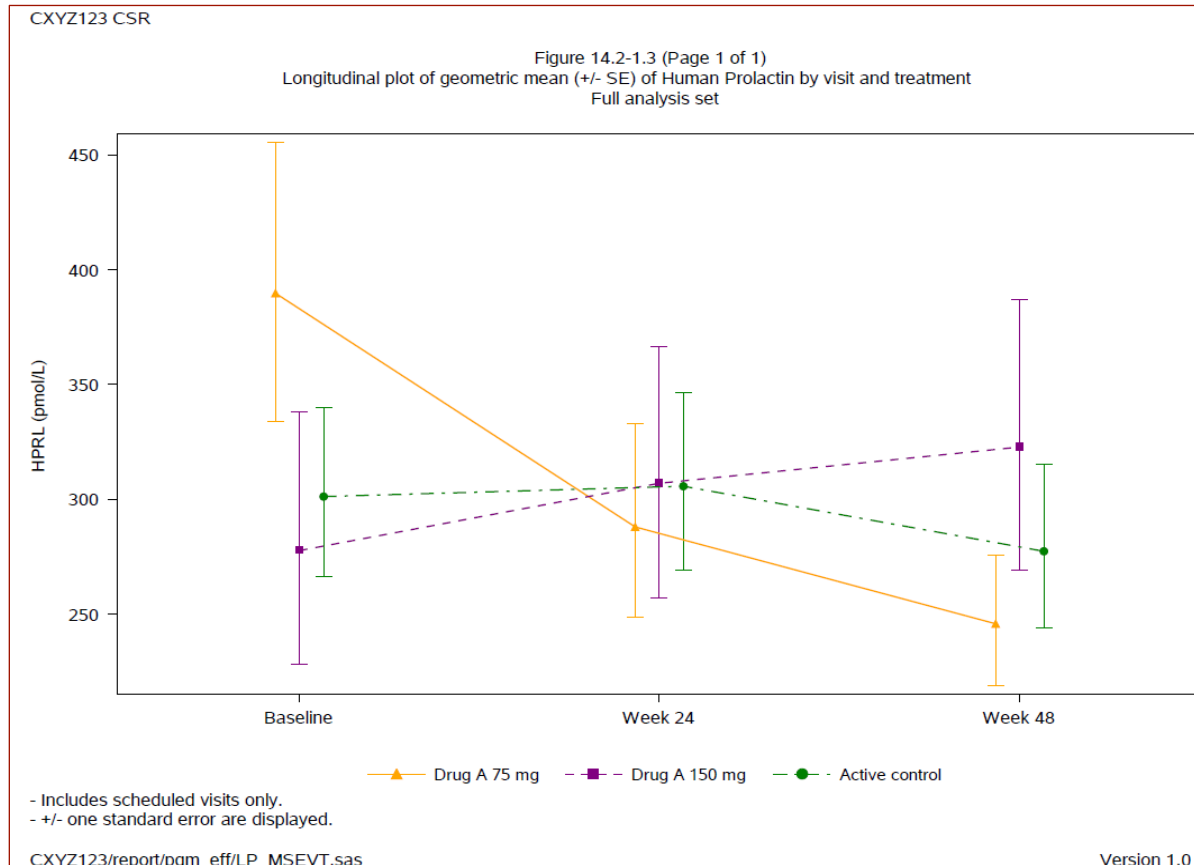
```
proc template ;
define style Styles.MyDefault;
  parent=rtf_temp; /*--- Attributes for grouping variable ---*/
  style GraphData1 from GraphData1 / contrastcolor=Orange markersymbol="TRIANGLEFILLED" LineStyle=1;
  style GraphData2 from GraphData2 / contrastcolor=Purple markersymbol="SQUAREFILLED" LineStyle=2;
  style GraphData3 from GraphData3 / contrastcolor=Green markersymbol="CIRCLEFILLED" LineStyle=41;
end;
define statgraph longplot;
  begingraph/border=false pad=0 designwidth=26.0cm designheight=20.0cm;
  entrytitle halign=left "CXYZ123 CSR"; /*--- To plot titles and footnotes ---*/
  entrytitle HALIGN = left " ";
  entrytitle HALIGN = center "Figure 14.2-1.3 (Page 1 of 1)";
  entrytitle HALIGN = center "Longitudinal plot of geometric mean (+/- SE) of Human Prolactin by visit and treatment";
  entrytitle HALIGN = center "Full analysis set";
  entrytitle HALIGN = center " ";
  entryfootnote HALIGN = left "- Includes scheduled visits only.";
  entryfootnote HALIGN = left "- +/- one standard error are displayed.";
  entryfootnote HALIGN = left " ";
  entryfootnote HALIGN = left "CXYZ123/report/pgm_eff/&pgmname..sas" halign=right "Version 1.0" ;

  /*--- To plot data by visit and treatment ---*/
  layout overlay/ xaxisopts=( label = " " type=discrete discreteopts=(tickvaluelist=('0' '1' '2')
    tickdisplaylist=('Baseline' 'Week 24' 'Week 48')) display=(line ticks tickvalues label))
  yaxisopts=(label="HPRL (pmol/L)" display=(ticks tickvalues label));
  scatterplot x=vis2n y= gmean1 / primary=true group=trtn yerrorupper=uprcl yerrorlower=lwrcl groupdisplay=cluster
  clusterwidth=0.2 name="SCATTER" MARKERATTRS=( color=MyDefaultColor:contrastcolor);
  seriesplot x=vis2n y= gmean1 / group=trtn name="SERIES" groupdisplay=cluster clusterwidth=0.2
  LINEATTRS=(color=MyDefaultColor:contrastcolor);
  Discretelegend "SCATTER" "SERIES" / merge=true location=outside border=false autoitemsiz=3;
endlayout;
endgraph;
end;
quit;
run;
options orientation=landscape papersize='ISO A4' nodate nonumber nobylines;
ods pdf file="CXYZ123/report/efficacy/LP_MSEVT.pdf" style=MyDefault dpi=300;
ods listing close; * Avoid .PNG creation in home drive;
proc sgrender data=lp_ids template=longplot;
run;
ods listing;
ods pdf close;
```

	TRTN	VIS2N	GMEAN1	LWRCL	UPRCL
1	1	0	389.87766938	333.68891088	455.52786481
2	1	1	287.90927782	248.84713515	333.10310044
3	1	2	245.80805439	219.00567452	275.89056646
4	2	0	277.73941797	228.05547678	338.24745357
5	2	1	307.09772259	257.16527703	366.72529165
6	2	2	322.78756838	269.2447519	386.97806947
7	3	0	301.04895565	266.382161	340.22726357
8	3	1	305.57425283	269.29625273	346.73941076
9	3	2	277.34563374	244.00814825	315.23783574

Longitudinal plot

```
proc te      /*--- To plot data by visit and treatment ---*/
define      layout overlay/ axisopts=( label = " " type=discrete discreteopts=(tickvaluelist=('0' '1' '2' )
pa          tickdisplaylist=('Baseline' 'Week 24' 'Week 48')) display=(line ticks tickvalues label))
style       yaxisopts=(label="HPRL (pmol/L)" display=(ticks tickvalues label));3LEFILLED" LineStyle=1;
style       scatterplot x=vis2n y= gmean1 / primary=true group=trtn yerrorupper=uprcl yerrorlower=lwrcl groupdisplay=cluster
style       clusterwidth=0.2 name="SCATTER" MARKERATTRS=( color=MyDefaultColor:contrastcolor);e=41;
end;        seriesplot x=vis2n y= gmean1 / group=trtn name="SERIES" groupdisplay=cluster clusterwidth=0.2
define      LINEATTRS=(color=MyDefaultColor:contrastcolor);
begin      Discretelegend "SCATTER" "SERIES" / merge=true location=outside border=false autoitemsiz=3;
ent        endlayout;
ent        endgraph;
ent        title HALIGN = center "Figure 14.2-1.3 (Page 1 of 1)";
ent        title HALIGN = center "Longitudinal plot of geometric mean (+/- SE) of Human Prolactin by visit and treatment";
ent        title HALIGN = center "Full analysis set";
ent        title HALIGN = center " "
ent        options orientation=landscape papersize='ISO A4' nodate nonumber nobylines;
ent        ods pdf file="CXYZ123/report/efficacy/LP_MSEVT.pdf" style=MyDefault dpi=300;
ent        ods listing close; * Avoid .PNG creation in home drive;
ent        proc sgrender data=lp_ids template=longplot;
ent        ods listing;
ent        ods pdf close;
```



Drug Exposure plot with RECIST Overall response

Well structured input dataset to plot drug exposure with RECIST overall response by treatment groups.

pat	dewks	cr	pr	sd	pd	uk	ongday	tdd1a
14	6.28571	.	.	.	.	.	.	60mg + 1.5mg
14	6.42857	.	.	.	.	.	.	60mg + 1.5mg
14	6.57143	.	.	.	.	.	.	60mg + 1.5mg
14	6.71429	.	.	.	.	.	.	60mg + 1.5mg
14	6.85714	.	.	.	.	.	.	60mg + 1.5mg
14	7	.	.	.	.	.	.	.
14	7.14286	.	.	.	.	.	.	.
14	7.28571	.	.	.	.	.	.	.
14	7.42857	.	.	.	.	.	.	.
14	7.57143	.	7.57143	.	.	.	.	.
14	7.57143	.	7.57143	.	.	.	.	60mg + 0.5mg
14	7.57143	.	7.57143	.	.	.	.	60mg + 1mg
14	7.57143	.	7.57143	.	.	.	.	60mg + 1.5mg
14	7.71429	.	.	.	.	.	.	60mg + 1mg
14	7.85714	.	.	.	.	.	.	60mg + 1mg
14	8	.	.	.	.	.	.	60mg + 1mg
14	8.14286	.	.	.	.	.	.	60mg + 1mg
14	8.28571	.	.	.	.	.	.	60mg + 1mg
14	8.42857	.	.	.	.	.	.	60mg + 1mg
14	8.57143	.	.	.	.	.	.	60mg + 1mg
14	8.71429	.	.	.	.	.	.	60mg + 1mg
14	8.85714	.	.	.	.	.	.	60mg + 1mg
14	9	.	.	.	.	.	.	60mg + 1mg
14	9.14286	.	.	.	.	.	.	60mg + 1mg
14	9.28571	.	.	.	.	.	.	60mg + 1mg
14	9.42857	.	.	.	.	.	.	60mg + 1mg
14	9.57143	.	.	.	.	.	.	60mg + 1mg
14	9.71429	.	.	.	.	.	.	60mg + 1mg
14	9.85714	.	.	.	.	.	.	60mg + 1mg
14	10	.	.	.	.	.	.	60mg + 1mg
14	10.1429	.	.	.	.	.	.	60mg + 1mg
14	10.2857	.	.	.	.	.	.	60mg + 1mg
14	10.4286	.	.	.	.	.	.	60mg + 1mg
14	10.5714	.	.	.	.	.	.	60mg + 1mg
14	10.7143	.	.	.	.	.	.	60mg + 1mg
14	10.8571	.	.	.	.	.	.	60mg + 1mg
14	11	.	.	.	.	.	.	60mg + 1mg
14	11.1429	.	.	.	.	.	.	60mg + 1mg
14	11.2857	.	.	.	.	.	.	60mg + 1mg
14	11.4286	.	.	.	.	.	.	60mg + 1mg
14	11.5714	.	.	.	.	.	.	60mg + 1mg
14	11.7143	.	.	.	.	.	.	60mg + 1mg
14	11.8571	.	11.8571	.	.	.	.	.
14	11.8571	.	11.8571	.	.	.	.	60mg + 0.5mg
14	11.8571	.	11.8571	.	.	.	.	60mg + 1mg
14	11.8571	.	11.8571	.	.	.	.	60mg + 1.5mg
14	12	.	.	.	.	.	.	60mg + 1mg
14	12.1429	.	.	.	.	.	.	60mg + 1mg

Drug Exposure plot – SAS code to create Template

```
proc template;
  define statgraph DEPLOT;
    begingraph/border = false designwidth=25.0cm designheight=17.0cm;
    entrytitle halign=left "CXYZ123 CSR"; /*--- To plot titles and footnotes ---*/
    entrytitle HALIGN = left " ";
    entrytitle HALIGN = center "Figure 14.3-2.3 (Page 1 of 1)";
    entrytitle HALIGN = center "Duration of exposure and RECIST overall response";
    entrytitle HALIGN = center "Full analysis set";
    entrytitle HALIGN = center " ";
    entrytitle HALIGN = left "Primary site of Cancer : Lung";
    entryfootnote HALIGN = left " > denotes ongoing patient.";
    entryfootnote HALIGN = left " ";
    entryfootnote HALIGN = left "CXYZ123/report/pgm_saf/&pgmname..sas" halign=right "Version 1.0" ;
    /*--- Attributes for grouping variable ---*/
    discreteamap name="dosegroup" / ignorecase=true;
      value " " /markerattrs=(color=white );
      value "0mg + 1mg" /markerattrs=(color=LIGRYBR );
      value "30mg + 0.5mg" /markerattrs=(color=cyan );
      value "60mg + 0.5mg" /markerattrs=(color=blue );
      value "60mg + 1mg" /markerattrs=(color=green );
      value "60mg + 1.5mg" /markerattrs=(color=orange );
      value "60mg + 2mg" /markerattrs=(color=pink );
      value "70mg + 1.5mg" /markerattrs=(color=red );
      value "80mg + 1mg" /markerattrs=(color=darkred );
      value "80mg + 1.5mg" /markerattrs=(color=purple);
      value "90mg + 1mg" /markerattrs=(color=black );
    enddiscreteamap;
    DiscreteAttrVar attrvar=_group var=tddla attrmap="dosegroup";
    /* Designing the plotting area */
    layout overlay / xaxisopts =(griddisplay=on Label="Duration of exposure (weeks)" type=linear linearopts=(tickvaluesequence=( start=0 end=100 increment=4) viewmin=0
      viewmax=100)) yaxisopts =(griddisplay=on Label="Patient id." type=discrete display= STANDARD tickvalueattrs=(size=6pt));
    /* Step 1: To plot the day of exposure*/
    ScatterPlot X=dewks Y=pat / primary=true Group=_group Markerattrs=(symbol=squarefilled Size=6px) DataTransparency=0.5 LegendLabel="Subject Identifier" NAME="SCATTER";
    /* Step 2: To plot the ongoing patient status*/
    ScatterPlot X=ongday Y=pat / primary=true Markerattrs=( symbol=greaterthan color=black Size=8px)DataTransparency=0 LegendLabel="Ongoing patients" NAME="SCAT";
    /* Step 3: To plot the exposure and response */
    ScatterPlot X=cr Y=pat / primary=true Markerattrs=(symbol=squarefilled color=black Size=8px) DataTransparency=0 LegendLabel="Complete response" NAME="SCATTER2";
    ScatterPlot X=pr Y=pat / primary=true Markerattrs=(symbol=circlefilled color=black Size=8px) DataTransparency=0 LegendLabel="Partial response" NAME="SCATTER3";
    ScatterPlot X=sd Y=pat / primary=true Markerattrs=(symbol=trianglefilled color=black Size=8px) DataTransparency=0 LegendLabel="Stable disease" NAME="SCATTER4";
    ScatterPlot X=pd Y=pat / primary=true Markerattrs=(symbol=diamondfilled color=black Size=8px) DataTransparency=0 LegendLabel="Progressive disease" NAME="SCATTER5";
    ScatterPlot X=uk Y=pat / primary=true Markerattrs=(symbol=hash color=black Size=8px) DataTransparency=0 LegendLabel="Unknown" NAME="SCATTER6";
    /* Step 4: To plot the legends */
    DiscreteLegend "SCATTER" / Location=Outside halign=center valign=bottom Border=false valueattrs=(size=8pt);
    DiscreteLegend "SCAT" / Location=inside across=1 halign=right valign=bottom Title="09"x Border=false valueattrs=(size=8pt);
    DiscreteLegend "SCATTER2" "SCATTER3" "SCATTER4" "SCATTER5" "SCATTER6" / Location=outside autoalign=(topright) across=10 halign=left valign=top Title="Overall response"
      Border=false valueattrs=(size=8pt);
    endlayout;
  endgraph;
end;
run;
options orientation=landscape papersize='ISO A4' nodate nonumber nobyline;
ods pdf file="CXYZ123/report/safety/DE_PLOT.pdf" style=graph dpi=300;
ods listing close; * Avoid .PNG creation in home drive;
proc sgrender data=toprint template=DEPLOT;
format pat sid_;
run;
ods listing;
ods pdf close;
```

Drug Exposure plot

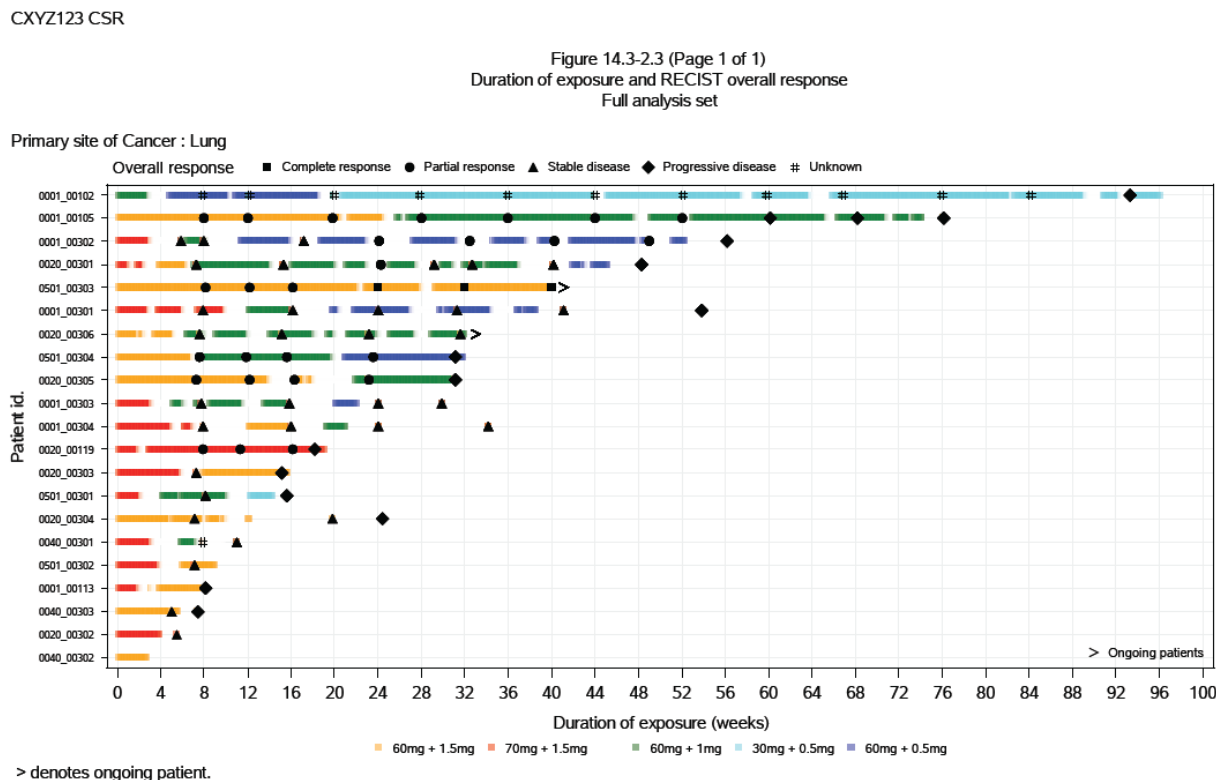
```

/*--- Attributes for grouping variable ---*/
/* Designing the plotting area */, name="dosegroup" / ignorecase=true;
layout overlay / xaxisopts =(griddisplay=on Label="Duration of exposure(weeks)" type=linear linearopts=(tickvaluesequence=( start=0 end=100 increment=4) viewmin=0
viewmax=100)) yaxisopts =(griddisplay=on Label="Patient id." type=discrete display= STANDARD tickvalueattrs=(size=6pt));
/* Step 1: To plot the day of exposure*/.mg" /markerattrs=(color=LIGRYBR );
ScatterPlot X=dewks Y=pat/ primary=true Group=_group Markerattrs=(symbol=squarefilled Size=6px) DataTransparency=0.5 LegendLabel="Subject Identifier" NAME="SCATTER";
/* Step 2: To plot the ongoing patient status*/;
ScatterPlotoptions orientation=landscape papersize='ISO A4' nodate nonumber nobylines;ndLabel="Ongoing patients" NAME="SCAT";
/* Step 3: ods pdf file="CXYZ123/report/safety/DE PLOT.pdf" style=graph dpi=300;
ScatterPlot ods listing close; * Avoid .PNG creation in home drive; DataTransparency=0 LegendLabel="Complete response" NAME="SCATTER2";
ScatterPlot ods listing close; * Avoid .PNG creation in home drive; DataTransparency=0 LegendLabel="Partial response" NAME="SCATTER3";
ScatterPlotproc sgrender data=toprint template=DEPLOT;lor=black Size=8px) DataTransparency=0 LegendLabel="Stable disease" NAME="SCATTER4";
ScatterPlotformat pat sid .;e Markerattrs=(symbol=diamondfilled color=black Size=8px) DataTransparency=0 LegendLabel="Progressive disease" NAME="SCATTER5";
ScatterPlot run; y=pat / primary=true Markerattrs=(symbol=hash color=black Size=8px) DataTransparency=0 LegendLabel="Unknown" NAME="SCATTER6";
/* Step 4: at the legends */.mg + 1 5mg" /markerattrs=(color=purple);
DiscreteLegods listing;location=Outside haln=center valn=bottom Border=false valueattrs=(size=8pt);
DiscreteLegods pdf close;=inside across=1 haln=right valn=bottom Title="09"x Border=false valueattrs=(size=8pt);
DiscreteLegend "SCATTER2" "SCATTER3" "SCATTER4" "SCATTER5" "SCATTER6"/ Location=outside autoalign=(topright) across=10 haln=left valn=top Title="Overall response"
Border=false valueattrs=(size=8pt);rvar=_group var=tddla attrmap="dosegroup";
endlayout;
graph;

```

CXYZ123 CSR

Figure 11.2.22 (Page 1 of 1)



Forest plot - Most frequent AE with Relative Risk

Well structured input dataset to plot most frequent AE with relative risk compared to Active control

	SOC	TRTGR	PCT	PCT2	VALUE	LOWERCL	UPPERCL	SECTION	COMP	BEYPL
1	Blood	1	6.349206	1.5873	1.9683	0.3740	10.0000	1	1	10
2	Card	1	9.52381	.	5.9048	0.7320	10.0000	2	1	10
3	Gastr	1	33.33333	.	1.7222	0.9297	3.1904	3	1	.
4	Gastr	2	19.35484	.	.	.	.	3	1	.
5	Genrl	1	9.52381	.	0.6561	0.2483	1.7336	4	1	.
6	Genrl	2	14.51613	.	.	.	.	4	1	.
7	Hepat	1	15.87302	.	0.6151	0.3030	1.2486	5	1	.
8	Hepat	2	25.80645	.	.	.	.	5	1	.
9	Infec	1	19.04762	.	0.9084	0.4502	1.8328	6	1	.
10	Infec	2	20.96774	.	.	.	.	6	1	.
11	Inv	1	12.69841	1.5873	1.1247	0.4342	2.9136	7	1	.
12	Inv	2	11.29032	.	.	.	.	7	1	.
13	Metab	1	63.49206	1.5873	1.7893	1.2184	2.6279	8	1	.
14	Metab	2	35.48387	.	.	.	.	8	1	.
15	Musc	1	11.11111	1.5873	0.6263	0.2597	1.5104	9	1	.
16	Musc	2	17.74194	3.22581	.	.	.	9	1	.
17	Nerv	1	22.22222	.	1.9683	0.8524	4.5446	10	1	.
18	Nerv	2	11.29032	1.6129	.	.	.	10	1	.
19	Vasc	1	9.52381	1.5873	1.4762	0.4377	4.9782	11	1	.
20	Vasc	2	6.451613	.	.	.	.	11	1	.

Forest plot – SAS code to create Template

```
proc template;
define style Styles.MyDefault;
  parent=rtf_temp; /*--- Attributes for grouping variable ---*/
  style GraphData1 from GraphData1 / contrastcolor=Green markersymbol="CIRCLEFILLED";
  style GraphData2 from GraphData2 / contrastcolor=Red markersymbol="SQUAREFILLED";
end;
define statgraph aeplot;
beginningraph/border = false designwidth=25.0cm designheight=20.0cm;
  entrytitle halign=left "CXYZ123 CSR"; /*--- To plot titles and footnotes ---*/
  entrytitle HALIGN = left " ";
  entrytitle HALIGN = center "Figure 14.3-2.4 (Page 1 of 1)";
  entrytitle HALIGN = center "Most frequent adverse event (> 5% in any treatment)";
  entrytitle HALIGN = center "Safety set";
  entrytitle HALIGN = center " ";
  entryfootnote HALIGN = left "- > symbols indicate RRs outside the plotting range." ;
  entryfootnote HALIGN = left " " ;
  entryfootnote HALIGN = left "CXYZ123/report/pgm_saf/&pgmname..sas" halign=right "Version 1.0" ;

  layout lattice / columns=3 rows=1 columnweights=(0.40 0.40 0.20);
  *** overlay layout to plot ae_pct;
  layout overlay / xaxisopts=(Label="Percent" type=linear)
    yaxisopts=(griddisplay=off display= STANDARD type=discrete) border=false;
  ScatterPlot X=PCT Y=section / primary=true Group=TRTGRPN NAME="SCATTER1";
endlayout;
  *** overlay layout to plot ae_rr;
  layout overlay / xaxisopts=( Label="Relative Risk (RR) with 95% CI" type=linear
    linearopts=( tickvaluelist=( 0 1 2 3 4 5 6 7 8 9 10) viewmin=0 viewmax=10))
    yaxisopts=( griddisplay=off display=none) border=false;
  ScatterPlot X=VALUE Y=section / primary=true XErrorUpper=UPPERCL XErrorLower=LOWERCL NAME="SCATTER"
    Markerattrs=(symbol=diamondfilled color=black Size=8px);
  DiscreteLegend "SCATTER1"/ Location=outside valign=top title="Treatment:" border=false;
  ***plot the ongoing pts status*
  ScatterPlot X=beypl Y=section / primary=true Markerattrs=( symbol=greaterthan color=black Size=10px )
    DataTransparency=0;
  referenceLine x=1/ clip=true;
endlayout;
  *** overlay layout codes to plot Sae_pct;
  layout overlay / xaxisopts=(Label="SAE's" type=linear)
    yaxisopts=(griddisplay=off display=none type=discrete) border=false;
  ScatterPlot X=PCT2 Y=section / primary=true Group=TRTGRPN NAME="SCATTER2";
endlayout;
endlayout; **lattice;
endgraph;
end;
run;

options orientation=landscape papersize='ISO A4' nodate nonumber nobylines;
ods pdf file="CXYZ123/report/safety/FREQAE_FP.pdf" style=MyDefault dpi=300;
ods listing close; * Avoid .PNG creation in home drive;
proc sgrender data=FP_ids template=aeplot;
format section socf_. TRTGRPN trtf.;
run;
ods listing;
ods pdf close;
```

Forest plot

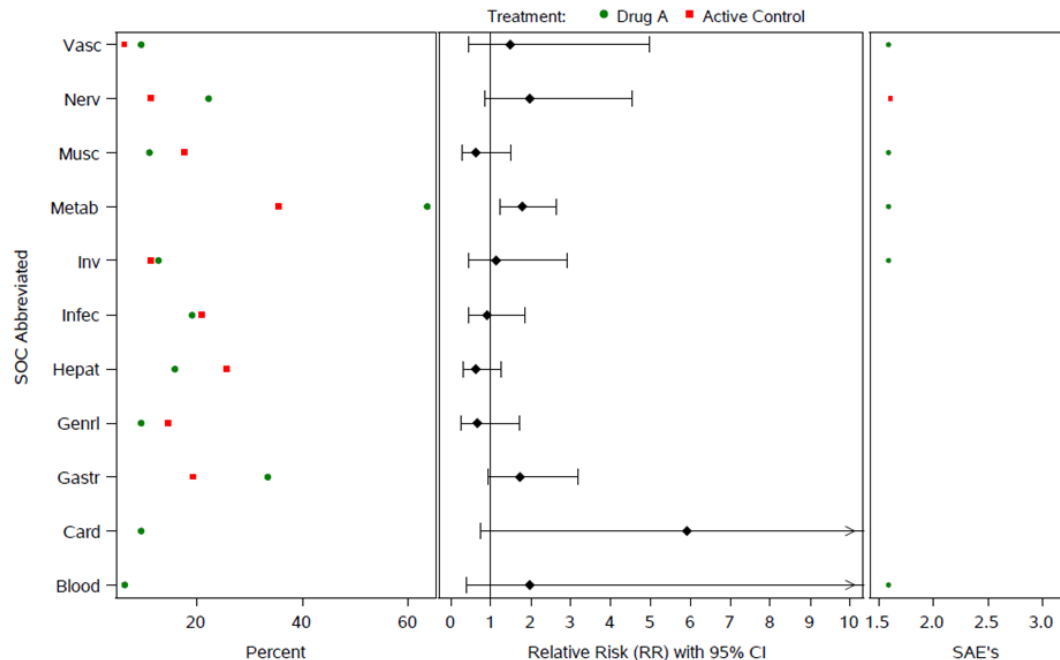
```

layout lattice / columns=3 rows=1 columnweights=(0.40 0.40 0.20);
def:*** overlay layout to plot ae_pct;
  layout overlay / xaxisopts=(Label="Percent" type=linear); variable ---*/
  yaxisopts=(griddisplay=off display= STANDARD type=discrete) border=false;
  ScatterPlot X=PCT Y=section / primary=true Group=TRTGRPN NAME="SCATTER1";
  endlayout;
end*** overlay layout to plot ae_rr;
  layout overlay / xaxisopts=(Label="Relative Risk (RR) with 95% CI" type=linear);
  linearopts=(options orientation=landscape papersize='ISO A4' nodate nonumber nobyline;
  _yaxisopts=(ods pdf file="CXYZ123/report/safety/FREQAE_FP.pdf" style=MyDefault dpi=300;
  ScatterPlot X=
  Markerattrs ods listing close; * Avoid .PNG creation in home drive;
  DiscreteLevel=proc sgrender data=FP ids template=aeplot; border=false;
  ***plot the on
  ScatterPlot format section socf_ TRTGRPN trtf.; l=greaterthan color=black Size=10px )
  Data run; parency=0; er " ";
  referenceLine
  ods listing;
endlayout;
*** overlay layout to plot ae_sae;
  layout overlay / xaxisopts=(Label="SAE's" type=linear);
  yaxisopts=(griddisplay=off display=none type=discrete) border=false;
  ScatterPlot X=PCT2 Y=section / primary=true Group=TRTGRPN NAME="SCATTER2";
  endlayout;
endlayout; **lattice;
endgraph;
end;
run;

```

CXYZ123 CSR

Figure 14.3-2.4 (Page 1 of 1)
Most frequent adverse event (> 5% in any treatment)
Safety set



-> symbols indicate RRs outside the plotting range.

CXYZ123/report/pgm_saf/FREQAE_FP.sas

Version 1.0

Conclusion

- ✓ The SG procedures and the GTL provide an efficient way of creating high-quality graphs quickly and with minimal programming effort.
- ✓ Programming of any complex graphs can be made simple through the presented procedures using no more than a page of code because of well-structured built-in syntax supported by statements.
- ✓ Surprisingly, no special coding or annotation is required.

